Area Plan for the East

04/11/2020

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THE AREA PLAN EAST SCENARIO TESTING

AREA PLAN FOR THE EAST

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1. INTRODUCTION

1.1 Background

1.1.1 SYSTRA Limited (SYSTRA) was commissioned by the Department of Infrastructure (DoI), Isle of Man Government in April 2016 to update and extend the exiting 2009 Lower Douglas Paramics Model (LDPM) to include the wider area of Douglas and the road network out to Spring Valley, Ballanard, Hillberry, Birch Hill and Onchan.

1.1.2 The updated model, now referred to as the 2016 Douglas Paramics Model (2016 DPM), was developed in 2017 as detailed in the Lower Douglas S-Paramics Model Upgrade and Extension – Base Model Development Report (SYSTRA Ref. GB01T16A59/tpIOMDUE/25082017/1).

1.1.3 The DoI then appointed SYSTRA to undertake a cumulative assessment, using the 2016 DPM, of the proposed developments resulting from The Area Plan East (APE) consultation.

1.1.4 The initial study assessed and reported the impact on the Douglas and Onchan Road network with the, then proposed, full development content in place. This was reported in *The Area Plan East Scenario Testing Report (SYSTRA Ref. GB01T17O37/112018_02, June 2018)*.

1.1.5 The proposed development content has since been revised, and the demand matrix used within the modelling exercise updated to reflect the recent changes supplied by the Cabinet Office.

1.1.6 This report describes the overall modelling approach and presents the potential impacts of the revised proposed development content on the highway network in Douglas & Onchan.

2. DEVELOPMENT CONTENT

2.1 Introduction

2.1.1 Informed directly from The Area Plan East (APE) consultation, the Cabinet Office initially provided information for 130 separate development sites in and around the Douglas and Onchan areas for consideration within the study. The cabinet Office subsequently identified 107 sites to be included within the 2016 DPM, which has subsequently been revised to 38 sites; 25 residential and mixed use, 13 employment.

2.2 Development Content

2.2.1 The TRICS database was used to derive trip rates for each land use type and predict the total number of trips arriving and departing from each site location for each modelled period.

2.2.2 The total number of trips, for both light goods vehicles (cars, LGVs) and heavy good vehicles (OGV1, OGV2), extracted from the TRICS database for each proposed site, and as agreed with the DoI, are detailed in the following tables.

2.2.3 The following five tables detail the sites considered within this study. In each case, the site is identified along with the land use type, the number of units/size of area being considered for development and the total number of trips entering and exiting each site during each modelled period.

Table 1. Development Content (Residential)

Site Code	Address	Use	Yield	AM (In) Lights	AM (Out) Lights	PM (In) Lights	PM (Out) Lights	Sat (In) Lights	Sat (Out) Lights	AM (In) Heavies	AM (Out) Heavies	PM (In) Heavies	PM (Out) Heavies	Sat (In) Heavies	Sat (Out) Heavies
BM006g	Vicarage Road	Mixed Use	100	37	90	113	70	67	73	1	1	0	0	0	0
DBH002g/BH030g	Braddan Road/Ballafletcher Road	Residential	300	97	236	261	156	202	220	2	1	1	1	1	1
DH001g	Westmoreland Road	Residential	39	13	31	33	20	27	29	0	0	0	0	0	0
DH004g	South Quay	Residential	30	10	23	25	15	20	22	0	0	0	0	0	0
DH011g	Ballanard Woods	Residential	40	13	31	34	20	27	29	0	0	0	0	0	0
DH016g	Anna Cur House	Residential	10	3	8	8	5	7	7	0	0	0	0	0	0
DH019g	South Quay	Residential	86	27	66	72	43	58	63	0	0	0	0	0	0
DH021g	South Quay	Residential	7	2	5	6	4	5	5	0	0	0	0	0	0
DH022g	Circular Road	Residential	63	20	49	53	32	42	46	0	0	0	0	0	0
DH025g	Fairfield	Residential	9	3	7	8	5	6	7	0	0	0	0	0	0
DH037g	Lower Dukes Lane	Residential	6	2	5	5	3	4	4	0	0	0	0	0	0
DH039g	Park Road	Residential	27	9	21	23	14	18	20	0	0	0	0	0	0
DH042g	Albany Road	Residential	8	3	6	7	4	5	6	0	0	0	0	0	0
DH046g	Victoria Road Prison	Residential	44	14	34	37	22	30	32	0	0	0	0	0	0
DM002g	Lake Road	Mixed Use	41	13	32	35	21	28	30	1	0	1	1	1	1
DM003g	Loch Promenade	Mixed Use	17	5	13	14	9	11	12	0	0	0	0	0	0
DM004g	Lord Street	Mixed Use	21	7	16	18	11	14	15	0	0	0	0	0	0
DM007g	Formerly Masterplan TF1 & TF2	Mixed Use	10	3	8	8	5	7	7	0	0	0	0	0	0
DM008g	Formerly Masterplan TF3 & TF6	Mixed Use	33	10	26	28	17	22	24	0	0	0	0	0	0
DM012g	Summerland	Mixed Use	7	0	1	1	1	1	1	0	0	0	0	0	0
DM013g	Little Switzerland	Mixed Use	22	7	17	19	11	15	16	0	0	0	0	0	0
DM014g	Milestone	Mixed Use	6	96	59	58	95	78	81	3	4	3	2	4	4
OH016g	Follies Cabaret	Residential	15	7	22	27	16	13	15	0	0	0	0	0	0
BH034g	Mannin Infirmary Site	Residential	23	8	21	26	16	15	17	0	0	0	0	0	0

