

**PLYMOUTH AND SOUTH WEST DEVON JOINT LOCAL
PLAN – 2034 FORECAST SATURN MODEL RESULTS
SUMMARY – DECEMBER 2017**

Spatial scenario analysis



PLYMOUTH
CITY COUNCIL

1.0 Executive Summary

A traffic modelling exercise has been undertaken by WSP on behalf of Plymouth City Council (PCC) and the Transport Strategy Working Group (TSWG) to assess the future performance of the Plymouth Policy Area (PPA) highway network. The work was undertaken in support of the Plymouth and South West Devon Joint Local Plan (JLP) which will see additional homes built and jobs created.

As part of the assessment of the traffic impacts of the JLP a set of development scenarios were considered within the future year modelling; these scenarios are recorded in Table One.

Table One: Modelling Scenarios Reference Table

Development Scenario	Modelled Networks			
	Baseline		Mitigated	
	With committed physical transport interventions ¹	With committed physical transport interventions and sustainable transport measures	With committed physical transport interventions, sustainable transport measures and non-committed (pipeline) transport interventions ²	With committed physical transport interventions, sustainable transport measures and non-committed (pipeline) transport interventions and revised housing supply figures and site allocations
	1	2	3	3a
A – Core (Control scenario) – with non-JLP growth (background growth only)	A1			
B³ – All JLP allocations⁴, including Woolwell⁵	B1	B2	B3	B3a
C – All JLP allocations except Woolwell, plus redevelopment of the Airport site for non-aviation uses	C1		C3	C3a
D – All JLP allocations, including Woolwell, plus redevelopment of the Airport site for non-aviation uses⁶	D1		D3	D3a
E⁷- All JLP allocations, including Woolwell plus an operational Airport⁸				E3a

¹ The committed physical transport interventions are as per Appendix C of the Plymouth and South West Devon Joint Local Plan Strategic Modelling Methodology Note.

² The pipeline physical transport interventions are as per Appendix C of the Plymouth and South West Devon Joint Local Plan Strategic Modelling Methodology Note.

³ This is the preferred scenario.

⁴ All JLP allocations in the Plymouth Policy Area.

⁵ Approximately 2,000 new homes, a primary school and local community facilities.

⁶ 2,000 new homes and 25,000 sqft retail space and an additional 30,000 sqft of employment space encompassing a gym and restaurant facilities.

⁷ This scenario was introduced after the revised housing supply and site allocations were agreed and hence only the 3a iteration of the model was developed.

⁸ Please see Appendix One for the assumptions made with regard to the Airport.

A number of development scenarios have been considered because, although scenarios C and D are not being promoted by the Joint Local Plan Council's they have been the subject of major representations on earlier stages of the Plan and were therefore tested to ensure that the TSWG have sufficient understanding of their potential impacts. Scenario E was also tested in order to understand the traffic impact of a functioning airport. The spatial scenarios were tested against a core scenario composed of committed development and committed highway schemes.

The assessment of the operation of the network was focused on the nodes identified as operating with a Ratio of (traffic) Flow to Capacity (RFC) of 0.75 or above⁹(≥75%). Nodes matching this criterion have been listed for each scenario, indicating the level of impact on the network from each. Table Two provides a summary of the modelling outputs.

Table Two: Number of congested nodes by time period¹⁰

Time Period	Number of congested nodes ¹¹				
	AI (Core)	B3a	C3a	D3a	E3a
AM (08:00-09:00)	184	180	188	189	181
PM (17:00-18:00)	195	203	208	214	204

Of the four spatial scenarios considered B3a performs the best in terms of delivering the fewest congested nodes, in both the AM and PM peaks, when compared with the other scenarios and 'bringing the network back' as close as possible to the 'core' scenario. This is followed by E3a, then C3a and lastly D3a

⁹ RFC is a measure of node saturation and indicates how much traffic is passing through the node in relation to its overall capacity. Should the volume of traffic approach the maximum level of available throughput, then a junction/node will become congested and delay to vehicle journeys will begin to occur.

¹⁰ A table recording the number of congested nodes in each iteration of the model, up to the '3a' iterations, is recorded in Appendix Two for completeness.

¹¹ Junctions/nodes which will operate with an RFC of 75% or above are considered to be congested as set out in the Plymouth and South West Devon Joint Local Plan: Strategic Modelling Methodology Note.

2.0 Introduction:-

This report specifically focuses upon the results from the following modelled scenarios: - **B3a; C3a; D3a and E3a**. Figures One and Two show the total number of vehicle trips for each time period in the different scenarios.

