Derriford Roundabout and William Prance Road Junction Improvements

Appraisal Specification Report

On behalf of **Plymouth City Council**

Project Ref: 29210-012| Rev: 4 | Date: July 2014

Office Address: Caversham Bridge House, Waterman Place, Reading, Berkshire, RG1 8DN
T: 01189520646 E: reading@peterbrett.com

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	Name	Position	Signature	Date
Prepared by:	Leo Eyles	Consultant		18/11/13
Reviewed by:	Tom Withey	Senior Modeller		18/11/13
Approved by:	Bob Pinkett	Partner		18/11/13
For and on behalf of Peter Brett Associates LLP				

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1	12/12/13	Revision to reflect discussions with LTB	LE	BP	BP
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4	17/07/14	Various Client Revisions	IB/RB		

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1 Introduction

1.1 Purpose of the Report

1.1.1 This Appraisal Specification Report sets out the proposed methodology for the appraisal of a highway and public transport scheme on the A386 between Derriford Roundabout and William Prance Road in Plymouth.

1.2 Scheme Location and Description

1.2.1 The location of the two junctions at which improvements are proposed is shown below:

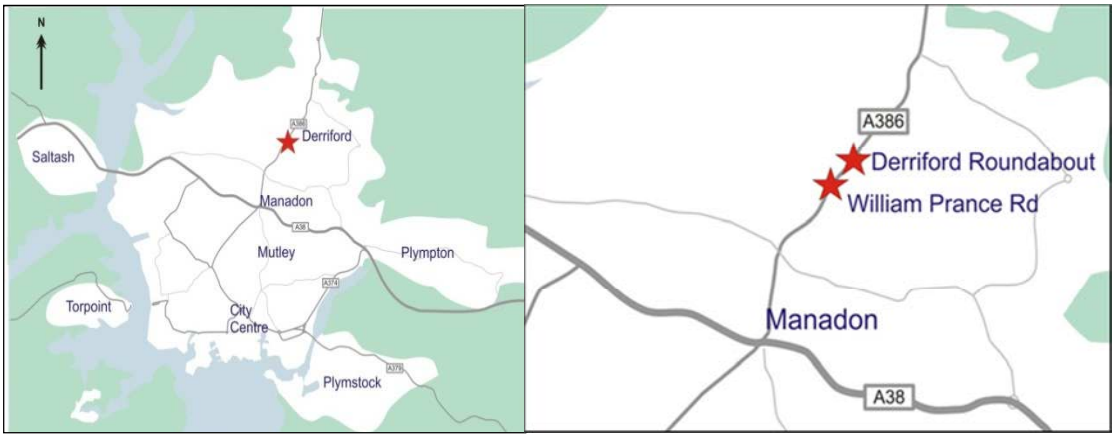

Figure 1 - Location of junction improvements

1.2.2 This scheme improves the A386 between Derriford Roundabout and William Prance Road by adding capacity to both junctions and providing improved bus priority, pedestrian and cycling facilities.

1.2.3 This section of the A386 has been identified as being one of the key strategic locations on the Northern Corridor and for the city as a whole. The A386 links the north of the city to the A38 Trunk Road network and the large residential areas of Woolwell, Estover and Crownhill, as well as key future development sites - most notably those referred to in the Core Strategy and its aspirations for growth in the north of the city. This large scale development will generate significantly increased travel demand and place great pressure on the A386 and its key junctions.

1.2.4 Derriford Roundabout is the largest junction on the Northern Corridor, with the exception of Manadon junction with the A38 Parkway. The junction is used by most traffic travelling to and from Derriford Hospital and other key destinations in the Derriford area, including University College of St Mark and St John and Tamar Science Park. It is currently configured as a signalised five arm roundabout that has a large footprint, makes inefficient use of land, and provides limited and ineffective bus priority. The junction is a congestion hot spot which impacts negatively on the quality and attractiveness of many local bus services in respect of journey times and bus service reliability and punctuality.

1.3 Current Stage of the Project

1.3.1 Plymouth City Council is in the process of identifying the preferred option for each junction. This is being done by testing each option in a micro-simulation model (S-Paramics). Comparison of each scheme against the others will allow a preferred scheme to be identified,

which will then be taken forwards for the full appraisal, for which this report provides the specification.

1.4 Overall Project Programme

1.4.1 The draft Appraisal Specification Report was submitted to the Local Transport Body (LTB) in November 2013, with a follow up meeting with the Independent Technical Advisor (ITA) in late November and early December. A number of technical matters were raised by the ITA, which have been addressed in this revised Final Report. These include the use of NTEM v5.4, calibration, public transport matrices, and the treatment of uncertainty about transport schemes and development.

1.4.2 A draft Options Assessment Report (OAR), which will summarise the findings of the options testing currently being undertaken, using S-Paramics, is due to be issued in July 2014. Once this Final ASR has been agreed with the ITA, and the preferred option identified, the business case appraisal will start in August 2014 prior to a Programme Entry business case submission in October 2014.

2 Challenges and Issues

2.1 Strategic Case

2.1.1 The reconfiguration of Derriford Junction and the related improvement of William Prance Road Junction were identified in the Derriford Transport Strategy (DTS), a supporting document to the draft Derriford and Seaton Area Action Plan (DSAAP), as necessary elements of a wide ranging package of hard and soft measures without which the successful delivery of essential housing and employment developments set out in the Council's Core Strategy (and a key element of the city's growth agenda) could be compromised.

2.2 Scheme Objectives

2.2.1 The scheme objectives are to:

- Reduce congestion
- Provide capacity for additional growth
- Provide improved bus priority
- Provide improved facilities for pedestrians and cyclists

2.2.2 Bus journey time variability is a major issue in the Derriford area. Analysis has shown that maximum journey times are more than 2 ½ times the average time taken during the AM peak, whilst in the PM peak this factor was even worse at almost 3. The main outcomes of the scheme will be improved bus punctuality and reliability, and reduced journey times for the High Quality Public Transport routes between Derriford, Sherford, the City Centre and other key destinations.

2.3 Options Being Considered

2.3.1 There are currently seven different options for improvements at Derriford Roundabout and four different options for William Prance Road. All of the William Prance options include additional lanes for highway traffic and greater bus priority through the use of bus gates and new or extended bus lanes.

2.3.2 At Derriford Roundabout the options include:

- Converting to a signalised junction
- Removing (partially or wholly) the connection with Brest Road (and thereby re-routing all traffic to William Prance Road)
- Maintaining the existing roundabout but introducing improved signalisation and additional capacity on the approach arms and circulatory system
- The addition of a fly over for North-South traffic.

3 Transport Modelling

3.1 Scale of Impact

3.1.1 There are a number of different options for a scheme at Derriford Roundabout and William Prance Road. Current modelling work is focussed on identifying the preferred option through use of micro-simulation. The identified preferred option will be taken forward for full appraisal.

3.1.2 The proposed scheme will have an impact on both the highway and public transport (PT) along Plymouth's Northern Corridor as the preferred option will reduce journey times for highway vehicles and buses, due to the proposed bus priority measures.

3.1.3 The impacts of the preferred scheme will extend along the whole of the Northern Corridor, which will have knock on effects elsewhere in the city. The anticipated changes in journey times for highway and public transport trips are likely to affect mode choice.

3.2 Existing Knowledge and Data

3.2.1 To capture all of these impacts it will be necessary to use a Strategic Variable Demand Model (VDM). Plymouth City Council has an existing VDM model, with the highway element modelled in Saturn and the PT and VDM models included in EMME3. This suite of models was originally constructed for a major scheme business case for a public transport scheme on the city's Eastern Corridor, and is ideal for modelling all of the potential impacts of the proposed schemes. The model was built to meet the relevant criteria in WebTAG.

3.2.2 The highway and PT models have a base year of 2009 with morning and evening peak hours, as well as an average inter-peak hour represented. For the highway model, a base year of 2009 is considered sufficient as there has been relatively little change in travel patterns and flows in the intervening years, and it is understood that data up to five years old will still be considered acceptable. The highway model was built from a variety of sources, including Roadside Interview Surveys which were conducted across the city, including one on the Northern Corridor. The model was validated against count data and journey times collected in 2009.

3.2.3 The PT model was originally developed in 2009 and focussed on testing the Eastern Corridor scheme, where the bus surveys were primarily undertaken and incorporated in building the bus matrix. The movements along the Northern Corridor were built using ETM data as no observed interview data was available.

3.2.4 In the discussions with the ITA on the draft Appraisal Specification Report, the lack of information regarding calibration of the public transport matrices in the Northern Corridor area was identified. As a result, the revised approach is to utilise on board bus OD surveys and ETM data collected in March and April 2014 to update the Plymouth Public Transport Assignment Model. The expanded bus OD matrices will be merged with the ETM data at selected locations along the Northern Corridor using the variance weighting technique. This method, which aims to minimise the coefficient of variation of the combined data source, has been adopted by DfT's MATVAL package and ERICA programme. The merged matrix will then be factored back to 2009 using the annual bus patronage change as obtained from TEMPRO 6.2. A select link on the modelled matrix along the Northern Corridor from the 2009 base year model will then be substituted within the model by the merged matrix, and assigned flows will be compared to the bus occupancy counts conducted in 2014 (factored to 2009). The model will be validated against bus occupancy counts conducted at A386 Crownhill (Low level) and North Hill (in proximity to Plymouth High Schools for Girls) during October 2011 (but factored to 2009). Previously unused city centre boardings from ETM data 2009 will also be compared with those modelled as a validation check.