Table 2. Development Content (Employment)

Site Code	Address	Net Area	AM (In) Lights	AM (Out) Lights	PM (In) Lights	PM (Out) Lights	Sat (In) Lights	Sat (Out) Lights	AM (In) Heavies	AM (Out) Heavies	PM (In) Heavies	PM (Out) Heavies	Sat (In) Heavies	Sat (Out) Heavies
BE002(a)	South of Cooil Road	5.21	136	61	58	127	94	97	5	6	4	4	7	6
BE002(b)	South of Cooil Road	10.45	273	123	116	254	189	195	10	12	9	7	13	13
BE006	South of Cooil Road	9.43	246	111	105	230	171	176	9	10	7	6	12	11
BE010 (Special Industry)	Middle Farm	6.9	3	1	0	3	0	0	5	3	2	1	0	0
DE002	Middle River Industrial Estate	1.34	35	16	15	33	24	25	1	1	1	1	2	2
DE004	Sangster's Field	5.31	139	63	59	129	96	99	5	6	4	3	6	6
DE007	White Hoe	1.19	31	14	13	29	22	22	1	1	6	1	1	1
BE004	Kirby Farm	1.46	76	34	32	71	53	54	3	3	2	2	4	3
BE016	Tromode and Ballafletcher	0.64	58	26	25	54	40	41	2	2	2	1	3	3
BE017	Tromode and Ballafletcher	1.22	32	14	14	30	22	23	1	1	1	1	1	1
BE018	Kirby Farm	0.8	21	9	9	19	14	15	1	1	1	0	1	1
BE012	Isle of Man Business Park	1.26	33	15	14	31	23	23	1	1	1	1	2	1
BE023	Union Mills Industrial Estate	0.3	8	4	3	7	5	6	0	0	0	0	0	0

Table 3. Development Content (Sites 44-63)

2.2.4 The total number of new trips generated, as a result of considering each of the 107 separate development proposals, and added to the existing 2016 DPM are shown in Table 6.

Table 4. Development Trip Totals

Dev. Trip Totals	AM Period (Veh)	PM Period (Veh)	Sat Period (Veh)
Matrix 1	2,841	3,033	3,060
Matrix 2	109	92	116
Total	**2,951**	**3,125**	**3,176**

2.3 Trip Distribution & Trip Matrix Totals

2.3.1 In agreement with the DoI, all new trips assigned to the 2016 DPM as development trips were distributed using existing profiles within the 2016 DPM. Where a development proposal shared an existing zone within the network, the same profile(s) was adopted and where a new zone was created for a proposed development a profile from a nearby zone of similar land use was used.

2.3.2 The overall trip matrix totals used in the assessment are detailed in Table 7 and show both the 2016 Base Year matrix totals alongside the proposed development totals for each modelled period.