Figure One: - Vehicle trips, in each model scenario, in the AM peak

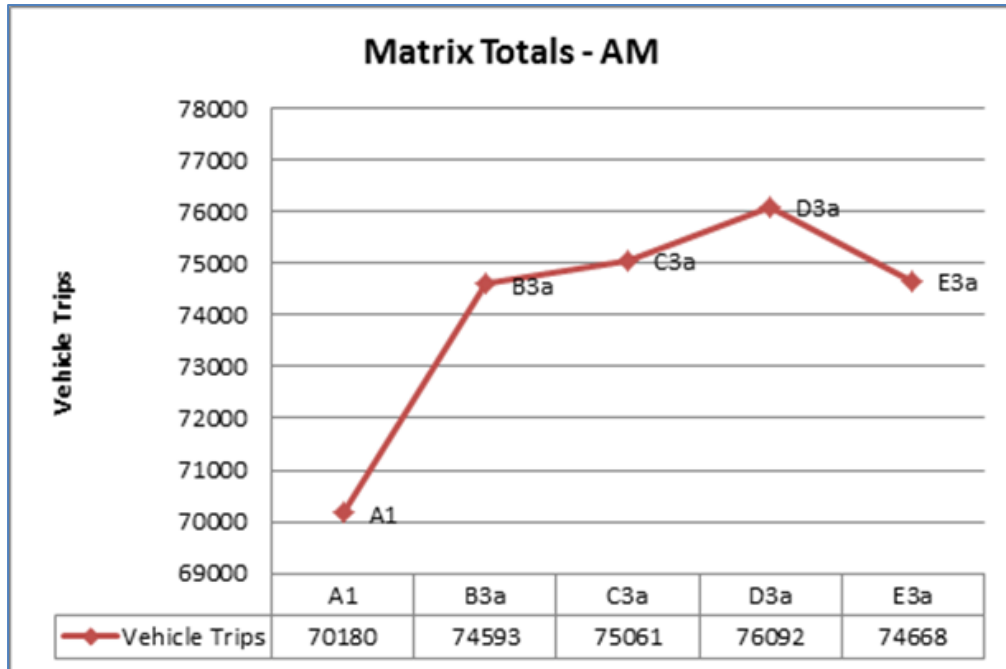


Figure Two: Vehicle trips, in each model scenario, in the PM peak

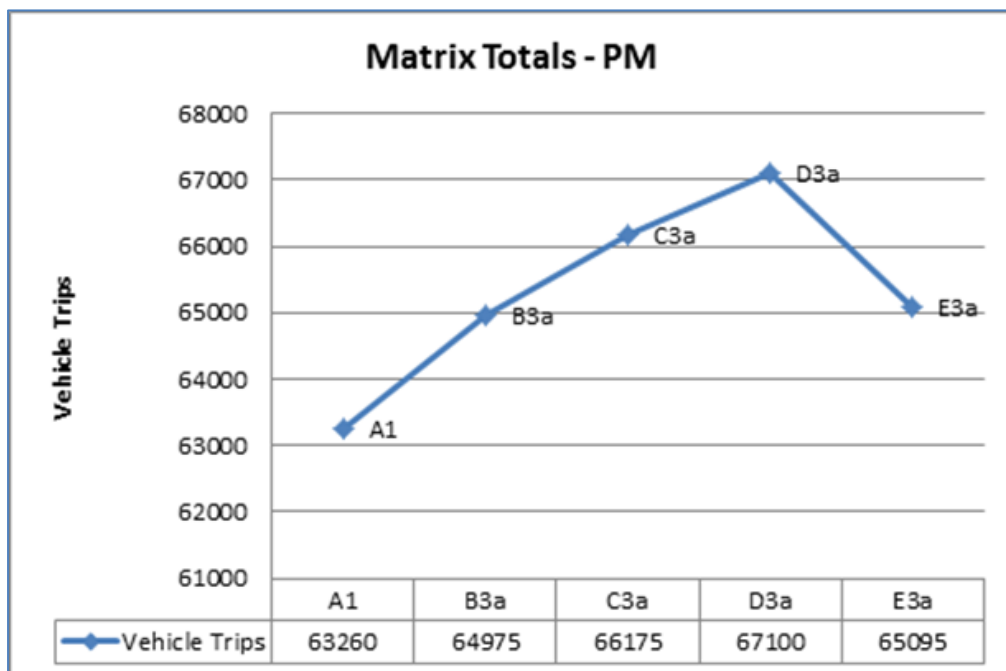


Table Three provides a summary of results for each time period, providing an indication of the overall, forecast, network performance.

Table Three: Number of congested nodes by time period¹²

Time Period	Number of congested nodes ¹³				
	AI (Core)	B3a	C3a	D3a	E3a
AM (08:00-09:00)	184	180	188	189	181
PM (17:00-18:00)	195	203	208	214	204

3.0 Results

Upon completion of the modelling, results were extracted from each scenario to assess their individual operation. Node capacity results were analysed with the number of nodes considered to be congested used as the indicator of the overall operation of the network, i.e. the fewer congested nodes the better the network is deemed to operate.

Congested nodes are defined as locations on the network with a Ratio of (traffic) Flow to Capacity (RFC) of 75% or more. RFC is a measure of junction/node saturation and indicates how much traffic is passing through the junction/node in relation to its overall capacity. Should the volume of traffic approach the maximum level of available throughput, then a junction/node will become congested and delay to vehicle journeys will begin to occur.

3.1 AM Peak Period

Figures Three and Four display the node RFC results output from the AM peak for the modelled scenarios.

Appendix Three lists those nodes in the B3a – E3a model scenario AM peak periods which are either:

1. Below 75% RFC in the AI model but exceed the $\geq 75\%$ RFC threshold in the B, C, D or E scenarios; or
2. $\geq 75\%$ RFC in the AI model and have a larger RFC in the B, C, D or E scenarios.

These are the nodes which are considered to be congested.

¹² A table recording the number of congested nodes in each iteration of the model is recorded in Appendix Two for completeness.

¹³ Junctions/nodes which will operate with an RFC of 75% or above are considered to be congested as set out in the Plymouth and South West Devon Joint Local Plan: Strategic Modelling Methodology Note.

On Figure Three the orange bars indicate the number of congested nodes in the ‘core’ scenario and hence the target value to achieve in the B3a – E3a development scenarios.

Figure Three: AM Peak Period – Number of congested nodes by scenario

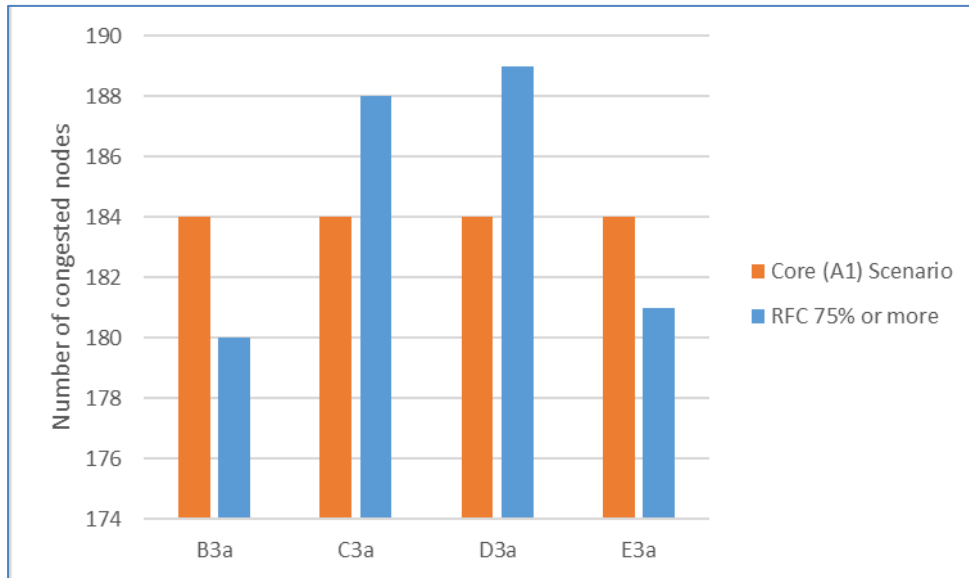


Figure Four shows the number of nodes which are forecast to be over-capacity in the AM peak period as a result of the JLP growth, i.e. nodes which are not congested in the AM peak period ‘core’ scenario but become so, or which are already congested but become more so, once JLP traffic flows are assigned to the network. Removing those nodes which are congested in the ‘core’ scenario allows us to pinpoint those areas in the network which become congested as a direct result of JLP development allocations.