3.2.5 A Technical Note describing the detailed approach for re-calibrating and re-validating the Plymouth PTAM along the city's Northern Corridor will be issued and should provide reassurance that the public transport matrices will be appropriate for the appraisal of this scheme.

3.2.6 It should be noted that no distinction is made within the PT model between journeys made for different purposes or by persons who have access/no access to a car, due to limitations within the EMME software. The PT model assigns using a single user class. Instead the overall public transport demand is allocated to public transport sub-modes i.e. bus or rail. Car availability (car available and non-car available) and journey purpose is dealt with within the segmentation of the demand model.

The following graphs identify count data taken at three locations on the Northern Corridor:

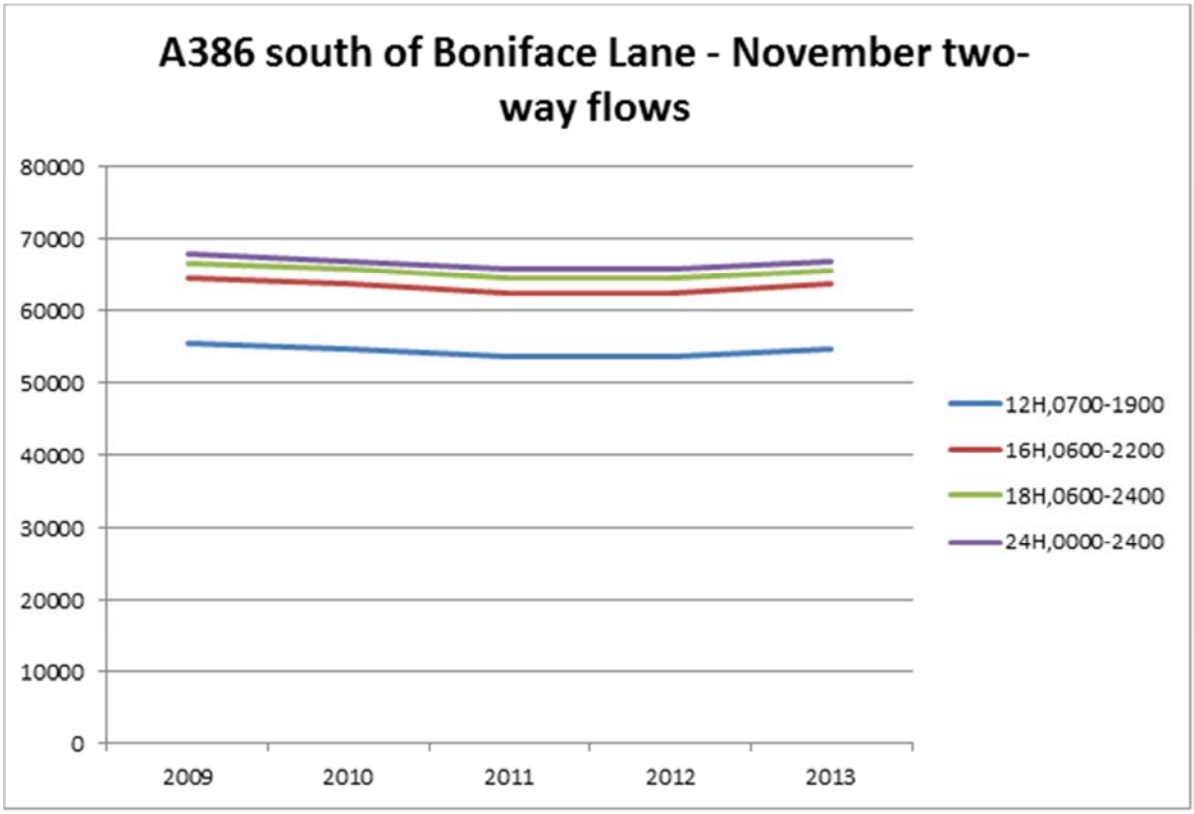

Figure 2 - A386 flows (1)

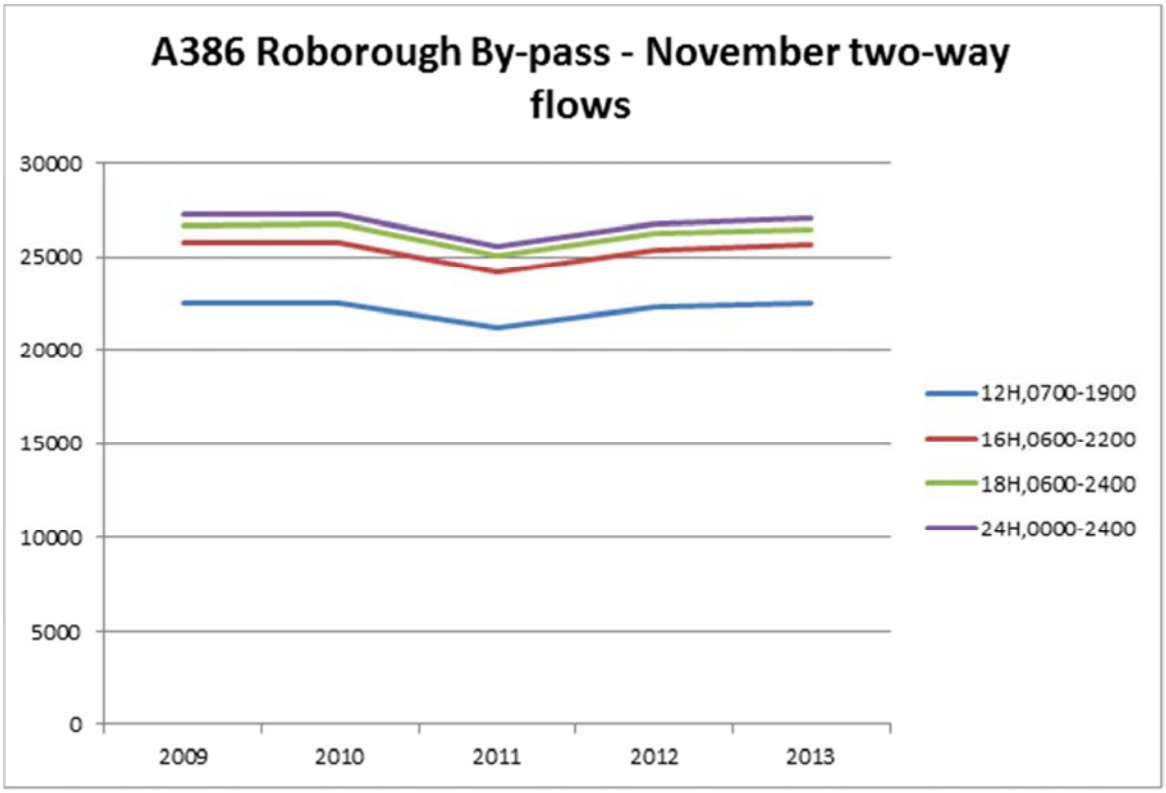

Figure 3 - A386 flows (2)

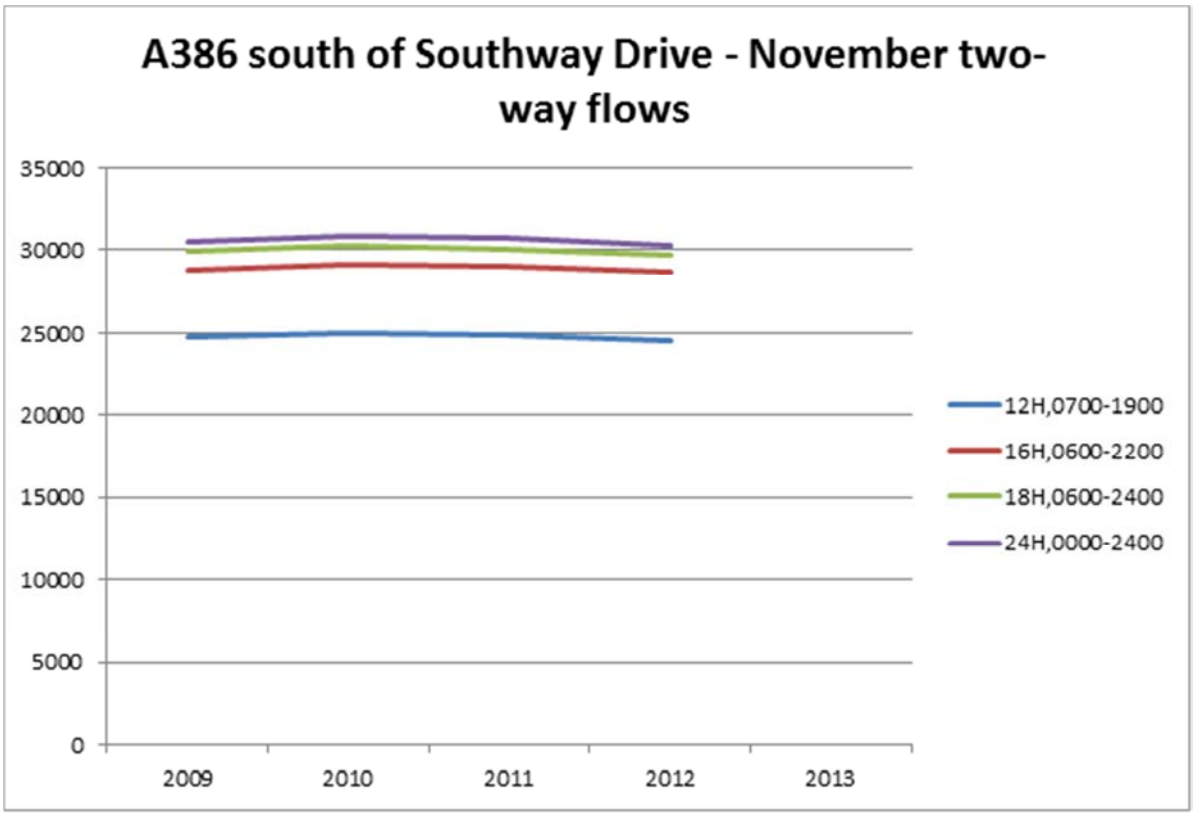

Figure 4 - A386 flows (3)

3.2.7 These graphs all confirm that there has been relatively little, if any change in flows on the A386, and support the use of the 2009 highway base model as part of this assessment, as there is no evidence to suggest that it no longer represents current day travel patterns.