Table 5. Trip Matrix Totals

Matrix Trip Totals	AM Period (Veh)	PM Period (Veh)	Sat Period (Veh)
Base			
Matrix 1	32,587	36,282	33,710
Matrix 2	983	523	355
Total	*33,570*	*36,805*	*34,064*
Development			
Matrix 1	2,841	3,033	3,060
Matrix 2	109	92	116
Total	*2,951*	*3,125*	*3,176*
% Increase from Base	*8.8%*	*8.5%*	*9.3%*
Grand Total	**36,521**	**39,930**	**37,241**

2.3.3 With the development trips in place, the total number of vehicle being modelled using the 2016 DPM during the AM period is 36,521 vehicles, during the PM period 39,930

vehicles and during the Saturday period 37,241 vehicles, an increase of around 9% across all periods being modelled.

2.3.4 For the purposes of the exercise, all development trips were included within the model as 'new' trips to the network i.e. no trips between each of the new developments being proposed were included. It should therefore be acknowledged that the study reflects a 'worst case' scenario as in reality not all trips would be new to the network.

3. DEVELOPMENT TESTING RESULTS

3.1 Introduction

3.1.1 The DoI requires and understanding of how the Douglas & Onchan highway network will perform with the proposed developments, resulting from The APE consultation, included in addition to the Base Year (2016) traffic levels. This development is referred to, within this document, as the Area Plan East Full Development (APE Development).

3.1.2 It should be recognised that the testing undertaken retained the same fixed time signal controlled plans, for each signal controlled junction within the network, in place for the 2016 Base network. The modelling work did not account for any dynamic operation of the signal controllers, nor were they adjusted to account for the changes in flow patterns as a result of the additional traffic levels in each future year test. In addition, no change was made to the assignment profiles used within the study to account for any possible 'peak spreading' that may/may not occur should the proposed development content be brought forward.

3.1.3 In line with previous studies for the DoI, the impact of the proposed changes to the road network in Douglas were reported using:

- Network Summary Statistics
- Average Network Speeds
- Average Network Travel Times

3.1.4 The modelled periods covered were:

- AM Period: 07:00 – 10:00
- PM Period: 16:00 – 19:00
- Saturday Period: 11:00 – 14:00

3.1.5 Each model run was assigned a random seed value to reflect the daily variation in traffic conditions. The outputs were averaged across 5 separate runs using a random seed.

3.2 Network Summary Statistics

3.2.1 The network summary statistics report on the overall network performance of a model.

3.2.2 The network summary statistics for each modelled period and scenario were extracted from the model runs and presented as an average across all runs.

3.2.3 In line with previous work for the DoI, the following ranking system was adopted to help compare the performance of the network against the existing 2016 Base. This was achieved by putting the network mean speed into the following bins. For consistency, the same ranking system has been applied and included within the network summary statistics presented in this section.

Speed	Level of Service
>17mph	1
15 – 17mph	2

- 13 – 15mph 3
- 11 – 13mph 4
- < 11mph 5

AM Period

3.2.4 The network summary statistics for the AM period are detailed in Table 7. The results for the model including APE Development are compared against the 2016 Base.

Table 6. Network Summary Statistics (AM Period)

Model	Number of Vehicles	Total Distance Travelled (km)	Average Time Taken (hh:mm:ss)	Mean Speed (mph)	Rank
2016 Base	33,445	62,058	00:05:39	19.70	1
APE Full Development	37,167	69,459	00:06:30	17.24	1

3.2.5 Compared with the Base situation, the results show that with the APE Development in place, the mean speed reduces, the average time taken for all vehicles in the network to make their journey increases and the total distance travelled by all vehicles increases.

3.2.6 Based on the adopted ranking system, and with the APE Development in place, the mean network speed falls within the >17mph range and thus is ranked at number 1. By comparison, the 2016 Base model indicated an overall network mean speed >17mph during the AM period and ranks also at number 1 using the adopted ranking system.

PM Period

3.2.7 The network summary statistics for the PM period are detailed in Table 8.

Table 7. Network Summary Statistics (PM Period)

Model	Number of Vehicles	Total Distance Travelled (km)	Average Time Taken (hh:mm:ss)	Mean Speed (mph)	Rank
2016 Base	36,737	70,686	00:06:13	18.56	1
APE Full Development	40,500	79,828	00:09:32	12.41	4

3.2.8 Compared with the Base situation, and with the APE Development in place, the PM period results also show that the mean speed reduces, the total time taken for all vehicles in the network to make their journey increases and the total distance travelled by all vehicles increases.