Figure Four: AM period – Scenario B3a to E3a congested nodes minus AI ‘Core’ nodes

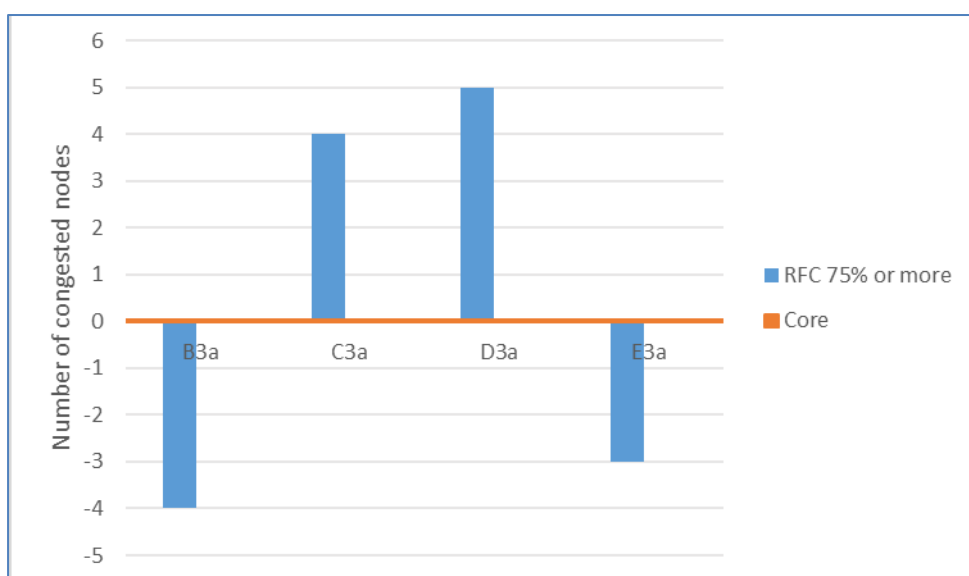


Figure Four shows that there are four fewer congested nodes in the B3a scenario compared to the 184 nodes which appear as congested in the 'core' scenario (indicated by the orange threshold line). Compared with the A1 scenario results, four additional nodes in the C3a scenario and five in the D3a are congested, whilst the E3a scenario shows three less congested nodes compared to the 'core' scenario. Whilst the scenarios are not numerically significantly different in terms of their AM performance, B3a performs the best followed closely by E3a.

3.2 PM Peak Period

Node capacity results were extracted from the model for analysis and comparison for the PM peak period in the same way as for the AM peak period. The number of nodes which are forecast to have an RFC of 75% or above in the PM peak period, and are therefore considered as congested, can be seen in Figure Five. The orange bars indicate the number of congested nodes in the 'core' scenario and hence the target value to achieve in the B3a – E3a development scenarios.

Figure Five: PM Peak Period – number of congested nodes by scenario

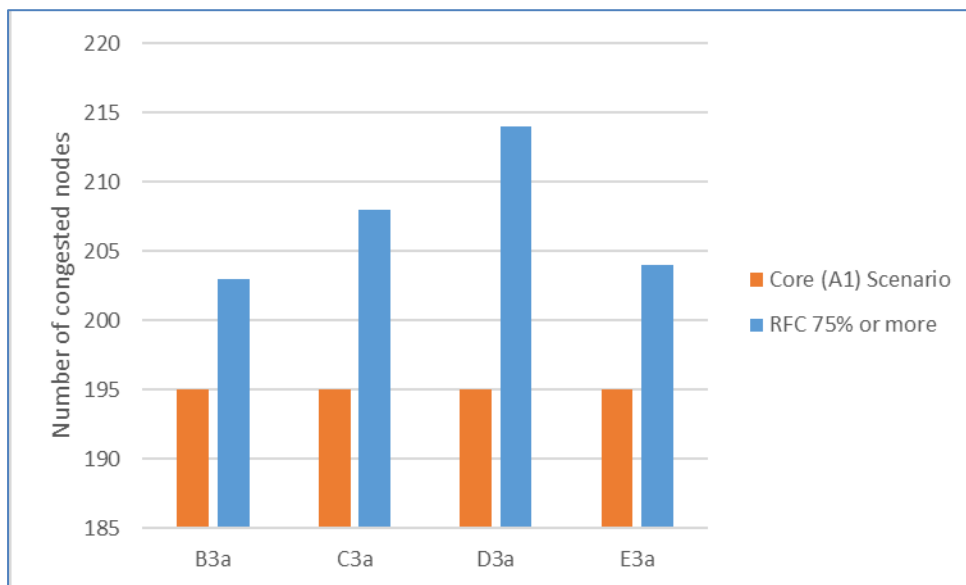


Figure Five shows that in the PM peak period there are forecast to be eight additional congested nodes in the B3a network as a result of increased traffic flow, however, B3a still performs better than all the other '3a' scenarios (C3a – E3a).

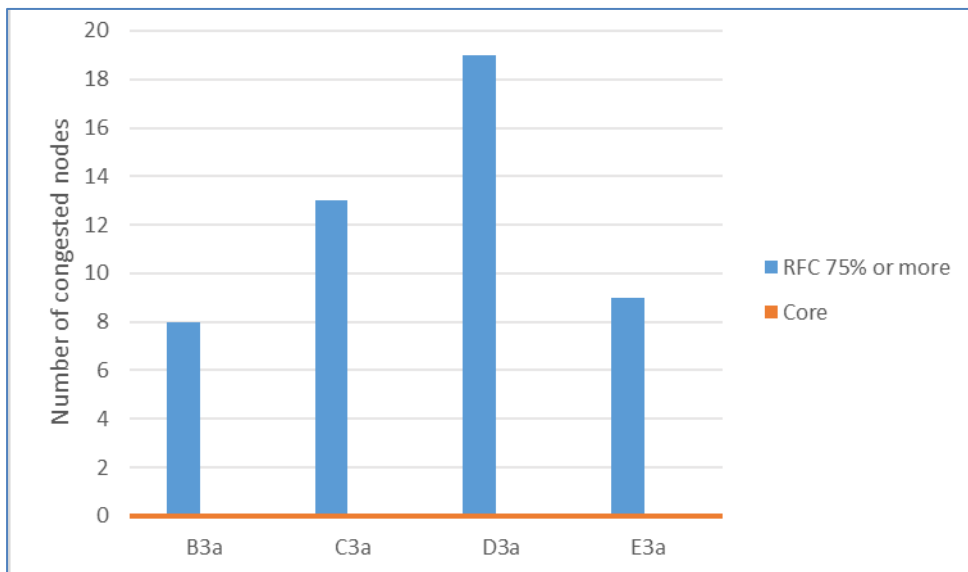
Figure Six illustrates the number of congested nodes in each development scenario in the PM peak period, once those nodes which are congested in the 'core' scenario are removed. It shows that none of the scenarios are forecast to have fewer congested nodes in the PM peak, compared with the core scenario. However, the B3a scenario is the 'best' of the scenarios tested with a forecast eight additional congested nodes than in the core scenario. The core scenario is indicated by an orange threshold line.

Appendix Three lists those nodes in the B3a – E3a model scenario PM peak periods which are either:

1. Below 75% RFC in the AI model but exceed the $\geq 75\%$ RFC threshold in the B, C, D or E scenarios; or
2. $\geq 75\%$ RFC in the AI model and have a larger RFC in the B, C, D or E scenarios.

These are the nodes which are considered to be congested.

Figure Six: PM period – Scenario B3a to E3a congested nodes minus AI 'Core' nodes



4.0 Conclusion

As part of the assessment of the traffic impacts of the JLP a set of development scenarios were considered within the future year modelling in order to understand the potential impacts of each scenario compared to both the AI 'Core' scenario and the scenario as set out in the submitted Plymouth and South West Devon Joint Local Plan.