3.2.8 In addition, there has been relatively little new development in the area since 2009. The table below summarises all housing completions north of the A38 and west of the River Plym between April 2009 and March 2013. All developments of fewer than ten houses have been excluded for brevity:

Location	No. Of houses completed
Area 1b, Clittaford Road	158
Land Parcel 1a, Off Clittaford Road	110
Plymouth Airport, Plymbridge Lane	41
Plymouth Airport Approach Site	72
Land At Tavistock Road	42
443 Tavistock Road	48
St Chads Church, Whitleigh Green	38
Whitleigh Community Campus	20
Agaton Farm, Budshead Road	6
Crownhill Baptist Church, Berwick Avenue	20
LP067 Land At Hallerton Close	19
Land Bounded By Plymbridge Lane, Derriford Road And Howeson	16
Penlee Cottage, Plymbridge Road	14
Alston House, 2 Plymbridge Road	13
50-58 Ernesettle Green	12

Table 1- Housing completions on the Northern Corridor

3.2.9 Clearly, the data in the table shows there has been relatively few housing developments along the corridor since 2009. This is borne out by the lack of any change in flows along the corridor. Again, this supports the assertion that the 2009 highway base year model is suitable for use in forecasting.

3.2.10 To ensure the robustness of the VDM, realism testing was conducted when the model was validated, in which the car fuel cost, and separately the public transport fares, were increased by 10%. The elasticity of the demand with respect to these costs was established, using both matrix based and network based methods. The results confirmed compliance of the model responses to WebTAG.

3.2.11 The base year models had a high level of detail within the internal study area of Plymouth, Torpoint, and Saltash, with 277 zones covering these areas. The zones were built up from Census output areas, as these allowed existing reporting boundaries of land use data to be utilised for zonal land use data in the model. Outside of this area there are 79 zones representing the rest of the country, becoming increasingly larger as the distance from Plymouth increases. The model zone system within Plymouth is shown below:

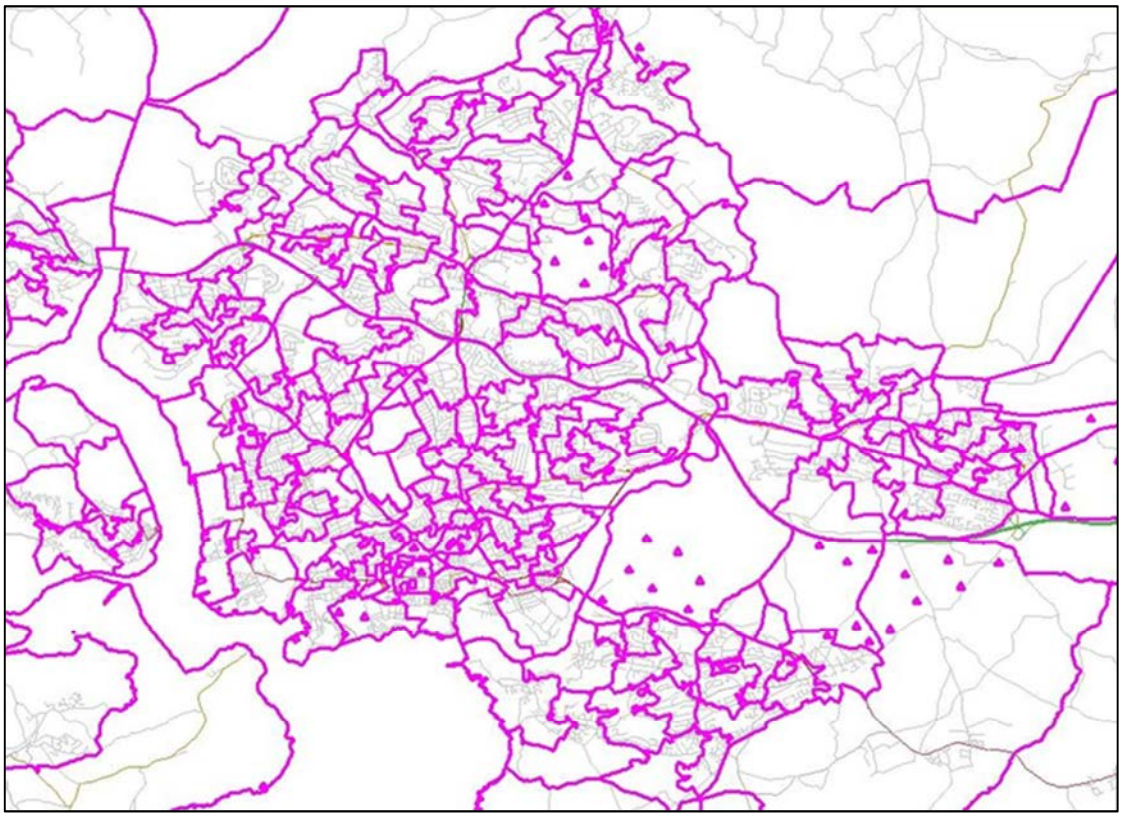

Figure 5 - Model zoning system

3.2.12 Within the internal study area, the highway links are represented exclusively by Saturn simulation links. Outside of this area, Saturn buffer links are used. The highway model makes extensive use of Origin Based Assignment methods, reflecting the latest methodologies in highway assignment. The highway network is shown below, with simulation links in red, and buffer links in green:

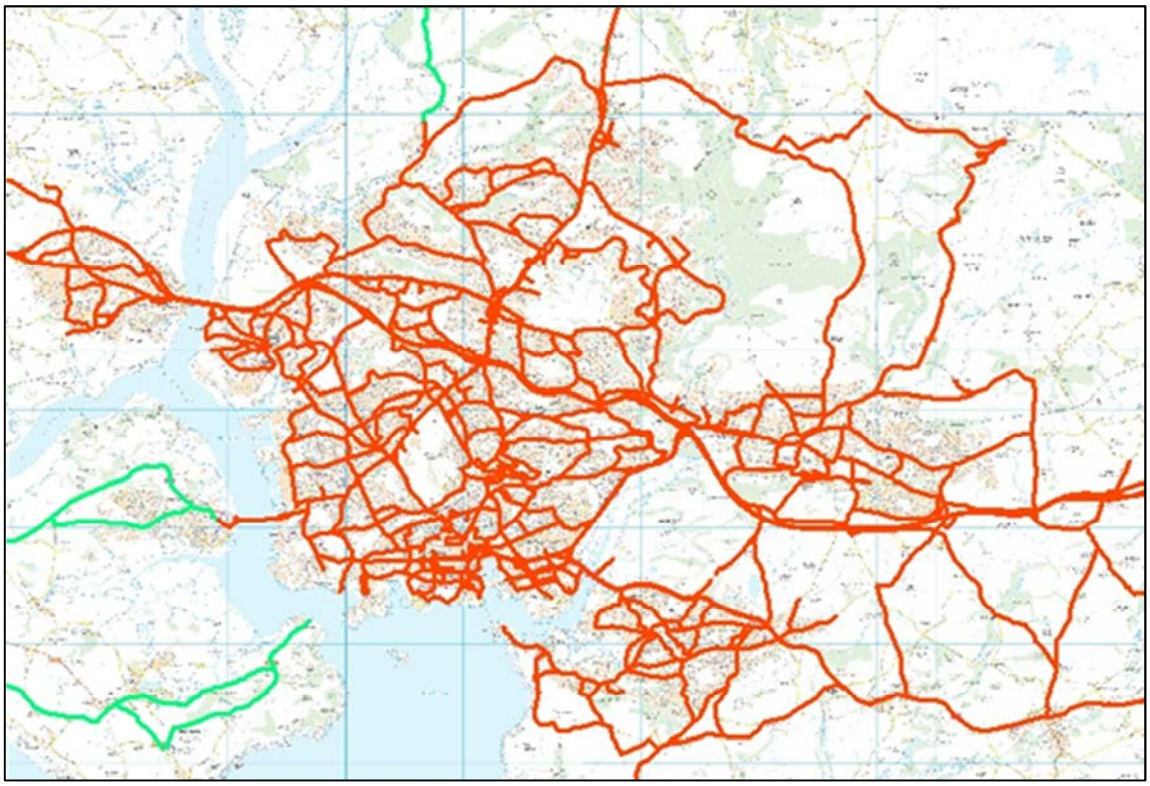

Figure 6 - Modelled highway links

3.2.13 As part of a study on the Northern Corridor, a local highway model re-validation was performed. The validation of the modelled flow against observed counts along the Northern Corridor from this re-validation is shown below:

		All (vehicles)			
Description	Direction	Observed	Modelled	GEH	DMRB
Derriford Roundabout - A386 Tavistock Road North Exit	NB	863	1113	7.97	×
Derriford Roundabout - A386 Tavistock Road North Entry	SB	1162	1210	1.40	✓
Derriford Roundabout - Derriford Road Exit	EB	1139	1258	3.43	✓
Derriford Roundabout - Derriford Road Entry	WB	531	599	2.87	✓
Derriford Roundabout - A386 Tavistock Road South Exit	SB	1593	1634	1.02	✓
Derriford Roundabout - A386 Tavistock Road South Entry	NB	1898	1951	1.21	✓
Derriford Roundabout - Looseleigh Lane Exit	WB	294	76	16.04	×
Derriford Roundabout - Looseleigh Lane Entry	EB	424	423	0.05	✓
Tavistock Road	SB	1022	1016	0.17	✓
Tavistock Road	NB	784	784	0.00	✓
Tavistock Road @ Footbridge North of Manadon	NB	2897	2931	0.63	✓
Tavistock Road @ Footbridge North of Manadon	SB	2574	2446	2.55	✓

Table 2 - AM peak highway model validation along Northern Corridor

Description	Direction	All (vehicles)			
		Observed	Modelled	GEH	DMRB
Derriford Roundabout - A386 Tavistock Road North Exit	NB	953	1061	3.39	✓
Derriford Roundabout - A386 Tavistock Road North Entry	SB	1045	1154	3.29	✓
Derriford Roundabout - Derriford Road Exit	EB	644	715	2.73	✓
Derriford Roundabout - Derriford Road Entry	WB	923	1227	9.26	×
Derriford Roundabout - A386 Tavistock Road South Exit	SB	1917	2162	5.43	✓
Derriford Roundabout - A386 Tavistock Road South Entry	NB	1436	1570	3.46	✓
Derriford Roundabout - Looseleigh Lane Exit	WB	369	345	1.26	✓
Derriford Roundabout - Looseleigh Lane Entry	EB	196	155	3.09	✓
Tavistock Road	SB	1018	1037	0.59	✓
Tavistock Road	NB	991	931	1.93	✓
Tavistock Road @ Footbridge North of Manadon	NB	2459	2503	0.89	✓
Tavistock Road @ Footbridge North of Manadon	SB	2930	2996	1.23	✓

Table 3 - PM peak highway model validation along northern corridor

3.2.14 Of the counts listed above, the last two in each table (Tavistock Road @ Footbridge) were used in validation and are independent counts. The rest were used in calibration (and were therefore included in matrix estimation).

3.2.15 The tables show that generally there is a very good match between the model and observation. There are a couple of links which fail the validation criteria tests, but the vast majority meet the criteria. It is notable that each arm of Derriford Roundabout is included as this is one of the junctions subject to the proposed improvements.

3.2.16 The corridor was also subject to journey time validation. The route along the A386 from the city centre to Belliver Roundabout, at the northern city boundary was included in validation. The modelled and observed journey times along this route are shown below:

Time period	From Junction	To Junction	Observed Journey Time	Lower 15%	Upper 15%	Modelled Journey Time	Validation
AM peak	Saltash road and North Cross rbt	Roborough Bypass and Belliver rbt	18:10	15:26	20:53	18:09	✓
AM peak	Roborough Bypass and Belliver rbt	Saltash road and North Cross rbt	22:03	18:44	25:21	20:17	✓
PM peak	Saltash road and North Cross rbt	Roborough Bypass and Belliver rbt	22:56	19:29	26:22	21:55	✓
PM peak	Roborough Bypass and Belliver rbt	Saltash road and North Cross rbt	21:04	17:54	24:13	19:39	✓

Table 4 - Highway journey time validation

3.2.17 The journey time validation shows that the journey times along the Northern Corridor validate in all directions and in all time periods.

3.2.18 Because the local model re-validation represents an improvement over the original base year model, the re-validated model will be used for this assessment. The LMVR that will be provided, along with this report, details the original flow validation.

3.2.19 The highway and public transport assignments, and the demand models are segmented into Business, Commuting, Education and Other trip purposes. Additionally, the highway assignment has Light and Heavy Goods Vehicles, although for obvious reasons these classes

are not required for the PT and demand models. This segmentation allows the impacts of the schemes to be felt differently by different users of the transport system. This is important because, for example, people travelling on business place a greater value on their travel time than people travelling to a leisure activity.

3.2.20 The generalised costs used in the assignment for the purposes of route choice are based on values of time and vehicle operating costs as outlined in WebTAG. Using Origin Based Assignment in Saturn ensured that a high degree of convergence was reached. Both the highway and public transport models were validated against observed data.

3.2.21 The methodology behind the creation of the base year models, as well as a description of their performance against observed data is detailed in Local Model Validation Reports. The re-validation approach of Plymouth PTAM along the city's Northern Corridor will be available in the supporting Technical Note previously mentioned.

3.3 Proposed Methodology

3.3.1 Given the time available and in an effort to make the best use of existing tools, and the need for a proportionate modelling and appraisal, it is felt best to use the existing version of the model which was utilised in 2012 for testing the Eastern Corridor scheme. This would save considerable time and resource in that all the processes and systems are in place, and it is less onerous to build forecasts, reference case matrices, distribution of development and the assessment of their trip ends, etc.

3.3.2 It is a multi modal model using VDM and was developed as a WebTAG compliant model with a base year of 2009. In 2012, forecasts were undertaken for a Do-Minimum DM and a Do-Something DS for 2016 and 2026.

3.3.3 The supply assumptions for the 2012 Eastern Corridor work were as follows:

Public Transport					
Transport Element	**Description**	**2016 DM**	**2016 DS**	**2026 DM**	**2026 DS**
Eastern Corridor					
Deep Lane Park and Ride Site	New Park and Ride site			✔	✔
LSTF Bus Route	New bus route funded via LSTF scheme	✔	✔		
High Quality Public Transport	High quality bus service supported by new infrastructure			✔	✔
Eastern Corridor Timetable	Revision of Eastern Corridor Bus Timetable	✔	✔	✔	✔
Highway					
Transport Element	**Description**	**2016 DM**	**2016 DS**	**2026 DM**	**2026 DS**
Eastern Corridor					
Deep Lane Junction	New slips to serve Park and Ride site			✔	✔
Sherford Highway Package (Sherford Development)	New spine road and supporting junctions intended	✔	✔	✔	✔

(2016 Southern Section/2026 Full Route to Deep Lane)	to support development at Sherford				
Langage	Roundabout improvement	✔	✔	✔	✔
Plymstock Quarry	Junction improvement	✔	✔	✔	✔
Eastern Corridor Package (scheme)	Mixed package of improvements including bus priority and reconfiguration of Cattedown Roundabout and Pomphlett Roundabout		✔		✔
Transport Element	**Description**	**2016 DM**	**2016 DS**	**2026 DM**	**2026 DS**
Wider Network					
Millbay	Highway improvements	✔	✔	✔	✔
Forder Valley Link Road	New link road	✔	✔	✔	✔
East End Transport Scheme	Mixed package of improvements intended to improve bus priority	✔	✔	✔	✔
LSTF Highway Scheme (Finnegan Road)	Highway improvements designed to improve bus punctuality	✔	✔	✔	✔

Table 5 -Supply assumptions

3.3.4 We believe it would be acceptable to retain the Eastern Corridor network coding as that scheme is independent of the Northern Corridor scheme to be tested. But the scheme would need to be coded in both the DM and DS so that its impact on the Northern Corridor is neutral. The Forder Valley Link Road however would need to be taken out of both DM and DS and in both forecast years. This should be considered as 'Reasonably Foreseeable' according to WebTAG Unit M4, and it is considered that it would be unrealistic to include this in a forecast scenario.

3.3.5 The DM land use assumptions in the 2012 Eastern Corridor work were as follows:

AAP or Area	Residential	Employment/ Commercial	Retail
North Plymstock AAP	3,840	26,115	1,882
Millbay & Stonehouse AAP	1,767	40,500	7,500
Devonport AAP	600	11,000	1,860
Sutton Harbour AAP	1,918	83,800	17,500
Central Park AAP	0	13,800	1,300
City Centre & University AAP	1,409	107,000	70,750

Derriford and Seaton AAP	3,493	141,900	32,820
Proposed Development in Non AAP areas	855	31,935	5,000
Completions and Under Construction 2009- 2011	not considered below 500 units	23,732	0
Plymouth Urban Fringe	5,310	102,214	15,637
Total 2009-2026	17,792	502,208	154,249

Table 6 - Land use assumptions

3.3.6 It can be argued that since the Derriford and Seaton AAP is not adopted there are uncertainties surrounding its inclusion for the DM. But firstly this development is in the Core Strategy and more importantly, the purpose of the tests are to confirm the need for network interventions, not to test the impact of the development as well as the interventions.