3.2.9 With the APE Development in place, and based on the adopted ranking system, the mean network speed is shown to fall within the 11 – 13mph range and is thus ranked at number 4. The 2016 Base model indicated an overall network mean speed >17mph during the PM period and ranks at number 1 using the adopted ranking system.

3.2.10 The network summary statistics for the Saturday period are detailed in Table 9.

Table 8. Network Summary Statistics (Saturday Period)

Model	Number of Vehicles	Total Distance Travelled (km)	Average Time Taken (hh:mm:ss)	Mean Speed (mph)	Rank
2016 Base	34,065	62,271	00:05:02	21.76	1
APE Full Development	37,608	70,341	00:05:04	22.12	1

3.2.11 Compared with the Base situation, the Saturday period results show that the network mean speed, and the average time taken for all vehicles in the network to make their journey, are similar. Given additional trips exist in the network with the APE Development in place, the total distance travelled by all vehicles is shown to increase, which was expected.

3.2.12 With the APE Development in place, and based on the adopted ranking system, the mean network speed is shown to be >17mph and is thus ranked at number 1 along with the 2016 Base model, which also indicated an overall network mean speed >17mph during the Saturday period.

3.3 Network Speeds

3.3.1 The average network speeds for all vehicles in the network were output in 5-minute intervals as part of the modelling assessment. The results for the AM period assessment are shown in Figure 1.