The results indicate that, when account is taken of traffic growth associated with the JLP, the number of nodes which will operate with an RFC of 75% or above in the preferred B3a scenario is forecast to decrease in the AM and increase only slightly in PM peak periods, compared to the Core Scenario, when all the transport interventions set out in the Plymouth and South West Devon Joint Local Plan – Strategic Modelling Methodology Note are applied. The relative performance across the four '3a spatial scenarios' also provides reassurance that the B3a spatial scenario, the proposed scenario set out within the Plymouth and South West Devon Joint Local Plan, is indeed delivering the best overall results.

Appendix One: - Written by WSP

Plymouth City Airport Trip Generation

Background

As part of the ongoing strategic traffic modelling exercise in support of the Plymouth and South West Devon Joint Local Plan, Plymouth City Council have requested that a scenario is tested in which the currently closed Plymouth City Airport (PCA) is reopened for aviation purposes.

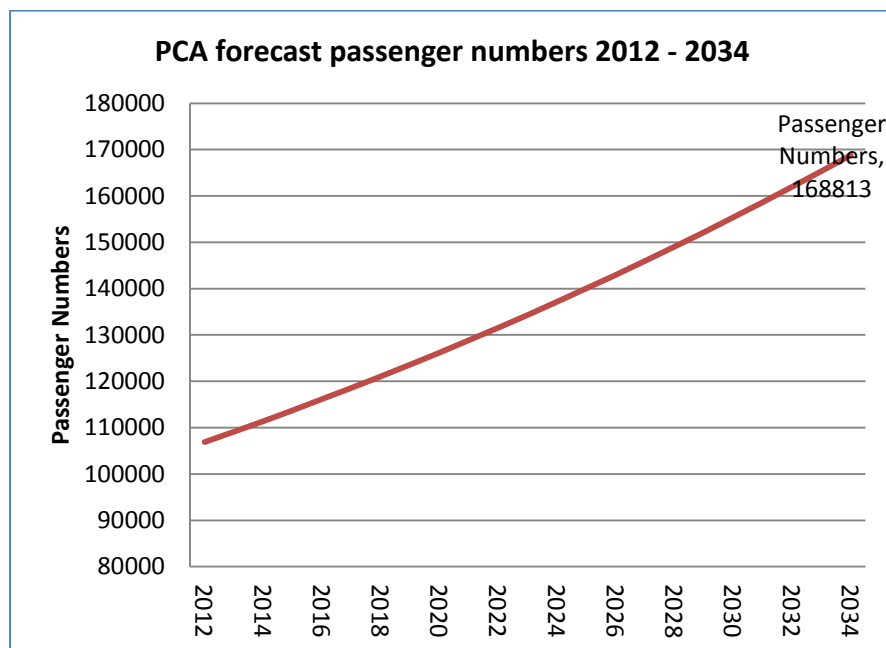
As there is no formalised method for the calculation of vehicle trips for regional airport sites, trips were calculated through gathering data from similarly sized airports. This was used alongside information available for PCA prior to its closure in 2011.

This report outlines the method used for calculating vehicle trips for a reopened PCA for use in the HAM 2 strategic traffic model.

Passenger Vehicle Trips

2034 airport passenger numbers were forecast based on existing latent demand and an assumed 2.1% level of growth per year¹⁴. Based on this level of growth, passenger numbers are projected to increase from 106,866 per year in 2012 to 168,813 per year in 2034 as seen in Figure 1 below:

Figure 1 - Forecast PCA passenger numbers



The yearly figure was divided by 365 to calculate daily airport passenger numbers (assuming the airport will operate year round). In doing so it is calculated that should PCA reopen then a daily passenger rate of 463 can be expected by the year 2034.

Airport travel data¹⁵ based on figures from Bournemouth Airport indicate that 78% of passengers travel to the airport by private car. Table 1 overleaf outlines mode split for passengers travelling to Bournemouth Airport:

¹⁴ Figures derived for the DfT report – ['A Study Of Consultancy Reports' Conclusions on Reopening Plymouth City Airport for Commercial Passenger Services'](#) – December, 2016

Table 1 - 2005 passenger modal split - Bournemouth Airport

Vehicle Type	% split
Private Car	78.4%
Taxi	17.3%
Hire Car	2.1%
Bus	2.1%

Reliance on passengers using private cars to travel to regional airports can be further seen in a Civil Aviation Authority survey of travel to Exeter International Airport undertaken in 2007¹⁶. The survey shows that 80% of passengers travel to the airport by car. This is largely due to passengers travelling from a wide catchment area with relatively poor public transport links to the airport outside of Exeter City itself.

It may reasonably be assumed that by 2034 passengers travelling to PCA will benefit from improved public transport links. In the absence of likely future modal shift data however, the modal split as seen in Table 1 was used in the PCA vehicle forecasting exercise.

Based on the projected 2034 passenger numbers and the percentage of passengers travelling to the airport by car, hire car or taxi, the total number of passenger's travelling to and from the airport by private means is calculated to be 452 each way over a 24 hour period.

Vehicle occupancy was calculated and applied to the overall number of passenger trips to account for people travelling to the airport in groups. Data from Cardiff Airport obtained from the Civil Aviation Authority (CAA) Passenger Survey Report 2015¹⁷ highlights that only 28% of passengers using the airport travel alone. The remaining passengers surveyed had travelled with at least one other person. Table 2 below shows the group size of travellers at Cardiff Airport in 2015:

Table 2 - Group size of air travellers at Cardiff Airport in 2015

Group size	UK Business %	UK Leisure %	Foreign Business %	Foreign Leisure %	All Passengers %
Travelling alone	89	17.5	78.1	38.5	27.9
Travelling with one other	7.7	41.8	13.8	35.2	37.3
Travelling with two others	1.1	9	2.3	7.1	7.9
Travelling with three	0.3	16.6	1.4	8.4	13.7

¹⁵ 'Bournemouth Airport Area Wide Travel Plan' – July, 2011.

¹⁶ 'Exeter International Airport – Master Plan' – October, 2009

¹⁷ 'CAA Passenger Survey Report 2015' -

<http://caa.co.uk/uploadedFiles/CAA/Content/Standard Content/Data and analysis/Datasets/Passenger survey/CAA%20Passenger%20survey%20report%202015.pdf>

others					
Travelling with four others	0.2	6.9	2.3	2.9	5.7
Travelling with five others	1.8	8.3	2.1	7.9	7.5
Total	100	100	100	100	100

The figures for 'All Passengers' in the table above has been applied to the estimated PCA passenger numbers to calculate the number of car journeys over the course of an average day.

Staff Vehicle Trips

It is a generally accepted assumption of staffing levels of circa 600 employees per every million passengers handled in a commercial airport per year¹⁸. With this being the case by 2034 with a reopened PCA expected to handle 168,813 yearly passengers the number of airport staff will equate to 101 employees.

