3 Methodology

3 Methodology

3.1 Introduction

In light of the concerns of the approach adopted in previous studies, this section provides an overview of the modelling approach and a summary of modelling methodology used in the PECS. Wherever possible this approach has conformed to the present DfT guidance and best practice.

3.2 Evaluation Methodology

The technical work undertaken as part of the Stage One evaluation process has consisted of the following steps:

- **An Assessment of Baseline Conditions**: this summarised all available information pertinent to the study at this stage, used for informing steps 2 and 3. This has been reported in s separate Baseline Conditions Report;
- **An Outline of Mode Option Characteristics**: a futuristic view of how each of the mode options could be developed taking into account the baseline conditions (Stage One Report); and
- **The Evaluation of the mode options**: using a corridor based Paramics model linked to spreadsheet based variable demand model evaluation framework (Stage One Report).

3.3 Modelling Approach

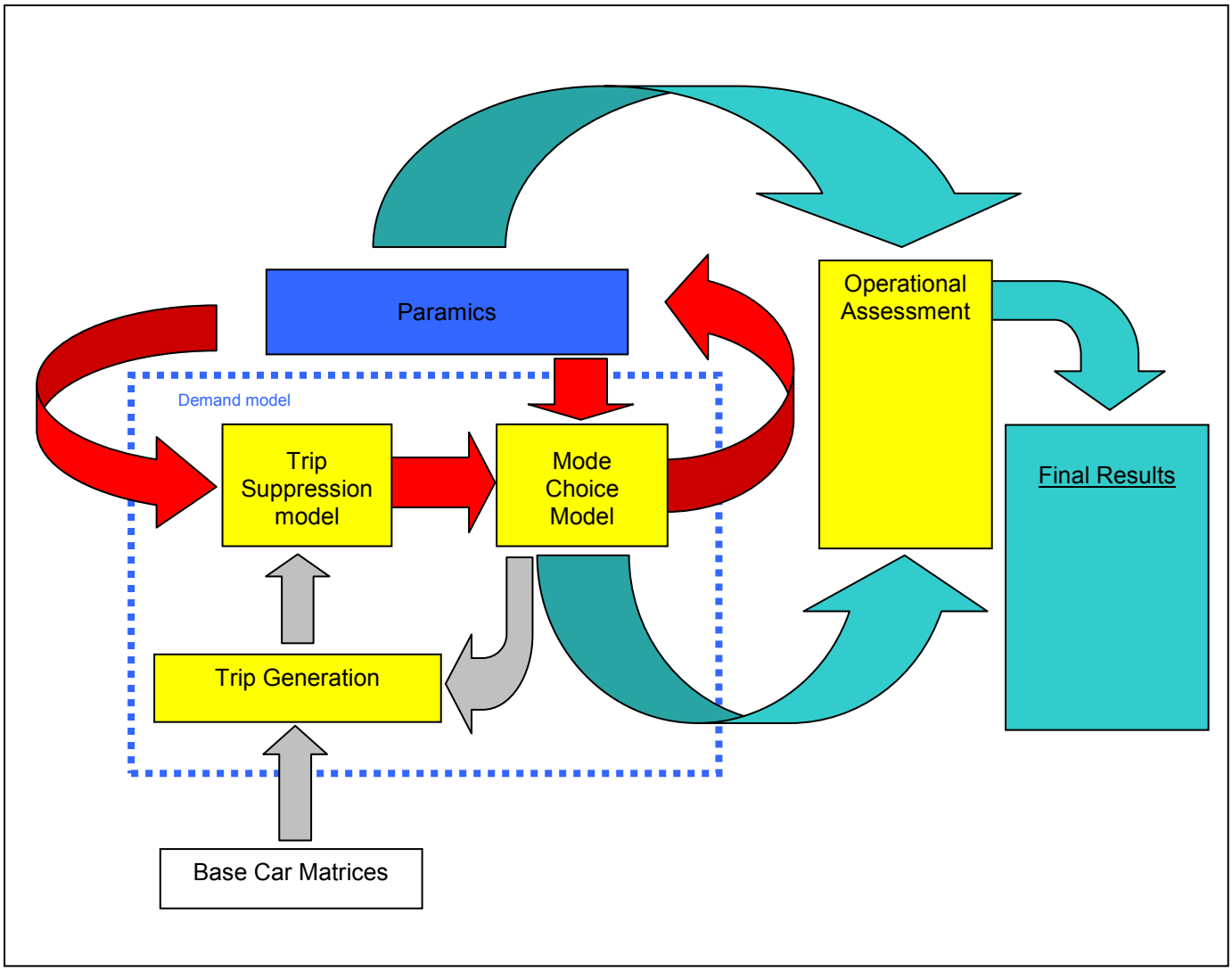
A Paramics corridor model covering the study area was developed by SIAS from the Plymouth-wide model, and validated for the AM and PM peak periods. No additional validation work has been undertaken, although additional count data has been inputted to the model for future detailed comparisons. The mode choice spreadsheet model has been developed using coefficients derived from previous work on similar corridors in the UK, and calibrated and validated against available Plymouth data.