3.3.2 The results for the PM period are detailed in Figure 2 and for the Saturday period in Figure 3.

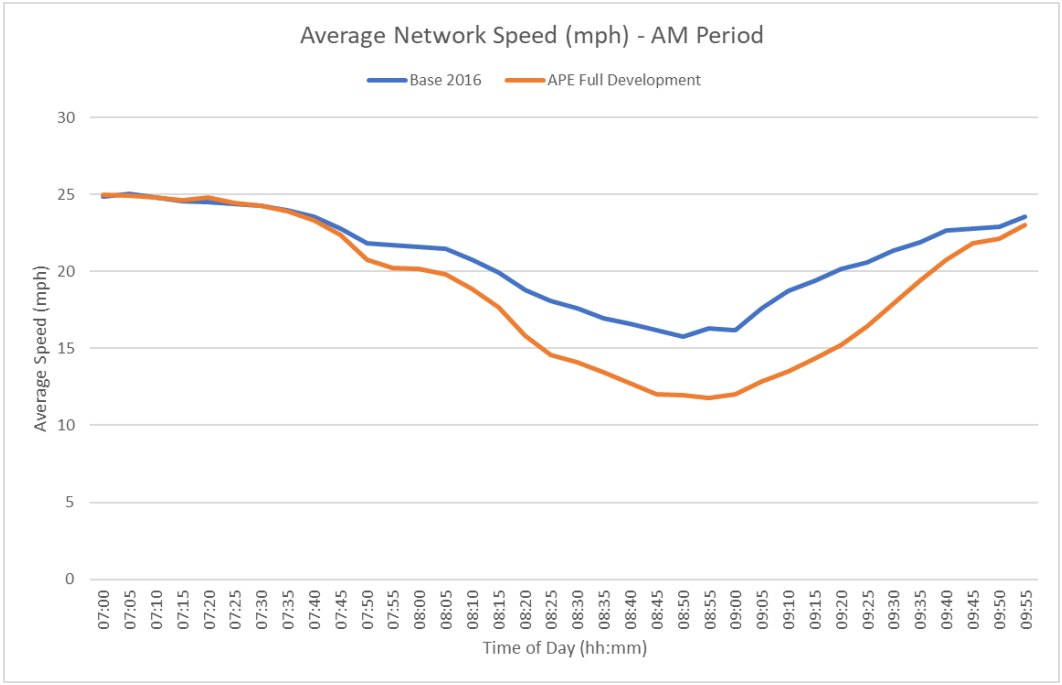

Figure 1. Average Network Speeds – AM Period

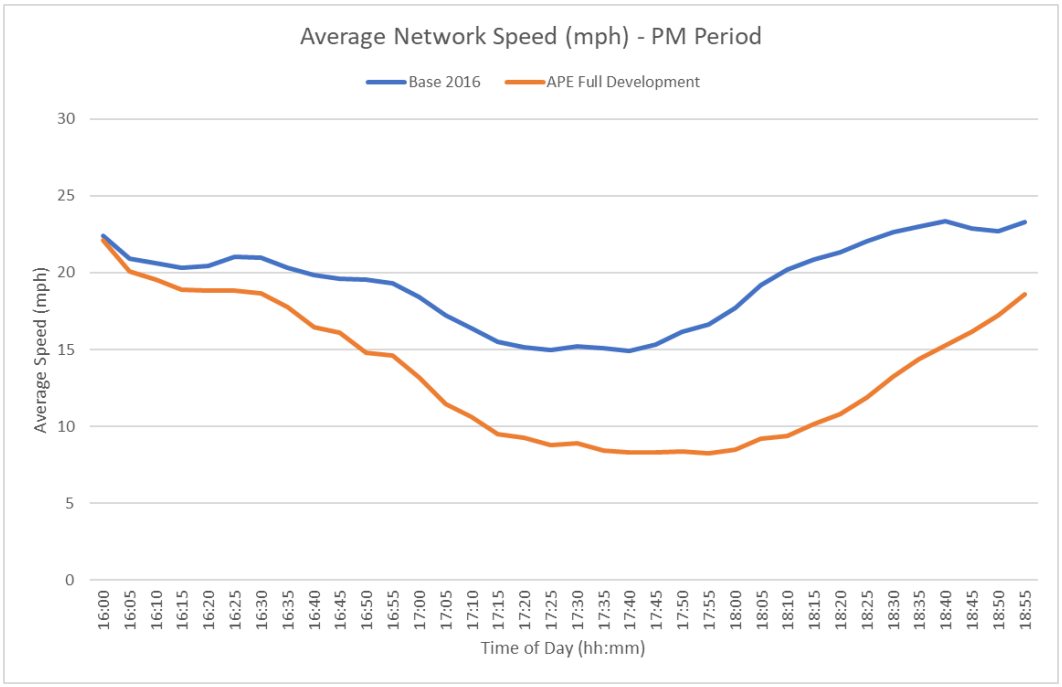

Figure 2. Average Network Speeds – PM Period

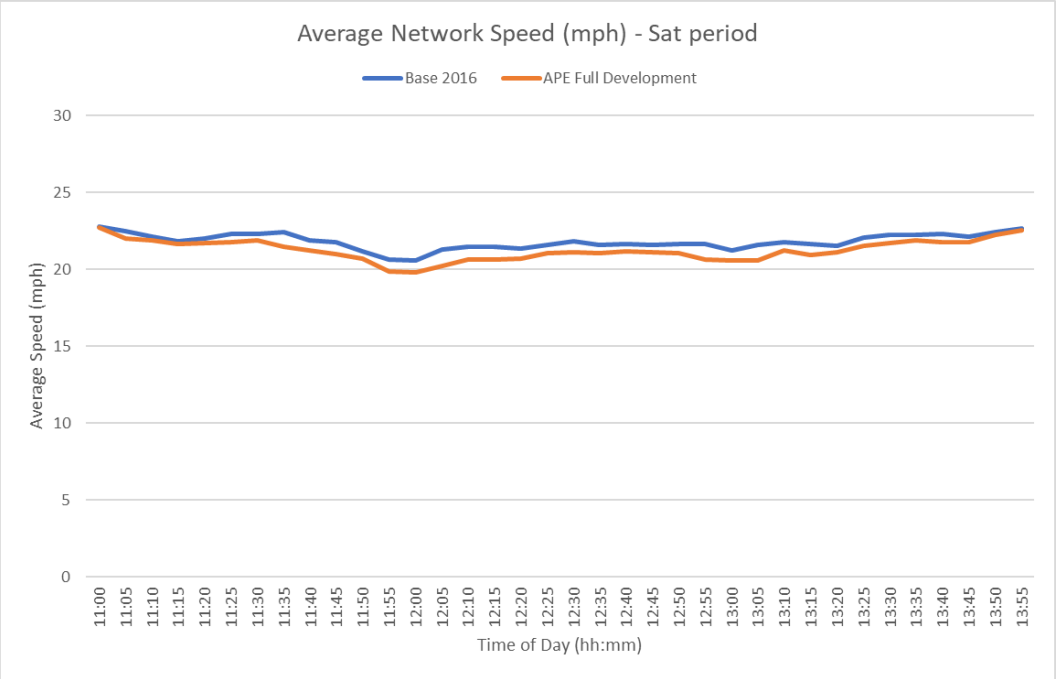

Figure 3. Average Network Speeds – Saturday Period

3.3.3 As with the network summary statistics, and compared against the 2016 Base results, the average network speeds across the entire network are lower when the APE Development is in place, particularly during the AM and PM periods. Given additional trips exist within the network with the APE Development included, and given additional congestion was evident leading to slower moving vehicles on the road highway network during these modelled periods, this was expected.