3.3.7 In line with a standard WebTAG compliant forecasting approach, the forecast uses future year trip end forecasts taken from the TEMPRO (trip end presentation programme) database. Whilst NTEM 6.2 is the definitive dataset, at the time, it was agreed with PCC that NTEM 5.4 more accurately reflects Plymouth's growth agenda, in particular for jobs and the resultant growth in travel demand. This gives some justification for using the older version of TEMPRO.

3.3.8 The differences between NTEM v5.4 and v6.2 have previously been the subject of a note from PCC that was issued to the DfT, which can be made available. It compared the predicted increase in jobs for the NTEM zone covering Plymouth. NTEM 5.4 data suggests an increase in jobs between 2006 and 2026 of 40,232. In NTEM 6.2 the equivalent figure is only 4,727. Clearly, NTEM 6.2 has a dramatically lower forecast for the number of jobs. Similarly, although less dramatically, NTEM 5.4 predicted 37,389 additional households over the period, whereas NTEM 6.2 has 30,263. Whilst the reduction in predicted household growth is less of a concern, the fact that NTEM 6.2 predicts such a small amount of job increases presents a considerable problem given that overall model forecasts should be capped to NTEM levels. Capping to NTEM 6.2 may well under-estimate the expected jobs increase in Plymouth, to the detriment of scheme benefits.

3.3.9 The issues concerning the use of NTEM v5.4 largely relate to the different interpretations of the number of jobs in the area; differences in household numbers are not as large. Within the VDM, forecast trips ends are calculated on a Production-Attraction (PA) basis, and reference case forecast matrices are generated by Furnessing base year PA matrices. In the Furnessing process, the total number of trips is constrained to the production totals. This means that, if there is a difference in the total number of forecast productions and forecast attractions, the attractions are factored to meet the productions. Generally, trip productions are associated with the number of households (as opposed to the number of jobs), and so, by constraining to data derived from households, the issues over the number of jobs assumed in TEMPRO becomes less prevalent at the study area level. The total number of trips in the forecast matrix is generally associated with households rather than jobs. Given that NTEM v5.4 and v6.2 are in general agreement on the number of households, the differences in the number of jobs, although significant, do not have as great an impact on the total number of trips in the forecast models. It is true however, that the NTEM v5.4 will give a different 'profile' of trip attractions to that produced by NTEM v6.2, though the total trip making will be quite similar in both versions.

3.3.10 In discussions with the ITA the use of NTEM v5.4 has been accepted, on the understanding that the uncertainty of lower growth in NTEM v 6.2 is considered through sensitivity testing. This will be undertaken as part of the range of sensitivity tests previously agreed with the ITA.

3.3.11 Whilst NTEM and the development assumptions are used to provide an initial reference demand, the VDM will provide the final demand in each forecast scenario. The VDM will use the reference demand as a starting point, and then estimate the demand by reflecting changes in frequency choice, macro time period choice, mode choice, destination choice, and finally

sub-mode choice (between car and park and ride) using appropriate levels of demand segmentation. These responses are considered appropriate given the nature of the schemes being tested.

3.3.12 Once the VDM has produced scenario specific demand, this will be assigned to the appropriate highway and public transport networks. For each forecast year (i.e. 2016 and 2026) the model will test a 'with intervention' and 'without intervention' scenario ('the intervention' referred to is the proposed scheme). A full run of the VDM process will be undertaken for each. It is acknowledged that the OAR may identify more than one option to take forward to detailed appraisal, in which case an alternative "with intervention" will be modelled in the same way as above.

3.3.13 By comparing the forecast assignments of the 'with' and 'without' intervention scenario, the impacts of the scheme can be identified. As the models are strategic in nature, the whole of the City will be included in the outputs, and thus any secondary effects of the scheme (i.e. those felt in areas away from the location of the scheme itself) will be identified. These models will also be used to provide the input to a TUBA assessment, which will identify the benefits of the scheme to transport users.

3.3.14 It is acknowledged that the proposed modelling approach needs to consider the treatment of uncertainty as outlined in WebTAG Unit M4, which describes different types of uncertainty, including demographic, economic and behavioural trends, and factors affecting the demand for, and the supply and cost of transport. WebTAG also requires the assessment of the dependency of development on the scheme.

3.3.15 Given the relative scale of this scheme and limitations of resources, it is understood from our meetings with the ITA that a pragmatic approach to uncertainty will be acceptable. It is therefore proposed that the appraisal will, as outlined above, initially utilise existing forecasts developed for the Eastern Corridor work. In addition, sensitivity tests will then be undertaken to establish the sensitivity of the scheme benefits with respect to different traffic growth scenarios. The ITA noted the considerable effort required to test each permutation of the uncertainties and suggested a different approach to sensitivities. It was suggested, and we fully accept the recommended approach, to "combine the uncertainties into a single lower bound and a single upper bound to allow us to see a range for BCRs and to judge how appropriate the scheme is to the scale of problems predicted".

3.3.16 In order to test an appropriate range, demand matrices will be developed as follows:

- Lower Bound: To include all of the Northern Corridor developments at half of the planned levels and reduce growth in other zones by approximately 5% in opening year and 10% in the design year; and

- Upper Bound: To increase growth across the matrix by 5% in the opening year and 10% in the design year

3.3.17 As part of the growth sensitivity test, the change in vehicle-km, vehicle-hours and the usual global network and matrix statistics will be extracted and reported.

3.3.18 In terms of development dependency, a similar pragmatic approach is considered to be acceptable. It is likely that a proportion of the proposed development in the Derriford area will be dependent on the Derriford Roundabout and William Prance Road improvements, as well as other transport schemes that are planned in the local area. However, some of the development is not dependent on the scheme, and would be likely to come forward if the improvement scheme wasn't implemented. Determining the level and locations of dependent development using the methodology detailed in WebTAG would be very onerous, given the complex arrangement of development sizes, locations and other schemes in the area. It is therefore proposed that the lower bound sensitivity test detailed above is sufficient to cover the dependent development. In this lower bound test, only half of the proposed development will

be included, and this is considered adequate to cover any dependent development scenario. Therefore, no specific additional development dependency testing will be carried out.

3.3.19 The Derriford Transport Scheme is only one of the transport infrastructure interventions required to support the future growth of Plymouth and in particular Derriford. There are a number of other interventions, which are also included within HotSW LEP's Strategic Economic Plan, that will also support the city's growth and these include Tavistock Rail, Woolwell to the George and Forder Valley Link Road. It is important to understand how the network will operate once all of these schemes have been implemented and how they impact on the design and benefits of the Derriford Transport Scheme. The work undertaken as part the Options Assessment modelled the impact that the Forder Valley Link Road and Woolwell to the George schemes will have on the Derriford Transport Scheme and these impacts will be described within the Business Case. A commentary on the impact of the Tavistock Rail scheme will also be included, albeit this will be qualitative as the impacts will not have been modelled.

3.4 Operational Assessment

3.4.1 The operation of the Derriford Transport Scheme will be assessed using output data from the Paramics micro-simulation Northern Corridor model that was developed for the Options Assessment work. Information will be provided on link and junction flows for both forecast years, as well as journey time information, to demonstrate that there are no unintended and undesirable secondary transport impacts.

3.5 Communication Strategy

3.5.1 As part of the modelling exercise, a forecasting report will be published, which will detail the methodology and summarise the outcomes of the modelling and the economic appraisal.

3.6 Risks

3.6.1 There are some risks associated with the modelling work:

- TUBA reveals illogical results, needing to revisit modelling
- Tight timescales for forecast modelling work
- Change of scope by LTB

3.7 Change Log

3.7.1 In the course of the modelling exercise, it is possible that a number of changes to the model scope or methodology may arise. Where this is the case, in order that these can be tracked, a change log will be maintained.

4 Economy

4.1 Scale of Impact

4.1.1 The A386 from Derriford Roundabout to William Prance Road currently experiences high traffic flows, congestion and delays during peak traffic periods and handles very large traffic flows in the inter-peak periods. It also handles a very large number of bus movements (888 per weekday) as Derriford Hospital is the location served by the most buses in the city, after the city centre. Bus operators report that congestion is causing difficulties for them in terms of maintaining reliable punctual services during the peak periods.

4.1.2 Congestion contributes to a poor pedestrian and cycle environment, as well as noise and air pollution. Congestion along the Northern Corridor has already led to the designation of an Air Quality Management Area (AQMA) at Crownhill. Pedestrian and cycle severance is a problem at and between Derriford Junction and William Prance Road Junction.

4.1.3 The scheme is expected to reduce congestion, provide capacity for additional growth and provide improved bus priority and provision for pedestrians and cyclists. It will improve bus punctuality and reliability and reduce journey times for public transport services between Derriford, Sherford, the City Centre and other key destinations.

4.2 Existing Knowledge and Data

4.2.1 Journey time data has shown that delays to traffic during peak hours are currently significant. This has impacts on highway and bus journey time reliability.