Travel to work data indicates that 81% of airport staff commute to work by car¹⁹. This would create 82 unique daily vehicle trips to and from PCA.

Similarly to the calculated passenger vehicle trips, hourly staff vehicle trips to and from PCA were calculated using existing data surveyed at London Ashford Airport. From this an estimate of trips to and from PCA per hour could be made, which when added to the hourly passenger vehicle rates provides total combined vehicle rates per hour.

Total 2034 Vehicle Trips

Following calculation of both passenger and staff vehicle trips and taking into consideration vehicle occupancy numbers, the total overall vehicle trips were output for each hour. Table 3 below displays calculated vehicle trips over a 24 hour period for a typical week day. Peak traffic hours as seen in the HAM 2 model are highlighted in yellow:

Table 3 - 2034 PCA total calculated vehicle trips per hour

Hour	Inbound	Outbound
06:00	6	3
07:00	36	14
08:00	35	17
09:00	36	34
10:00	7	5
11:00	1	3
12:00	33	37
13:00	13	9

¹⁸ 'London Ashford Airport – Terminal Development Transport Assessment' – December, 2006

¹⁹ 'Bournemouth Airport Area Wide Travel Plan' – July, 2011.

14:00	2	1
15:00	27	25
16:00	22	29
17:00	37	48
18:00	6	6
19:00	13	23

Following the process as outlined in this note, estimated vehicle trips have been generated which are to be applied to the HAM 2 model to test the impact of a reopened PCA for aviation purposes. The figures are based on gathered evidence from similarly sized airports and therefore deemed a robust approximation of likely vehicle numbers for 2034 in line with the Joint Local Plan period.

Appendix Two: - Number of congested nodes by time period and scenario.

	Number of congested nodes ²⁰									
Period	Core (A1)	B1	B2	B3	B3a	C3	C3a	D3	D3a	E3a
AM (08:00-09:00)	184	222	206	205	180	207	188	211	189	181
PM (17:00-18:00)	195	242	227	221	203	231	208	234	214	204

²⁰ Nodes which will operate with an RFC of 75% or above are considered to be congested as per the Plymouth and South West Devon Joint Local Plan: Strategic Modelling Methodology Note.

Appendix Three - Location of congested nodes (Scenario B3a – E3a)

KEY									
	Nodes not in B3a scenario which are in an alternative								
	Nodes in B3a which are not in an alternative scenario.								
Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
William Prance Road / Forder Valley Link Road	33	✓	✓	✓	✓	✓	✓	✓	✓
William Prance Road (East)	38	✓	✓	✓	✓	✓	✓	✓	✓
A374 Union Street / The Crescent	160		✓		✓		✓		✓
A374 Union Street / Martin Street	161	✓	✓	✓	✓	✓	✓	✓	✓
Park Avenue / Fore Street	166	✓		✓		✓		✓	
Park Avenue / Ferry Road	168		✓		✓		✓		✓
Ferry Road / Torpoint Ferry	170		✓		✓		✓		✓
Ferry Road / Pottery Road	171	✓	✓	✓	✓	✓	✓	✓	✓
Mill Bridge / Wilton Street	183		✓	✓			✓		✓
Fore Street / Kings Road	186	✓	✓	✓	✓	✓	✓	✓	✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Molesworth Road / Milehouse Road	194	✓	✓	✓	✓	✓	✓	✓	✓
B3396 Devonport Road / B3396 Albert Road	195	✓	✓	✓	✓	✓	✓	✓	✓
Albert Road / Park Road	197		✓		✓		✓		✓
Keyham Road / St Levan Road	199				✓		✓		
Ford Hill / St Levan Road	203	✓	✓	✓		✓	✓	✓	✓
A3064 Wolseley Road / Henderson Place	204		✓		✓		✓		✓
A3604 Wolseley Road / Royal Navy Avenue	207	✓	✓	✓	✓	✓	✓	✓	✓
Wolseley Road / Weston Mill Drive	212		✓		✓		✓		✓
Weston Mill Drive / Ferndale Road	214	✓	✓	✓	✓	✓	✓	✓	✓
Saltash Road / North Road West	239		✓		✓		✓		✓
Alma Road / Central Park Avenue	240	✓	✓	✓	✓	✓	✓	✓	✓
A386 Outland Road / Seagrave Road	252	✓	✓	✓	✓	✓	✓	✓	✓
A386 Outland Road / Peverell Park Road	253	✓	✓	✓	✓	✓	✓	✓	✓
Seagrave Road / North Prospect Road	258	✓	✓	✓	✓	✓	✓	✓	✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Ford Park Road / College View	284	✓	✓	✓	✓	✓	✓	✓	✓
Hyde Park Road / Gifford Terrace Road	285	✓	✓	✓	✓	✓	✓	✓	✓
Hyde Park Road / Weston Park Road	286	✓	✓	✓	✓	✓	✓	✓	✓
Weston Park Road / Burleigh Park Road	287				✓		✓		
A386 Outland Road / Weston Park Road	290	✓	✓	✓	✓	✓	✓	✓	✓
Ham Drive / Pennycross Park Road	293	✓	✓	✓	✓	✓	✓	✓	✓
B3413 Crownhill Road / Budshead Road	314	✓	✓	✓	✓	✓	✓	✓	✓
Crownhill Road / St Peters Road	318	✓	✓	✓	✓	✓	✓	✓	✓
Crownhill Road / Meavy Way	320	✓	✓	✓	✓	✓	✓	✓	✓
Budshead Way / Budshead Road	321		✓		✓		✓		✓
B3413 Budshead Road / Tamerton Foliot Road	322	✓		✓		✓		✓	
Budshead Road / Milford Lane	325	✓	✓	✓	✓	✓	✓	✓	✓
Milford Lane / Fore Street	326					✓			
B3373 Tamerton Foliot Road / Southway Drive	337	✓		✓		✓		✓	

