

Millbay Paramics Model - Option Tests 4a and 4b Technical Note

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Author :

SIAS Limited

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1 INTRODUCTION

- 1.1.1 This note has been produced in response to a request by Plymouth City Council to undertake an additional option test on the Millbay Paramics Model. It should be read in conjunction with the Millbay Paramics Model Validation and Option Testing Report dated February 2006 (SIAS Ref.TPMILBAY/64998).
- 1.1.2 Plymouth City Council has provided a plan illustrating a revised arrangement at the junction of Union Street, Western Approach and The Crescent to include a Diagonal Boulevard more directly connecting Millbay with the city centre and vice versa. The plan indicates that the previously proposed 5-arm junction will be reduced to a 4-arm junction. A junction south of the Diagonal Boulevard will be created to provide access for The Crescent.

2 NETWORK CHANGES

- 2.1.1 The option tests undertaken are as follows:
- Option 4a – Redirects The Crescent towards the proposed single lane Boulevard to form a second signalised junction south of the Western Approach/Union Street Junction.
 - Option 4b – As Option 4a but with the section of Boulevard between The Crescent and the Western Approach/Union Street Junction modelled using two lanes.
- 2.1.2 The model has been run for both the AM and PM peaks. A series of outputs have been collected and compared:
- Mean Speed
 - Average Journey Time
- 2.1.3 Specific journey paths have also been established to highlight the performance of key junctions along Union Street:
- The Octagon
 - Edgumbe Street/Stonehouse Bridge
 - Western Approach/Union Street



3 RESULTS

3.1.1 A summary of the mean speeds of the Option 4 testing is included in Table 3.1

Table 3.1: Overall Average Network Speed Summary (km/h)

	Base	Option 3	Option 4a	Option 4b
AM Peak	29.3	24.1	23.3	23.6
PM Peak	28.8	24.0	15.6	21.8

3.1.2 The results indicate that the impact of the Option 4a layout suffers significantly in the PM peak. Results indicate that Option 4b does not suffer to the same degree. This is due to the introduction of a second lane to facilitate the movement of the northbound traffic across the western Approach/Union Street Junction.

3.1.3 An examination of journey times provides a more detailed assessment of where additional delay is being experienced.

3.1.4 A summary of the overall average journey time is provided in Table 3.2 below.

Table 3.2: Average Journey Time Summary (Minutes)

	Base	Option 3	Option 4a	Option 4b
AM Peak	2m 29s	3m 00s	3m 07s	3m 04s
PM Peak	2m 26s	2m 55s	4m 41s	3m 15s

3.1.5 The average journey time summary reflects the situation indicated by the overall average network speed. Whilst the average journey time is seen to increase significantly in the PM peak of Option 4a this is mitigated in Option 4b.

3.1.6 The results for the PM peak indicate that the revised junction arrangements will have a significant effect on both the overall average network speed and the average journey time.

3.1.7 The results indicate that the loss of The Crescent as an entry arm into the junction, will cause the network to suffer due to the reduced capacity for northbound traffic.

3.1.8 Appendix A contains a comparison of link flows within the study area. The comparisons indicate that with Option 4a in the PM peak there is significant reassignment of traffic away from the Notte Street/Western Approach corridor to the Martin Street/Octagon corridor and the Charles Street/Cobourg Street corridor.

3.1.9 More detailed analysis of specific journey paths traversing key junctions provides more detailed illustration of the performance of the network inclusive of the changes.



3.1.10 A summary of the AM peak average journey times is summarised in Table 3.4 below:

Table 3.4: AM Peak Average Journey Time (Seconds)

Path Name	Base	Option 3	Option 4a	Option 4b
Torpoint Ferry to Derrys Cross	163	239	225	226
Derrys Cross to Torpoint Ferry	176	228	231	226
High St to Durnford St	36	43	39	39
Durnford St to High St	32	36	33	34
Anstis St to Martin St (Oct SB)	53	90	81	83
Martin St to Anstis St (Oct NB)	63	64	115	109
Western App to Notte St	99	124	153	155
Notte St to Western App	124	137	179	162

3.1.11 A summary of the PM peak average journey times is summarised in Table 3.5 below:

Table 3.5: PM Peak Average Journey Time (Seconds)

Path Name	Base	Option 3	Option 4a	Option 4b
Torpoint Ferry to Derrys Cross	170	228	358	283
Derrys Cross to Torpoint Ferry	180	230	390	357
High St to Durnford St	37	52	68	101
Durnford St to High St	33	38	42	42
Anstis St to Martin St (Oct SB)	52	100	96	72
Martin St to Anstis St (Oct NB)	73	69	144	102
Western App to Notte St	87	143	268	157
Notte St to Western App	137	117	1273	264

3.1.12 The journey times in the AM peak show a slight increase for both Option 4a and Option 4b in the time it takes to traverse the Western Approach/Union Street Junction. This is illustrated through the increase in time that it takes to travel from Western Approach to Notte Street and vice versa.