4.2.2 This scheme is a key element of the Derriford Transport Strategy, which sets out the infrastructure and softer measures needed to facilitate and enable the delivery of a large element of the city's planned future growth. Failure to respond to large scale growth in travel demand in the Derriford area and along the Northern Corridor has the potential to prevent full delivery of new development – approximately 2950 homes and 116,000 sq. m. of commercial development.

4.2.3 Development sites along the Northern Corridor and in the city centre make up 20% of the proposed residential dwellings, 41% of employment space and 65% of retail space of the overall planned development for the whole city by 2026. A significant number of trips generated from these sites are expected to use the A386 Tavistock Road route. Without intervention, the existing network will not be able to cope with the additional demand that trips from these development sites will produce.

4.3 Constraints

4.3.1 Improvements in journey times for private vehicles and buses can be achieved, but the extent to which this can be done is constrained by the simultaneous desire to provide safe crossing and waiting facilities for pedestrians and cyclists

4.4 User Benefits

4.4.1 The economic appraisal will use TUBA to convert highway and public transport model outputs to time and VOC savings for business users, disaggregated by freight and those travelling on business trips, by mode and by banded range of time saving. The forecast model will include two future years, and TUBA will use the outputs from those two models to extrapolate to a 60 year appraisal.

4.4.2 The TUBA will use data from the strategic highway and PT assignments, produced through the VDM, as inputs.

4.4.3 Annualisation factors will be derived by considering the seasonal representativeness of the transport models, and deriving adjustment factors using local count data, which will also be used to grow model time period data to all day figures. The annualisation figures will be used to factor up the modelled data (representing the peak hours of a single day) to represent all 'peak days' in a year. This means weekend periods and bank holidays are excluded from the assessment. However as the benefits at this period are expected to be positive the appraisal Benefit-Cost Ratio will be conservative. An explanation as to why the benefits are expected to be positive will be provided.

4.4.4 It is noted that with the introduction of signals at the junction there may be increased delays in the interpeak and off peak periods when congestion is not high. The extent to which this is an issue will be gauged from TUBA outputs for the interpeak period (which will indicate if there is a disbenefit to users in that period).

4.4.5 Construction and maintenance disbenefits will be assessed using the QUADRO programme, informed by the SATURN and PARAMICS models to understand lane closure situations.

4.5 Regeneration and Wider Impacts

4.5.1 Plymouth has been designated as a Growth Point and it is expected that the population will increase from 256,000 to 300,000 by 2026. New and innovative transport solutions are therefore needed to facilitate this growth. Large scale development plans are proposed in the Derriford and Seaton AAP and are a key element of the city's growth agenda as set out in the city's adopted Core Strategy. Development will include 2950 new homes, 116,000 sq. m of commercial and healthcare development, a new district shopping centre, and new community facilities including a new primary school. All of which will create approximately 8000 new jobs - many of which will be in economic growth sectors set out in the city's Local Economic Strategy.

4.5.2 Once the preferred option scheme is agreed, it is intended to follow WebTAG Units A2.1 and A2.2 to consider the need for either or both of a Regeneration Report and a Wider Impacts Assessment.

4.5.3 Central Plymouth and its Eastern Corridor have been designated for regeneration. Work will assess the enhancement in accessibility to jobs within the regeneration area, and for residents therein.

4.5.4 An initial qualitative assessment will be undertaken of the relationship between the accessibility changes that the Derriford scheme brings about and the constraints within the local economy. This will not confine itself to solely the accessibility/jobs relationship, but set it within the context of a broader audit of the Plymouth economy. This would cover other economic and productivity constraints, such as skilled labour shortages and the availability of land, together with a sectoral understanding of the strengths and weaknesses of the local economy. This work would draw on published sources as well as discussions with the Heart of the South West LEP and economic development expertise at PCC.

4.5.5 If required, primary research will be undertaken in the form of Business Interviews with representatives of key local sector employers, following WebTAG in the design of structured questionnaires.

4.5.6 Options for the modelled quantification of employment impacts will be considered as proportionate to the anticipated scale of the job impacts, as revealed by the above analyses. It will not be appropriate to employ a full land use transport interaction model for a scheme of

the size of Derriford. It is therefore anticipated that the regeneration work could be undertaken in parallel with the transport modelling and within the overall timeframe for the OBC.

4.5.7 Wider Impacts Assessment is the measurement of economic GDP benefits that go beyond those measured in the TEE process. These potentially consist of

- Agglomeration benefits;
- Move to more or less productive jobs;
- Wider impact from labour market changes;
- Additional benefits of operating in imperfect markets; and,
- Labour supply impacts.

4.5.8 In the absence of a land-use transport interaction model, the emphasis of the analysis will be on the latter two impacts.

4.5.9 Imperfect markets mean that consumers value an increase in output more highly than their production costs. The method for calculating this is a mark-up on business time saving benefits, and is therefore straightforward to calculate.

4.5.10 Labour supply impacts measure how the Derriford scheme might encourage additional workers to enter the labour market. For example, faster and more reliable bus services from north Plymouth could permit parents to more easily juggle childcare and work commitments, allowing greater labour market participation. The welfare component of this benefit (that accrues to travellers) is already captured within commuting time savings, but the wider productivity impact for the economy is not. These wider impacts are the additional value added to the economy and the resulting tax revenue to the government.

4.5.11 The methodology to calculate this impact will follow WebTAG Unit A2.1. It will require changes in zone-to-zone commuting generalised costs for the scheme, which can be taken from the transport models. It will also require data on average wages, and numbers of workers on a zonal basis. Elasticity of supply of labour variables can then be applied with respect to equivalent changes in wages. In the absence of a LUTI model, only the central estimate of this benefit can be estimated, i.e. where workers home locations are fixed. This will represent a conservative estimate of the benefit since at the margin some people may be encouraged to both move house and enter the labour market as a result of the accessibility improvements engendered by Derriford.

4.5.12 The final step is to extract the wider tax benefit of the additional workers. This is currently taken as 40% of the wage benefit.

4.5.13 Plymouth and its hinterland is a designated Functional Urban Region, which qualifies the Derriford scheme as having the potential to contribute positively to agglomeration benefits. Clustering benefits are deemed not to be significant in more rural areas.

4.5.14 It is proposed that an estimate of the potential agglomeration and move to more productive jobs effects be undertaken using benchmark analysis. There now exists a database of evidence where Wider Impacts analyses have been undertaken, and their scale assessed relative to conventional TEE benefits. This is a common approach in the absence of a LUTI model, although it is recognised that the uncertainty around these benefit components will be much greater.

4.6 Reliability

4.6.1 Current journey time reliability of the transport system will be extracted from observed journey time data via Plymouth City Council's Strat-e-GIS database of Traffic Master journey times. The reliability of bus journey times will be extracted from the RTPI system.

4.6.2 Changes in journey time reliability will be estimated through use of the forecast highway assignment. WebTAG Unit A1.3 provides comprehensive guidance on how this should be done, and the methodology used will be consistent with that. In summary, the change in variability will be calculated for each zone pair in the model using the identified formulae. The change in variability is a function of the change in journey time and journey distance.

4.6.3 This methodology will be used to assess the reliability implications for the Derriford and William Prance junctions, as well as other downstream junctions.

5 Environment

5.1 Scale of Impact

5.1.1 The scale of the impact of the scheme on the environment is sub-divided into a range of environmental impacts, as required by WebTAG which will include:

- Noise and vibration;
- Air quality (nitrogen dioxide and particulates);
- Greenhouse gases (carbon);
- Landscape and townscape;
- Heritage assets and archaeology;
- Biodiversity in relation to existing and any new habitat features introduced as part of the scheme; and
- Water quality, including surface water and groundwater where relevant.

5.1.2 Traffic on the Northern Corridor is expected to grow as planned developments in the area come forward and this poses risks in terms of increasing congestion causing worsening air quality and noise pollution. There is no AQMA currently within the scheme boundary, however, Mutley Plain is already designated an AQMA and air quality at Crownhill is close to levels that would require AQMA designation. The area of the scheme is not currently a DEFRA noise action priority site.

5.1.3 The scheme is expected to reduce congestion by improving the efficiency of the junction in terms of vehicle throughput and encouraging mode shift away from car use by improving bus services (bus priorities, reliability and journey times). The scheme aims to manage traffic such that air quality and noise pollution do not deteriorate.

5.1.4 Depending on the scheme selected, the scheme may have a smaller footprint than the existing junction, and may be less visually intrusive, although the impact of this might be small. The new junction may allow new development to take place on surplus land. This has the potential to allow the creation of new development, such as landmark buildings, to rejuvenate a diffuse neighbourhood and bring the western and eastern sides of the neighbourhood closer together.

5.1.5 Some mature trees located on the roundabout island and in the central reserve to the south of the exiting junction are likely to be lost. Policy DS01 of the Derriford and Seaton Area Action Plan (AAP) sets the framework to which the transport routes will need to conform in terms of integration into the new environment and maintaining existing landscape features.

5.1.6 Proposal DS21 of the Derriford and Seaton AAP is the Glacis Park Green Corridor which crosses the A386 between Derriford junction and William Prance Rd junction. This is an important part of the Green Infrastructure Network that will enable people and wildlife to move between green spaces as well as providing an attractive natural feature within the urban form.