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
North Hill / Clifton Place	349	✓	✓	✓	✓	✓	✓	✓	✓
North Road East / Houndiscombe Road	350	✓		✓		✓		✓	
Mutley Plain / Alexandra Road	354	✓	✓	✓	✓	✓	✓	✓	✓
Mutley Plain / Houndiscombe Road	355		✓		✓		✓		✓
Mutley Plain / Ford Park Road	357	✓	✓	✓	✓	✓	✓	✓	✓
Ashford Rd / Ashford Hill	359						✓		
B3250 Mannamead Road / Western College Road	360	✓		✓		✓	✓	✓	
B3250 Mannamead Road / Seymour Road	362	✓	✓	✓	✓	✓	✓	✓	✓
B3250 Mannamead Road / Egguckland Road	363	✓	✓	✓	✓	✓	✓	✓	✓
B3250 Mannamead Road / Thornhill Road	366	✓	✓	✓	✓	✓	✓	✓	✓
B3250 Mannamead Road / Torr Lane	367	✓	✓	✓	✓	✓	✓	✓	✓
Mannamead Road / Hyde Park Road	370	✓		✓		✓		✓	
A386 Tavistock Rd north of Manadon Roundabout	372	✓	✓	✓	✓	✓	✓	✓	✓
A386 Tavistock Road / Meavy Way	373	✓	✓	✓	✓	✓	✓	✓	✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
A386 Tavistock Road / Plumer Road	376	✓	✓	✓	✓	✓	✓	✓	✓
A386 Tavistock Road / Charlton Road (S/B)	377	✓	✓	✓	✓	✓	✓	✓	✓
A386 Tavistock Road / Sendall's Way	378	✓	✓	✓	✓	✓	✓	✓	✓
A386 Derriford Roundabout / A386 Tavistock Road (North)	379	✓		✓	✓	✓	✓	✓	
A386 Tavistock Road / Powisland Drive	380	✓	✓	✓	✓	✓	✓	✓	✓
Derriford Road / Plymbridge Lane	381	✓	✓	✓	✓	✓	✓	✓	✓
B3250 Mannamead Road / Compton Park Road	382	✓	✓	✓	✓	✓	✓	✓	✓
A386 Tavistock Road / Morgan Road	385	✓	✓	✓	✓	✓	✓	✓	✓
B3250 Mannamead Road / Hartley Road	388	✓		✓		✓		✓	
A386 Tavistock Road / Derriford Road	389	✓	✓	✓	✓	✓	✓	✓	✓
A386 Derriford Roundabout / Brest Road	390	✓	✓	✓	✓	✓	✓	✓	✓
Derriford Roundabout / A386 Tavistock Road (South)	391	✓	✓	✓	✓	✓	✓	✓	✓
A386 Derriford Roundabout / Looseleigh Lane	392	✓	✓	✓	✓	✓	✓	✓	✓
Derriford Road / Hospital Exit	398	✓	✓		✓		✓	✓	✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Beaumont Road / Tothill Avenue	403		✓		✓		✓		✓
Lipson Road / Mount Gould Road	408		✓		✓		✓		✓
Alexandra Road / Ashford Hill	413	✓	✓	✓	✓	✓	✓	✓	✓
Lipson Road / Mostyn Road	414		✓		✓		✓		✓
Old Laira Road / Efford Lane	417	✓	✓	✓	✓	✓	✓	✓	✓
Old Laira Road / Pike Road	419		✓		✓		✓		✓
Eggbuckland Road / Shallowford Road	426				✓		✓		
Fort Austin Road / Widey Lane	430		✓		✓		✓		✓
Fort Austin Road / Church Hill	431	✓	✓	✓	✓	✓	✓	✓	✓
Barnstaple Close / Longbridge Road	437	✓	✓	✓	✓	✓	✓	✓	✓
Forder Valley Road / Novorossiysk Road	439	✓	✓	✓	✓	✓	✓	✓	✓
Novorossiysk Road / Miller Way	440	✓	✓	✓	✓	✓	✓	✓	✓
Novorossiysk Road / Bampton Road	441	✓		✓	✓	✓	✓	✓	
B3432 Novorossiysk Road / Plymbridge Road	442	✓		✓		✓		✓	

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
B3416 Glen Road / Hillcrest Drive	460	✓	✓	✓	✓	✓	✓	✓	✓
Deep Lane E/B off-slip / Deep Lane	462	✓	✓	✓	✓	✓	✓	✓	✓
A38 / Deep Lane E/B off-slip	463	✓	✓	✓	✓	✓	✓	✓	✓
A38 / Deep Lane W/B off-slip	464	✓		✓		✓		✓	
Deep Lane / A38 W/B off-slip	466	✓	✓	✓	✓	✓	✓	✓	✓
Deep Lane / W/B on-slip	467	✓	✓	✓	✓	✓	✓	✓	✓
B3240 Notte Street / Princess Street Ope	484	✓	✓	✓	✓	✓	✓	✓	✓
Exeter Street / Bretonside	489	✓	✓	✓	✓	✓	✓	✓	✓
Exeter Street / Sutton Road	490	✓	✓	✓	✓	✓	✓	✓	✓
Gdynia Way / Exeter Street	496	✓	✓	✓	✓	✓	✓	✓	✓
Embankment Road / Lanhydrock Road	500	✓	✓	✓	✓	✓	✓	✓	✓
Plymouth Rd / Coypool Rd	504	✓	✓	✓	✓	✓	✓	✓	✓
Ridgeway / Dark Street Lane	514	✓		✓		✓		✓	
Ridgeway / Moorland Road	515	✓		✓		✓		✓	

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Underwood Rd / Market Rd	521	✓	✓		✓	✓	✓	✓	✓
Cot Hill / Merafield Road	525		✓				✓		✓
Merafield Road / Ridge Road	528	✓	✓	✓	✓	✓	✓	✓	✓
Stamps Hill / Deep Lane	533	✓	✓	✓	✓	✓	✓	✓	✓
A379 Laira Bridge Road / Hele's Terrace	552	✓	✓	✓	✓	✓	✓	✓	✓
Laira Bridge Road / Finnigan Road	553	✓	✓	✓	✓	✓	✓	✓	✓
A379 Billacombe Road / Pomphlett Road	554	✓	✓	✓	✓	✓	✓	✓	✓
Colesdown Hill / A379 Billacombe Road	555	✓		✓		✓		✓	
Stanborough Road / Hays Road	559	✓		✓		✓		✓	
Elburton Road / Southernway	561	✓		✓		✓		✓	
Dean Cross Road / Radford Park Road	569		✓		✓		✓		✓
Plymstock Road / Randwick Park Road	570	✓	✓	✓	✓	✓	✓	✓	✓
Pomphlett Road / Pomphlett Roundabout (south)	574	✓	✓	✓	✓	✓	✓	✓	✓
Pomphlett Road / Horn Cross Road	576	✓		✓		✓		✓	

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
A386 Outland Road / St Erth Road	581	✓	✓	✓	✓	✓	✓	✓	✓
Clovelly Rd / Macadam Rd	588		✓		✓		✓		✓
Western Approach / King Street	591		✓		✓		✓		✓
Novorossiysk Road / Dover Road	611		✓	✓	✓	✓	✓		✓
Deep Lane / Ridgeway	614	✓	✓	✓	✓	✓	✓	✓	✓
A374 Gdynia Way / Cattewater Road	618	✓	✓	✓	✓	✓	✓	✓	✓
A374 Embankment Road / Embankment Lane	621	✓	✓	✓	✓	✓	✓	✓	✓
A374 Gydnia Way / Laira Bridge Road	622	✓	✓	✓	✓	✓	✓	✓	✓
A38 E/B off-slip / Crownhill Road	625	✓		✓		✓		✓	
Victoria Way / Roman Road (Crownhill Roundabout South)	628		✓		✓	✓	✓		✓
Ernesettle Lane / B3413 Crownhill Road	632	✓	✓	✓	✓	✓	✓	✓	✓
Crownhill Roundabout (North) / Crownhill Road	633	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B off-slip / Roman Way	634	✓	✓	✓	✓	✓	✓	✓	✓
A38 E/B off-slip / A3064 St Budeaux Bypass	637	✓		✓		✓		✓	