3.3.4 It should be recognised that the APE Development models retained the same fixed signal control timings as the 2016 Base network. The modelling work did not account for any dynamic operation of the signal controllers, nor were they adjusted to account for the changes in flow patterns as a result of the additional traffic levels in each future year test.

3.3.5 Introducing signal control plans at key signal controlled junctions in the network may therefore provide a benefit to the network operation and increase the network speeds within the Douglas network area.

3.4 Network Travel Time

3.4.1 The average network travel times for all vehicles in the network were output in 10-minute intervals as part of the modelling assessment. The results for the AM period assessment are shown in Figure 4. The result for the PM period are shown in Figure 5, and for the Saturday period in Figure 6.

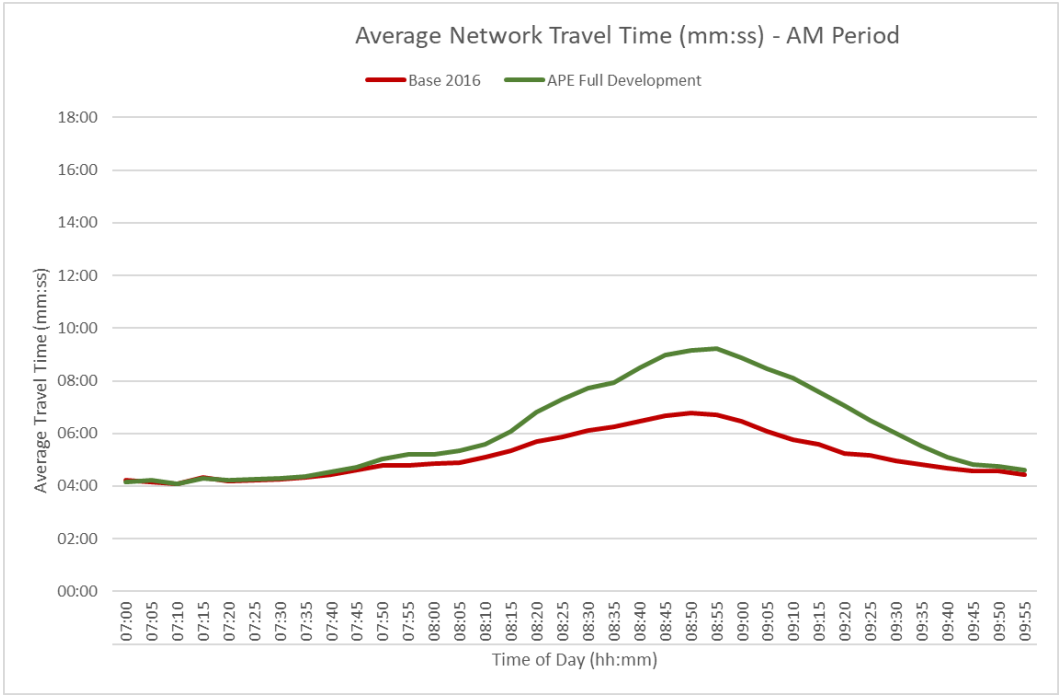

Figure 4. Average Network Travel Time – AM Period

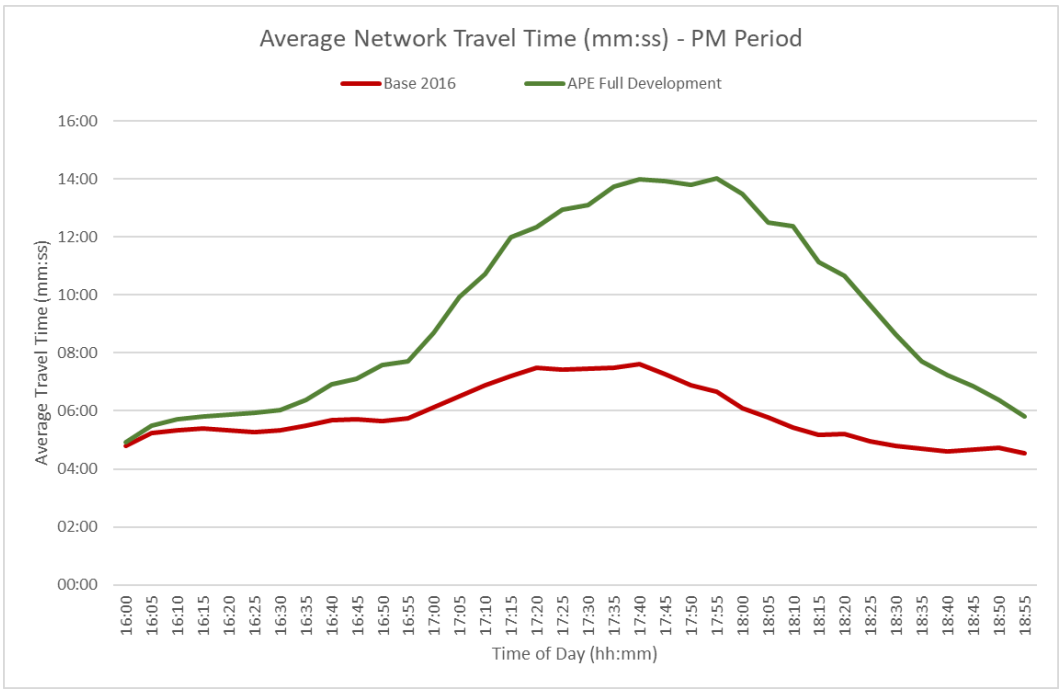

Figure 5. Average network Travel Time – PM Period

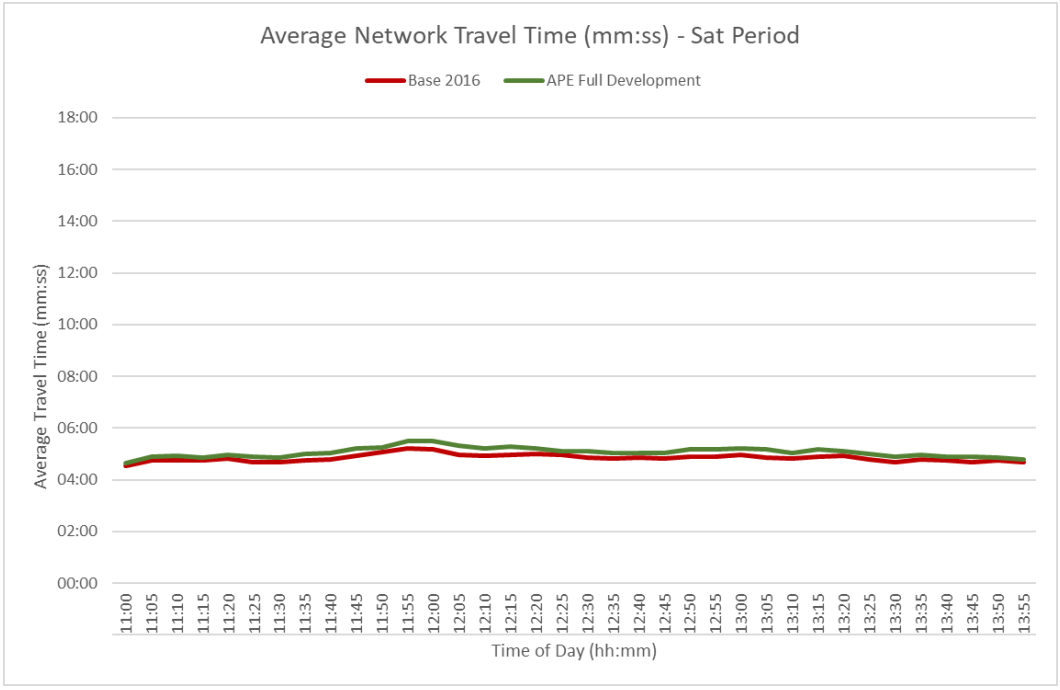

Figure 6. Average Network Travel Time – Saturday Period

3.4.2 As with the network summary statistics, and compared against the 2016 Base results, the average network travel times across the entire network are higher when the APE Development is in place, particularly during the AM and PM periods. Again, given additional trips exist within the network with the APE Development included, and given additional congestion was evident leading to slower moving vehicles on the road highway network during these modelled periods, this was expected.