5.1.7 Crownhill Fort and Glacis and Drake's Leat are both significant historical assets which are close to the improvements at both junctions but will not be directly impacted by the reconfigurations. All works will be carried out in accordance with Policy DS03 of the Derriford and Seaton AAP and in consultation with PCC's Historic Environment Officer.

5.1.8 Environment Agency data confirms that Derriford Junction, William Prance Road Junction and the A386 between them do not fall within a flood warning area or a flood alert area. The A386 at this location runs along a high ridge of land that drains west to the River Tamar and east to the River Plym. The area of flood risk for the watercourse running through Whitleigh Valley (to the west) is approximately 200m from the A386 and the area of flood risk for the watercourse running through Bircham Valley is approximately 250m from Derriford Junction.

5.2 Existing Knowledge and Data

5.2.1 The existing knowledge has been informed by the information provided in the mEAST form submitted in 2012 in relation to the scheme which was based on publicly available information about the site and the surrounding environment. Further work is to be undertaken at a later stage to obtain additional baseline information, as detailed in the Proposed Methodology below.

5.3 Constraints

5.3.1 Local policies within the draft Derriford and Seaton Area Action Plan place requirements on the scheme to integrate environmental and landscape features and provide green infrastructure.

5.3.2 The sensitivity of nearby surface water environments (draining to the River Tamar and River Plym) will require the scheme to manage surface water runoff and provide effective control pollution during the construction phase and in the design of the finished scheme, to avoid water quality impacts.

5.4 Additional Data Requirements

5.4.1 A detailed review of the baseline situation is to be undertaken to inform the business case.

5.5 Proposed Methodology, including Social and Distributional Impacts

5.5.1 Methodologies are outlined below for each of the environmental sub-objectives.

5.5.2 The assessments will identify qualitative and quantitative impacts of the scheme focussing on establishing the baseline conditions and then identifying whether there will be a significant change, e.g. by measuring or predicting a specific aspect at a particular location, or by confirming through measurement changes post-construction which may have been predicated or established at the pre-construction stage.

Noise and Vibration

5.5.3 It is anticipated that construction of the scheme could potentially cause noise and vibration disturbance to existing sensitive receptors close to the site such as the offices of Derriford Business Park and the hotel, both to the east of the A386. During the operational phase it is anticipated that traffic will be managed so as to avoid deterioration of noise levels.

5.5.4 The assessment of noise and vibration impacts will establish the baseline noise level conditions, evaluating what a significant change might be and then identifying whether such a significant change has occurred. For example, by measuring an increase in noise levels of more than 3dB in any location.

5.5.5 Consultation will be undertaken with Plymouth City Council's Environmental Health Department to agree the survey and assessment methodologies.

5.5.6 It is proposed that a baseline noise survey will be undertaken to establish the existing noise climate of the site consisting of a 24-hour unattended measurement with attended shorter

measurements taken at key locations on and off site, the locations to be agreed with the Council and to be repeatable once the scheme has been completed.

5.5.7 A noise model will be prepared as the basis for the assessment using the computer software SoundPLAN version 7.2. The baseline survey data will be used to validate the model.

5.5.8 The likely noise and vibration arising from the construction phase of the development will be assessed qualitatively using British Standard 5228: 2009 Parts 1 and 2 'Code of Practice for Noise and Vibration Control on Construction and Open Sites'.

5.5.9 The noise prediction from road traffic will be undertaken following the methodology in 'Calculation of Road Traffic Noise' (CRTN). The 'Method for Converting the UK Road Traffic Noise Index LA10,18h to the EU Noise Indices for Road Noise Mapping: 2006' will also be used.

5.5.10 The noise effect of the operation of the scheme upon existing sensitive areas will be assessed.

5.5.11 Any changes in traffic flow as a result of the scheme which are considered significant will trigger the need for a noise assessment at those locations. The highway model has significant detail within the City Council's boundaries such that it is suitable for assessing this. In addition, the model's forecast years are compatible with the noise requirements.

Air Quality (Nitrogen Dioxide and Particulates)

5.5.12 The assessment will consider the effect of the development on the surrounding area during the construction and operational phases. It is expected that with the predicted reduction in congestion there will be a potential overall beneficial impact on air quality, albeit this might be slight and could vary at individual monitored locations.

5.5.13 The assessment will consider the effect of the development on the surrounding area during the construction and operational phases.

5.5.14 Existing local air quality will be reviewed so as to establish the baseline against which the likely future air quality conditions can be defined. The assessment of construction effects will focus on the anticipated duration of works.

5.5.15 The principal air pollutants of concern associated with road vehicles using the new scheme will be nitrogen dioxide (NO2), fine airborne particles (PM10 and PM2.5) and dust. For construction activities the issues will be dust and PM10. Professional experience indicates that any impacts associated with other air pollutants will be negligible.

5.5.16 Existing local air quality will be defined drawing upon any monitoring carried out by the PCC for dust, PM10 and NO2. In the absence of such data, additional monitoring may be required to be undertaken for the scheme.

5.5.17 Air quality impacts will then be assessed at a range of receptors, including existing residential properties closest to the scheme or closest to busy roads, in particular those close to junctions, where traffic emissions are greater.

5.5.18 The potential effects of dust during demolition and construction will be assessed, making reference to best practice guidance on the control of dust and emissions from construction and demolition. There are no statutory objectives for dust; it is therefore common practice to provide a qualitative assessment based on the size of the site, local meteorological conditions and experience of the distances over which impacts may occur.

5.5.19 The assessment of operational road traffic impacts will be undertaken using the ADMS Roads detailed dispersion model. Model outputs will be verified against local air quality monitoring data. This modelling will make use of mapped background concentration data provided by Defra and predicted traffic flows.

5.5.20 As with the noise assessment, the highway model is compatible with the air quality model.

5.5.21 Air quality will be assessed in relation to the national air quality standards and objectives, established by the Government to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They also take account of, and incorporate as appropriate, limit values set by the European Union. The objectives for seven pollutants are prescribed within the Air Quality Regulations, 2000 and the Air Quality (England) (Amendment) Regulations 2002.

Greenhouse Gases (Carbon - CO2 levels)

5.5.22 Carbon dioxide (CO2) emissions for the baseline situation will be estimated based on traffic data determined from traffic surveys. The DMRB regional methodology will be used for the assessment.

5.5.23 It should also be noted that the TUBA assessment which will be done as part of the Economic Case will also assess the implications of the scheme for carbon emissions.

Landscape and Townscape

5.5.24 The landscape and townscape baseline will be established through a detailed site walkover assessment and establishment of key viewpoints and a description of landscape character features. An assessment of the impact of the removal of the trees will be included.

5.5.25 The scheme will introduce new landscape features and could encourage new development. The impact of the changes to landscape and townscape will therefore need to be considered in the context of the landscape design for the scheme. So whilst the establishment of the baseline is important, the assessment will simply confirm whether the scheme has delivered the landscape and townscape elements in accordance with the proposed design.

Heritage Assets and Archaeology

5.5.26 The baseline will be established through a Desk Based Assessment and consultation with English Heritage and the County Archaeologist. The Desk Based Assessment can then be used to identify any potential impacts from the scheme.

Biodiversity

5.5.27 A phase 1 Habitat Survey will be undertaken to establish the baseline habitat conditions at the site and its immediate surrounds. This will comprise a Desk Study to secure recent biological records from the local Records Centre (this will involve incurring a small third party cost) and the Phase 1 habitat survey to: (i) map habitats currently on and in the immediate vicinity of the site; and (ii) note any other features that may support protected species.

5.5.28 Consultation with the local authority ecologist will then be undertaken to agree the baseline ecological information.

5.5.29 Confirmation will be provided of (i) any potential ecological receptors likely to be affected by the scheme; (ii) the need for any further and/or species specific surveys; and (iii) any mitigation / enhancement measures that should be included as part of the scheme, e.g. in any

landscape areas. These measures will take into account the Derriford and Seaton AAP policies relating to the maintaining existing landscape features and the Glacis Park Green Corridor.

5.5.30 There are not expected to be any direct impacts on biodiversity, such as habitat loss. However, a number of trees may be removed which could impact protected species (e.g. bats) if present, and there is the potential for any construction compound, if sited outside of the scheme area, to have temporary impacts on other land in the surrounding area.

Water Quality

5.5.31 The site is located in an area of potential sensitivity to impacts on surface water features. The proposed scheme could potentially introduce an additional contaminant loading into the surface water drainage features present as a result of the construction activities which may affect surface water quality.

5.5.32 Surface water sampling and testing will be undertaken to establish the water quality baseline around the site, including within any existing ditches in the vicinity of the junction.

5.5.33 This information will then be used for comparative purposes during the construction phase and once the scheme is operational. As surface water quality is dependent upon a variety of external factors and uncertainties such as rainfall, catchment area, and the presence of other potential sources of contamination and even the testing methodology used, careful consideration will be given to establishing the baseline conditions and how future monitoring results might be compared to it.

5.6 Communication Strategy and Reporting

5.6.1 The following Statutory Environmental Bodies are to be consulted:

- Noise and vibration: Local Authority Environmental Health Officer;
- Air quality (nitrogen dioxide and particulates): Local Authority Environmental Health Officer:
- Greenhouse gases (carbon); Local Authority Environmental Health Officer;
- Landscape and townscape; Local Authority Environmental Health Officer, Natural England, English Heritage (if historical landscapes are present);
- Heritage assets and archaeology; County Archaeologist, English Heritage;
- Biodiversity: Natural England, the Environment Agency;
- Water quality: the Environment Agency.