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
A38 E/B on-slip / Weston Mill	638		✓		✓		✓		✓
A38 W/B off-slip / A3064 St Budeaux Bypass	639	✓	✓	✓	✓	✓	✓	✓	✓
The Parkway / Weston Mill Drive (South)	640		✓		✓	✓	✓		✓
A386 Tavistock Road (S/B) / Manadon Roundabout	642	✓	✓	✓	✓	✓	✓	✓	✓
A38 E/B on-slip / A3 E/B	643		✓		✓		✓		✓
A38 E/B slip / Forder Valley Junction	644	✓	✓	✓	✓	✓	✓	✓	✓
A386 Manadon Roundabout / B3250 Mannamead Road	645	✓	✓	✓	✓	✓	✓	✓	✓
Manadon Roundabout / A38 E/B off-slip	647	✓		✓		✓		✓	
Manadon Roundabout / A38 E/B on-slip	648	✓	✓	✓	✓	✓	✓	✓	✓
A38 E/B off-slip / Marsh Mills Roundabout (north)	650	✓	✓	✓	✓	✓	✓	✓	✓
Marsh Mills Roundabout / A38 E/B on-slip	651	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B off-slip / Marsh Mills Roundabout	652	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B on-slip / Marsh Mills Roundabout	653	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B off-slip / Manadon Roundabout	655	✓		✓		✓		✓	

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
A38 E/B off-slip / Forder Valley Interchange	656	✓	✓	✓	✓	✓	✓	✓	✓
Forder Valley Interchange (north) / Forder Valley Road	657	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B off-slip / Forder Valley Interchange	659	✓	✓	✓	✓	✓	✓	✓	✓
A38 E/B on-slip / Plymouth Road	663				✓		✓		
A38 E/B on-slip / Forder Valley Road S/B	664		✓		✓		✓		✓
A38 W/B on-slip / Forder Valley Interchange	665		✓		✓		✓		✓
A38 E/B / E/B off-slip Marsh Mills Roundabout	666	✓	✓	✓	✓	✓	✓	✓	✓
Forder Valley interchange A38 W/B on-slip / A38 W/B	700		✓		✓		✓		✓
A38 / A38 W/B off-slip toward Forder Valley Interchange	701	✓		✓		✓		✓	
A38 / A38 W/B off-slip toward Manadon Roundabout	702	✓	✓	✓	✓	✓	✓	✓	✓
Manadon Roundabout / A386 Outland Road (N/B)	703	✓	✓	✓	✓	✓	✓	✓	✓
Manadon Roundabout A38 W/B on-slip / A38 W/B	704		✓		✓		✓		✓
A386 Manadon Roundabout / Manadon Hill (N/B)	705	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B on-slip / B3413	709		✓		✓		✓		✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Manadon Hill / Great Berry Road	712	✓	✓	✓	✓	✓	✓	✓	✓
A386 Tavistock Road / Budshead Way	718	✓		✓		✓		✓	
A386 Tavistock Road / Charlton Road (N/B)	720	✓		✓		✓		✓	
Western Approach / North Cross Roundabout	733		✓		✓		✓		✓
Shapters Road	741	✓		✓		✓		✓	
A374 Exeter St	742	✓		✓		✓		✓	
A374 Union Street / Derrys Cross	770	✓	✓	✓	✓	✓	✓	✓	✓
Royal Parade / Derry's Cross	772	✓	✓	✓	✓	✓	✓	✓	✓
St Andrews Cross / Royal Parade E/B	780		✓		✓		✓		✓
St Andrews Cross / Exeter Street	782		✓		✓		✓		✓
A374 Charles Cross Roundabout / A374 Charles Street (S/B)	791	✓	✓	✓	✓	✓	✓	✓	✓
Charles Cross Roundabout / Hampton St	792		✓		✓		✓		✓
Charles Cross Roundabout / Exeter Street (W/B)	793	✓	✓	✓	✓	✓	✓	✓	✓
Charles Cross Roundabout / Exeter Street (SW/B)	794	✓	✓	✓	✓	✓	✓	✓	✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Beaumont Road / North Street	795	✓		✓		✓		✓	
Charles Street / Drake Circus Car Park exit	800	✓	✓	✓	✓	✓	✓	✓	✓
A386 (North of Roborough)	817		✓	✓	✓	✓	✓		✓
A386 Tavistock Road / William Prance Road	821	✓	✓	✓	✓	✓	✓	✓	✓
A386 Tavistock Road / McDonalds Entrance	823	✓		✓	✓	✓	✓	✓	
Crownhill Road / Transit Way	831		✓		✓		✓		✓
Outland Road / Torr Lane	835	✓	✓	✓	✓	✓	✓	✓	✓
A3604 Wolsley Road (S/B) / Wolsley Roundabout	860	✓	✓	✓	✓	✓	✓	✓	✓
Seagrave Road / A3064 Wolsley Roundabout	861	✓	✓	✓	✓	✓	✓	✓	✓
A3604 Wolsley Road (N/B) / Wolsley Roundabout	862		✓		✓		✓		✓
B3432 Novorossiysk Rd	891			✓		✓			
Miller Way / Dover Road	894			✓		✓		✓	
Tamar Bridge W/B / North Road	899	✓	✓	✓	✓	✓	✓	✓	✓
North Cross / Cobourg Street	900	✓		✓	✓	✓	✓	✓	