3.1.13 Both Option 4a and Option 4b experience an increase in the time it takes to traverse the Octagon junction in the northbound direction. This is mainly due to the re-routing which occurs due to the reduction in the capacity of the Western Approach/Union Street Junction.

3.1.14 The increase in queuing occurs as a result of the remodelling of The Crescent to join the Diagonal Boulevard south of the junction of Union Street and Western Approach. Vehicles that are travelling from the east and south towards the north and west now have to queue at both the Diagonal Boulevard/Crescent junction and then again at the Western Approach/Union Street Junctions.

3.1.15 The results for the PM peak are significantly worse than those experienced in the AM peak due to the PM peak travel patterns with significant levels of southwest to northeast traffic. The journey times indicate a breakdown of the Crescent/Boulevard junction in both the north and southbound direction, particularly northbound.



4 SUMMARY

- 4.1.1 A revised junction arrangement has been modelled at the junction of Western Approach and Union Street. A new junction between The Crescent and the Diagonal Boulevard, prior to the entry of the Boulevard into the Western Approach/Union Street Junction, has been proposed. The revision has been supplemental to those previously tested in the Millbay Paramics Model Validation and Option Testing Report dated February 2006 (SIAS Ref.TPMILBAY/64998).
- 4.1.2 The model results indicate that the revised junction arrangement of Option 4a will have a significant detrimental effect on junction delay and overall network speed. This is particularly clear when considering the PM peak hour.
- 4.1.3 The effects of Option 4a can be mitigated by the addition of a second lane on the Boulevard between The Crescent and the Western Approach/Union Street junction. However, the model results indicate that the revised junction arrangement still performs poorly in the PM peak with respect to junction and network delay. Whilst an effect is experienced in the AM Peak the level is not considered as significant.
- 4.1.4 The reduction in overall network speed and the increase in average journey times has been deemed to occur as a result of the remodelling of the Crescent. Traffic now has to navigate past two sets of traffic lights whilst only being able to enter and exit the main Western Approach/Union Street junction from one arm as opposed to two.
- 4.1.5 Journeys traversing the Martin Street/Octagon corridor as well as the Charles Street/Cobourg Street corridor are also likely to suffer due to the reassignment which occurs due to the reduced junction capacity between Western Approach and Union Street.
- 4.1.6 It can be concluded that the proposed junction arrangement will lead to increases in queueing and delay on the Notte Street/Western Approach corridor particularly in the PM peak. The increases in delay will lead to reassignment of traffic to alternative routes which may aggravate existing levels of congestion.



Appendix A: Peak Hourly Flows

Table A.1: AM Peak Hourly Flows

AM Peak Hourly Flow		Base	Option 3	Option 4a	Option 4b
Saltash Road	SB	1448	1679	1681	1675
	NB	914	1130	1140	1121
Cobourg Street	SB	1227	1275	1270	1261
	NB	1036	1020	1032	1012
Charles Street	SB	1369	1416	1400	1396
	NB	1195	1150	1165	1145
Exeter Street	WB	2672	2961	3005	2997
	EB	1337	1578	1559	1560
Vauxhall Street	WB	378	540	521	516
	EB	283	334	390	391
Western Approach	SB	875	1093	1100	1101
	NB	462	598	565	571
Union Street East	WB	993	464	442	476
	EB	610	535	657	638
Martin Street	SB	253	582	616	614
	NB	207	476	598	568
Millbay Road East	WB	505	335	304	296
	EB	210	199	246	237
Union Street West	WB	557	837	836	835
	EB	521	939	946	945
Millbay Road West	WB	332	210	212	205
	EB	156	182	158	158
Durnford Street	SB	367	78	73	77
	NB	197	131	142	136
Stonehouse Bridge	WB	693	903	897	905
	EB	793	997	992	1000



Table A.2: PM Peak Hourly Flows

PM Peak Hourly Flow		Base	Option 3	Option 4a	Option 4b
Saltash Road	SB	1176	1614	1600	1614
	NB	1874	3172	2246	2192
Cobourg Street	SB	1171	1191	1313	1226
	NB	1287	1360	1748	1500
Charles Street	SB	1136	1259	1388	1288
	NB	1256	1291	1682	1444
Exeter Street	WB	1733	2029	2016	2007
	EB	2053	2193	2087	2191
Vauxhall Street	WB	253	259	311	392
	EB	629	626	665	738
Western Approach	SB	580	764	798	802
	NB	1083	1310	1164	1250
Union Street East	WB	962	413	607	426
	EB	767	683	624	606
Martin Street	SB	128	260	454	288
	NB	294	581	600	671
Millbay Road East	WB	371	231	65	261
	EB	518	342	436	433
Union Street West	WB	549	918	857	897
	EB	609	793	753	795
Millbay Road West	WB	378	173	200	198
	EB	217	194	234	190
Durnford Street	SB	157	30	37	40
	NB	544	325	350	335
Stonehouse Bridge	WB	1093	1294	1239	1289
	NB	666	801	798	807