5.7 Risks

5.7.1 The main risks associated with the environmental aspects of the scheme include:

- The mature trees that are proposed to be removed are important habitats for protected species e.g. bats.
- The mature trees that are proposed to be removed are important landscape features and their loss is significant.

5.8 Change Log

5.8.1 Any changes from this proposed methodology will be logged.

6 Social

6.1 Scale of Impact

6.1.1 The scale of social impact will be considered against the following sub-objectives:

- Commuting and Other users
- Reliability impact on Commuting and Other users
- Physical activity
- Journey quality
- Accidents
- Security
- Access to services
- Affordability
- Severance
- Option values

6.1.2 The scheme is designed to address peak hour congestion and irregularity of journey times, as well as encouraging the use of more sustainable modes. A significant part of the impacts is therefore expected to accrue against the commuting sub-objective, including the reliability of such journeys. A mixture of qualitative and quantitative assessment is planned to measure the full range of social impacts, in a proportionate manner.

6.1.3 The following objectives specific to the scheme are relevant to the overall social objective:

- Provide dedicated bus priority;
- Improve bus journey times relative to equivalent car journeys;
- Improve reliability and punctuality of bus journey times;
- Increase walking and cycling through improved cycle link connectivity, providing safer on and off-line routes and reduced journey times;

6.2 Existing Knowledge and Data

6.2.1 Data on accidents in the area is available from Plymouth City Council's Accsamap (Stats 22) system. These records will be included in the assessment.

6.3 Additional Data Requirements

6.3.1 Northern corridor bus surveys are planned and will provide data on journey purpose splits to allow the disaggregation of commuting and other time savings.

6.4 Proposed Methodology including Social and Distributional Impacts

6.4.1 Methodologies are outlined below for each of the social sub-objectives.

Commuting and Other Users

6.4.2 As discussed under the economy objective, the approach will be to use TUBA to convert transport model outputs to calculate time and VOC savings for commuting and other users, by mode and by banded range of time saving. In accordance with WebTAG, this will cover the following bands of time savings:

- Less than -5 minutes;
- -5 to -2 minutes;
- -2 to 0 minutes;
- 0 to 2 minutes;
- 2 to 5 minutes
- Greater than 5 minutes.

6.4.3 The geographic distribution of benefits will be plotted. Subject to this screening process, it is planned to disaggregate the distributional impact of non-work time savings only, since work savings are assumed to accrue to employers. This will be in accordance with WebTAG Unit A1.3 Appendix A and will plot origin zone trip benefits against income groupings (from Census), and against the Index of Multiple Deprivation, by car and bus modes.

6.4.4 A qualitative assessment is also proposed against the 'improve connectivity' challenge for commuters and 'improve access to leisure' challenge for other users.

Reliability Impact on Commuting and Other Users

6.4.5 Work has already been done to understand the extent of peak hour bus unreliability and this will be updated and extended into the inter-peak to reflect current traffic conditions using RPPI bus data. The Strat-e-GIS System for vehicle traffic can be used to assess variability to general traffic conditions. A reliability assessment for with-scheme will be made using outputs from the highway model, as detailed in paragraph 4.6.2.

Physical Activity

6.4.6 This will be assessed qualitatively, by considering predicted changes in:

a. PT mode share as an indicator of activity in accessing bus stops

b. Pedestrian and cycle facilities as part of scheme design.

Journey Quality

6.4.7 This will be assessed qualitatively.

Accidents

6.4.8 By encouraging modal switch to bus, reduced car vehicle kilometres may lead to a reduction in road traffic accidents. Predicted changes in accident costs will be assessed in line with WebTAG Unit A4.1, using growth rates drawn from WebTAG Databook. Accident costs will be

used per casualty by mode. The change in vehicle kilometres by mode will be derived from the variable demand modelling.

6.4.9 Improved crossing facilities at the Derriford Roundabout will lead to a reduced junction accident rate for pedestrians. Benchmark analysis will be considered to quantify this.

Security

6.4.10 This will be assessed qualitatively.

Access to Services

6.4.11 This will focus on projected improvements to bus service journey times and reliability. An isochrones analysis of accessibility to Derriford hospital will be presented.

Affordability

6.4.12 No significant impacts anticipated.

Severance

6.4.13 New crossing facilities will lead to a significant improvement in local accessibility, including local access to Derriford hospital, and an associated reduction in severance. This will be assessed with reference to pedestrian flow data.

Option Values

6.4.14 This will be assessed qualitatively.

Appendix A Appraisal Specification Summary Table

Appraisal Specification Summary Table

		Contact:	
Name of scheme:	Derriford Roundabout and William Prance Road Junction Improvements	**Name**	Juli Wileman
Description of scheme:	Improvements to the A386 between Derriford Roundabout and William Prance Road by adding capacity to both junctions and improving bus priority, pedestrian and cycling facilities.	**Organisation**	Plymouth City Council
		Role	Promoter/Official
		Date Produced	Dec-13

	Impacts	Data Requirements	Source	Relevant WebTAG unit
Economy	Business users & transport providers	Time and VOC savings for business users, disaggregated by freight and those travelling on business trips, by mode and by banded range of time saving	TUBA outputs; SATURN outputs; Seasonality data by mode; Model-daily factors by mode for benefit aggregation; NTEM growth (as appropriate)	Tag Unit A1.1 and A1.3
Economy	Reliability impact on Business users	Variability in private and public (bus travel)	RPPI bus data; Strat-e-gis System for vehicle traffic	Tag Unit A1.3
Economy	Regeneration	Regeneration Area; Decision to proceed with a full Regeneration Report; Possible business survey research	Economic and planning data; Derriford Transport Strategy Derriford & Seaton Area Action Plan 2006-2021 Local Development Framework Local Transport Plan	Tag Unit A2.2
Economy	Wider Impacts	Agglomeration Impacts; benefits from operating in an imperfect market; labour market impacts	GDP per worker by industry; number of jobs by industry; Generalised cost changes (from transport model); productivity elasticity values by industry at the NUTS3 (PCC) level; trips by zone (from transport model); average earnings data; tax rates on earnings.	Tag Unit A2.1
Environmental	Noise	Assessment of significant noise changes	Baseline noise survey; output traffic flows from SATURN	Tag Unit A3 Section 2
Environmental	Air Quality	Review of existing air quality, identification of receptor locations, assessment of future air quality against national standards and objectives	Existing/new air quality modelling; SATURN outputs	Tag Unit A3 Section 3
Environmental	Greenhouse gases	Carbon	TUBA outputs; SATURN outputs	Tag Unit A3 Section 4
Environmental	Landscape	Impact of change in to landscape considered in context of landscape design for the scheme	Detailed site walkover assessment	Tag Unit A3 Section 6
Environmental	Townscape	Impact of change in to townscape considered in context of townscape design for the scheme	Detailed site walkover assessment	Tag Unit A3 Section 7
Environmental	Heritage of Historic resources	Scheme footprint, base line heritage aspect	Scheme design; consultation with English heritage and County Archaeologist	Tag Unit A3 Section 8
Environmental	Biodiversity	Map of habitats on and in immediate vicinity of the site; potential ecological receptors; mitigation/enhancement measures needed as part of the scheme	Habitat survey; biological records from records centre;	Tag Unit A3 Section 9

	Water Environment	Baseline water quality; water quality through construction, and then operational phase	Surface water sampling and testing;	Tag Unit A3 Section 10
Social	Commuting and Other users	Time and VOC savings for commuting and other users, by mode and by banded range of time saving	TUBA outputs; SATURN outputs; Seasonality data by mode; Model-daily factors by mode for benefit aggregation; NTEM growth (as appropriate); Index of Multiple Deprivation (IMD) mapping	Tag Unit A1.1 and A1.3
		Social and distributional impacts - 'improve connectivity' challenge for commuters and 'improve access to leisure' for other users		Tag Unit A4.2
	Reliability impact on Commuting and Other users	Variability in private and public (bus) travel	RTPI bus data; Strat-e-gis System for vehicle traffic	Tag Unit A1.3
	Physical activity	Qualitative		Tag Unit A4.1 Section 3
	Journey quality	Qualitative		Tag Unit A4.1 Section 6
	Accidents	Accident costs per casualty by mode; Change in vehicle kms by mode; number of accidents per million vehicle-kilometres on different types of road	WebTAG Databook (safety and growth factors); SATURN outputs; use of COBALT?	Tag Unit A4.1 Section 2
	Security	Qualitative		Tag Unit A4.1 Section 4
	Access to services	Qualitative, drawing on distributional analysis		Tag Unit A4.1 Section 8
	Affordability	Qualitative		Tag Unit A4.1 Section 9
	Severance	Pedestrian numbers and changing in crossing facilities	Pedestrian data; scheme design	Tag Unit A4.1 Section 5
	Option values	Qualitative		Tag Unit A4.1 Section 7
Pub. Accounts	Cost to Broad Transport Budget	Costing data	Amey/PCC	Tag Unit A1.2
	Indirect Tax Revenues	Indirect tax rates	WebTAG 3.5.3; TUBA	Tag Unit A1.3