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
North Cross / Western Approach	901		✓		✓		✓		✓
North Cross / Saltash Road	902		✓		✓		✓		✓
North Road East / North Cross Roundabout	903	✓		✓		✓		✓	
Mills A38 W/B / A38 W/B off-slip toward Marsh	950	✓	✓	✓	✓	✓		✓	✓
Notte Street / Lockyer Street	964		✓		✓		✓		✓
Notte Street / Hoe Approach	965	✓	✓	✓	✓	✓	✓	✓	✓
A38 Tamar Bridge / W/B exit	973	✓		✓		✓		✓	
A386 Tavistock Road (N/B) / Woolwell Road	975	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B on-slip / Smithaleigh	1004	✓	✓	✓	✓	✓	✓	✓	✓
A38 E/B off-slip / Lee Mill	1006	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B off-slip / Lee Mill	1007	✓	✓	✓	✓	✓	✓	✓	✓
Cobourg Street / North Hill (Drake Circus)	1096	✓	✓	✓	✓	✓	✓	✓	✓
Billacombe Road / The Range Car Park	1102		✓	✓	✓	✓	✓		✓
A38 W/B off-slip / Forder Valley Interchange	1106		✓	✓	✓		✓		✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Plymouth Road E/B / Great Woodford Drive	1201	✓	✓	✓	✓	✓	✓	✓	✓
B3416 Plymouth Road / Cot Hill	1202	✓	✓	✓	✓	✓	✓	✓	✓
Plymouth Road W/B / Larkham Lane	1204	✓	✓	✓	✓	✓	✓	✓	✓
Plymouth Road / Great Woodford Drive	1205		✓		✓		✓		✓
B3416 Plymouth Road / B3416 Glen Road	1209	✓		✓		✓		✓	
Ridgeway / Market Road	1210	✓	✓	✓	✓	✓	✓	✓	✓
A374 Gydnia Way (N/B) / Barbican Approach (E/B)	1221	✓	✓	✓	✓	✓	✓	✓	✓
Gydnia Way / Barbican Approach	1222	✓	✓	✓	✓	✓	✓	✓	✓
Finnigan Road / Faraday Road	1226		✓		✓		✓		✓
Embankment Road / Langham Place	1227	✓	✓	✓	✓	✓	✓	✓	✓
A379 Embankment Road / A374 Embankment Road	1228		✓		✓		✓		✓
A386 Tavistock Road / Bladder Lane	1235	✓	✓	✓	✓	✓	✓	✓	✓
Mannamead Road / Compton Avenue	1247	✓		✓		✓		✓	
Pemros Road (N/B) / Tamar Bridge	1260		✓		✓		✓		✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
A38 W/B / Tamar Bridge	1261		✓		✓		✓		✓
Tamar Bridge E/B / A38 E/B	1262	✓	✓	✓	✓	✓	✓	✓	✓
A38 Tamar Bridge E/B / Pemros Road Roundabout	1265	✓		✓		✓		✓	
A38 W/B / Pemros Road Roundabout	1266		✓		✓		✓		✓
B3416 Plymouth Road (E/B) Woodford Avenue	1294	✓	✓	✓	✓	✓	✓	✓	✓
B3416 Plymouth Road (W/B) Woodford Avenue	1295	✓	✓	✓	✓	✓	✓	✓	✓
A386 Tavistock Road / New Road	1299	✓	✓	✓	✓	✓	✓	✓	✓
Holland Road / Ledgate Lane	1304		✓		✓		✓		✓
Unnamed Rd off the A38 near Smithaleigh	1306	✓	✓	✓	✓	✓	✓	✓	✓
A38 E/B on-slip / Ridgway	1307	✓	✓	✓	✓	✓	✓	✓	✓
Ledgate Lane south of A38 / A38 W/B on-slip	1308		✓		✓		✓		✓
B3416 Deep Lane	1331		✓		✓				✓
Lee Mill W/B on-slip / A38 W/B	1350	✓	✓	✓	✓	✓	✓	✓	✓
Western Approach / Sainsbury's exit	1362		✓		✓		✓		✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Plymbridge Road / Thornbury Road	1378				✓		✓		
A374 Park Avenue / Granby Way	1395	✓	✓	✓	✓	✓	✓	✓	✓
Mannamead Road	1550			✓		✓			
B3214 Old Laira Road / Bramley Road	1627	✓	✓	✓	✓	✓	✓	✓	✓
Old Laira Road / Wycliffe Road	1628	✓	✓	✓	✓	✓	✓	✓	✓
Shapters Rd / Cattedown Rd	1630		✓		✓		✓		✓
Glen Road / Eagle Road	1653	✓		✓		✓		✓	
Tamerton Road / Belliver Way	1664		✓		✓		✓		✓
B3413 Forder Valley Road / B3432 Novorossiysk Road	1675	✓	✓	✓	✓	✓	✓	✓	✓
B3413 Forder Valley Road north of Forder Valley Interchange	1676	✓	✓	✓	✓	✓	✓	✓	✓
Derrys Cross / Royal Parade	1679	✓	✓	✓	✓	✓	✓	✓	✓
Royal Parade / Armada Way (Crossing)	1680	✓	✓	✓	✓	✓	✓	✓	✓
Royal Parade / St. Andrews Cross	1681	✓	✓	✓	✓	✓	✓	✓	✓
A374 Union Street west of Derry's Cross	1682	✓	✓	✓		✓	✓	✓	✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Forder Valley Road	1685	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B toward A38 Tamar Bridge	1700		✓		✓		✓		✓
A38 E/B toward Weston Mill	1701	✓		✓		✓		✓	
A38 E/B towards A386 Outland Rd	1703			✓					
A38 W/B toward Weston Mill	1704		✓		✓		✓		✓
A38 E/B toward Forder Valley Interchange	1705	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B near Reddington Road Footbridge	1706	✓	✓	✓	✓	✓	✓	✓	✓
A386 Derriford Roundabout / A386 Tavistock Road	1732		✓				✓		✓
Plymbridge Lane / Runway Road	3001			✓	✓	✓	✓		
Laira Bridge Road / Embankment Lane	3007	✓	✓	✓	✓	✓	✓	✓	✓
A38 W/B / Marsh Mills W/B on-slip	4001	✓		✓		✓		✓	
Haye Road / Sherford Main Street	4003	✓	✓	✓	✓	✓	✓	✓	✓
Chapel Street / Fore Street	4059		✓		✓		✓		✓
B3396 Devonport Hill / Cumberland Road	4061		✓		✓		✓		✓

Address	Node Ref	Nodes in the B3a model (Preferred Scenario)		Nodes in the C3a model		Nodes in the D3a model		Nodes in the E3a model	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Longbridge Road	4070		✓		✓		✓		✓
A386 Tavistock Road / Sendall's Way	4076		✓		✓		✓		✓
Tavistock Road	4078						✓		✓
Billacombe Road / Broxton Drive	4101	✓	✓	✓	✓	✓	✓	✓	✓
A379 Billacombe Road / Pomphlett Road	4104	✓		✓		✓		✓	
Exeter St	4108		✓		✓		✓		✓

Table One: Nodes not in the B3a scenario which are in an alternative scenario

Location	C3a		D3a		E3a	
	AM	PM	AM	PM	AM	PM
Northern Corridor	611, 817, 891, 894, 1550, 1703, 3001 (7)	287, 379, 441, 823, 1378, 3001 (6)	611, 817, 891, 894, 1550, 3001 (6)	287, 360, 379, 441, 823, 1378, 3001, 4078 (8)	894 (1)	4078 (1)
Eastern Corridor	1102, 1106 (2)	663 (1)	1102 (1)	663 (1)		
City Centre and Waterfront		900 (1)		900 (1)		
Other	183 (1)	199, 426 (2)	326, 628, 640 (3)	199, 359, 426 (3)		

Table Two: Nodes in B3a which are not in an alternative scenario

Location	C3a		D3a		E3a	
	AM	PM	AM	PM	AM	PM
Northern Corridor	398 (1)	1732 (1)	398 (1)			
Eastern Corridor	521 (1)	525 (1)		950, 1331 (2)		
City Centre and Waterfront		1682 (1)				
Other		183, 203 (2)				

Table Three: Summary Table (Table One – Table Two)

Location	C3a		D3a		E3a	
	AM	PM	AM	PM	AM	PM
Northern Corridor	+6	+5	+5	+8	+1	+1
Eastern Corridor	+1	0	+1	-1		
City Centre and Waterfront		0		+1		
Other	+1	0	+3	+3		