The traffic generation and distribution has been determined from appropriate development related documentation. The Paramics model and variable demand model have been developed to assess the impacts of the future year traffic on the network, and an iterative process has been adopted between the two models, leading to model output convergence.

A key element of the assessment and therefore modelling process is the suppression of trips. The combined trip (person movements) generation from Sherford and Plymstock Quarry in 2016 will be between 1800 and 2200 in the AM peak hour, according to information received from developers. Clearly, not all of these trips can be accommodated on the already congested highway network, and so public transport usage is likely to increase. However, in a congested network not all trips will, in reality, be made during the AM peak hour, with people re-timing their journeys or not travelling. This is referred to as trip suppression and peak spreading. At present, peak spreading is accounted for in the elasticity used in the trip suppression model; a future enhancement of the modelling would be to isolate the peak spreading element.

The modelling approach adopted follows current Variable Demand Modelling advice issued by the DfT with the general process outlined in Figure 3.1.

Figure 3.1 Schematic of Modelling Methodology



The processes carried out in each sub model are outlined below.

Trip Generation Analysis

This creates the future year demand matrix from the base Paramics highway matrix, National Road Traffic Forecast growth and development trip generation and distributions outlined in section 4.

Trip Suppression Model

This takes the future year matrix from the trip generation analysis and suppresses it, based on journey times from the future year and the base year Paramics models. This is done according to VaDMA guidance. Two elasticities are used, one that includes an element of mode shift and one that excludes modal shift. These elasticities are applied to sector to sector movements dependent upon whether the bus services for the specific movement have been included in the mode choice model.

Mode Choice Model

This takes the suppressed demand matrix and splits it into three modes, using a nested Logit function and a generalised cost calculation with journey time inputs from the Paramics model:

- Park & Ride (P&R);
- Bus; and
- Car.

Bus mode split is assessed for key sector to sector movements only. Bus journey times have been collected from appropriate bus services within the model for these movements.

The mode split for P&R requires a choice between P&R sites. This has been manually specified for sector to sector movements. The A38 and Plympton East to city centre trips have been specified as using the proposed Deep Lane P&R with all remaining sectors to city centre trips using the existing Coypool P&R. The fact that a sector to sector movement is allocated to a Park and ride does not mean that trips will definitely use the service. If the generalised cost of travelling to the P&R and then catching the bus to the city centre is significantly higher than the cost of travelling direct by either bus or car, the mode share for P&R will be negligible.

The mode choice model calculates public transport demand figures with appropriate P&R trips added from the P&R site and feeds this into the operational assessment. The mode choice model creates new highway matrices with appropriate P&R trips added to the P&R site and feeds this back into the Paramics model to be reassigned.

Paramics Model

The Paramics model assigns highway matrices from the demand model. Car and bus peak hour journey times are collected and fed into the trip suppression and mode choice models.

Operational Assessment

The operational assessment takes bus patronage data from the mode choice model and journey data, such as journey time and distance, from the Paramics model and generates annual operating cost, annual revenue and operating surplus.

Initially a future year matrix from the Trip generation analysis (without suppression or mode choice) was assigned in the Paramics model. The public transport and car journey times were then fed into the trip suppression model and Mode choice model to revise the future year matrix from the trip generation analysis. These revised matrices were then reassigned in the Paramics model. The public transport and car journey times were then fed back into the trip suppression and mode choice models. This is shown by the red arrows in Figure 3.1.