3.5 Network Operation

3.5.1 Given the significant number of additional trips being modelled with the APE Development included within the 2016 DPM, congestion within the network was expected during each modelled period, particularly during the AM and PM periods.

3.5.2 During the AM period, this congestion is shown to mainly develop on the north side of Douglas and generally along the main arterial routes into the town. This includes the corridors of Peel Road and the A23 at Braddan, the A18 at Hillberry and along Johnny Waterson Lane.

3.5.3 Congestion during the PM period is shown to again form along Peel Road and the A23 at Braddan, but the model also highlighted significant congestion forming in Douglas itself, particularly along Peel Road, Quarter Bridge Rd, Alexander Drive, Woodbourne Road and Bucks Road corridors. Queueing was also shown to form on Cooil Road and along Hillberry Road into Onchan during the PM period.

3.5.4 The Saturday period highlighted pockets of congestions forming and dissipating across the network area. These mainly form at junctions along the A2, namely the junctions at Quarterbridge, Ballaquayle Road and Hillberry Road. Within the town, queues were shown to form along the main routes in and out of the town along Lord Street, Peel Road,

Circular Road, Bucks Road and Woodbourne Road. Compared with the AM and PM periods, the Saturday period is shown to cope relatively well with the additional traffic demand assigned within the model.

3.5.5 Further investigation would be required to confirm the location and the level of mitigation required in the network during each period modelled.

4. SUMMARY

4.1 Summary

4.1.1 The Department of Infrastructure, Isle of Man Government (DoI) requested SYSTRA Limited (SYSTRA), using the latest Paramics Discovery microsimulation model for Douglas and Onchan, test the impact on the highway network from the proposed developments resulting from The Area Plan East consultation (APE Development).

4.1.2 In total, and as provided and identified by the Cabinet Office, 38 separate sites were included within the modelling exercise resulting in an additional 2,951 trips during the AM period, an additional 3,125 trips during the PM period, and an additional 3,176 trips during the Saturday period.

4.1.3 Consequently, and with the development trips in place, the total number of vehicle being modelled was shown to be 36,521 vehicles during the AM period, 39,930 vehicles during the PM period and 37,241 vehicles during the Saturday period.

4.1.4 With all 38 separate development proposals included within the modelled network, congestion was shown to form in the network, particularly during the AM and PM periods modelled.

4.1.5 Compared with the existing 2016 Base situation, the results highlighted that the average network speeds across the entire network were lower with the APE Development in place, the average network travel time was higher, and that the overall network summary statistics reflected a lower rating when judged against a speed comparator used to form a ranking system, particularly during the PM period.

4.1.6 Congestion was shown to mainly develop on the north side of Douglas during the AM period and generally along the main arterial routes into the town, including the corridors of Peel Road and the A23 at Braddan, the A18 at Hillberry and along Johnny Waterson Lane.

4.1.7 During the PM period, queueing was shown to generally form along Peel Road, Quarter Bridge Road, Alexander Drive and New Castletown Road. Congestion was however shown to form in Douglas itself also, mainly along Woodbourne Road. Queueing was also shown to form on Cooil Road during the PM period mainly attributed to queueing back from the signal control junction on new Castletown Road at the junction with Annacur Lane.

4.1.8 Pockets of congestion were shown to form and dissipate across the network area during the Saturday period. These were shown to mainly form at junctions along the A2 and the main routes in and out of Douglas itself i.e. the junctions at Quarterbridge, Ballaquayle Road and Hillberry Road, and within the town, the Lord Street, Peel Road, Circular Road, Bucks Road and Woodbourne Road corridors. Compared with the AM and PM periods however, the Saturday period was shown to operate well with the additional traffic demand assigned within the model.

4.1.9 With the APE Development in place, further investigation would be required to confirm the location and the level of mitigation required within the network, using the 2016 DPM, during each modelled period.

4.1.10 It is possible however that the road network performance may further improve, if the fixed time signal plans currently present in the network are replaced with dynamic signal control plans. This would provide some benefit to dealing with the impact of including the APE Development content currently being proposed.

SYSTRA provides advice on transport, to central, regional and local government, agencies, developers, operators and financiers.

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