1 DRAFT Model Capability

As part of the evaluation of the proposed Western Distributor, additional traffic counts and travel time surveys were collected. The model was updated and refined in several areas, including:

- trip generation rates for commercial vehicles in the Port of Melbourne;
- allocation of commercial vehicle trips to time period allocation; and,
- distribution of port related commercial vehicle trips.

The refined Zenith strategic transport model was then validated against traffic counts, travel time surveys and public transport patronage.

There were a number of significant recent infrastructure upgrades in the vicinity of the Western Distributor corridor that could have a direct impact on traffic volumes, especially on the motorway system. In summary, these include:

- Monash-CityLink-M1 Upgrade project in 2010
- On-going M80 upgrades (began in 2009)
- Widening of WGB to 10 lanes (five lanes in each direction) in June 2011
- Partially managed WGF with ramp metering and variable speed limit signs (noting that the Western Ring Road entering traffic is not controlled) in 2014
- Truck curfews in the inner west in January 2015

The VicRoads Traffic Monitor 2012-13, dated September 2014 shows that on average, traffic volumes on freeways have grown significantly over the previous five years. Therefore VLC have chosen to use more recent traffic counts in which to validate the base model against, as documented in the Local Area Model Validation report. Transport model forecasts will form the basis of the estimates for toll road revenue, impact assessment and business case.

Based upon the broad model validation results, the strengths and challenges of the model are shown in Table 1.1 below.

The accuracy of the transport model's validation, including realism, stability and convergence, does not assure accurate demand forecasts because the forecasts are dependent on assumptions about changes in economic, social and demographic conditions. These assumptions were made and provided to VLC by DEDJTR in their reference case specifications. However the model validation, realism and stability process does provide confidence that the model is representing current conditions in traffic, public transport patronage and toll road patronage reasonably closely and can be relied upon to reflect the impact of these assumptions on forecasts in a predictable way.

Based on these validation comparisons, it is reasonable to accept that the base year model provides a sound foundation for the evaluation of the Western Distributor project.

Table 1.1: Strengths and weaknesses of the Western Distributor Model

ITEM	Strengths	Challenges
Toll Road Modelling		
General	• Commercial advisors to develop a revenue model using traffic model, network capacity assumptions, etc. • Independent trend and elasticity model to be developed by the commercial team	
CityLink Traffic volumes and revenue	• Modelled volumes on toll roads represent observed daily toll gantry volumes • Model estimate of weekday CityLink revenue is within 4% of observed revenue	• Modelled volumes on Southern Link in the AM Peak are around 10% lower than observed volumes
CityLink Revenue Forecasts	• Model reproduces toll price elasticities in keeping with expected values	• Modelled forecasts may exceed capacity and therefore need adjustment in revenue model developed by Commercial team
WD Revenue Forecasts	• Market capture report to be completed • Zenith and VLC have a strong track record for accurate forecasts of patronage on new toll roads • Commercial advisors to adjust forecasts to account for ramp-up	• Modelled forecasts may exceed capacity and therefore need adjustment in revenue model developed by Commercial team
Transport Impacts in the Study area		
General	• Technical advisors to utilise observed data and use the model to estimate changes in traffic in the future in the impact assessment • Develop a micro-simulation model to assess traffic operations and capacity in detail as the design progresses	
Study Area Traffic	• Modelled volumes for all time periods meet VicRoads validation criteria • Modelled travel times show a good match to observed data • The local area model validation could be improved by collating additional information relating to locally generated commercial vehicles, including the Swanson Dock precinct, with a view to improving consistency between modelled and observed data	• Local area public transport modelling does not meet all criteria • Modelled volumes on local and arterial roads are typically lower than observed volumes • Commercial vehicle volumes are typically lower than observed volumes; the model will estimate the change in daily commercial vehicle travel in the inner west
WD Forecasts	• Modelled volumes across the day perform well against observed volumes conducted since the opening of the M1 upgrade • Modelled travel times along the WGF show a good match to observed data, especially in the AM peak and interpeak periods • The model responds in a predictable way to changes in fuel price, public transport fares, toll prices, free flow speeds and demographic and land use • Detailed analysis of freeway operations to be done via a Microsimulation model, using a combination of modelled cordon forecasts and observed data	• Modelled commercial vehicle volumes on WGB are around 10% lower than observed volumes • The transport model slightly under estimates CityLink Southern link volumes in the morning peak • Modelled outbound travel times in the PM peak are slower than observed • Modelled forecasts could go above capacity
Economic Impacts		
General	• Induced demand is included in the transport modelling (changing route, destination and mode) • Assignment convergence is met in the base model • The model responds in a predictable way to changes in fuel price, public transport fares, toll prices, free flow speeds and demographic and land use	• Changing time of travel, making additional journeys and relocated trips are not included • Demand convergence is not fully met in the base model. VLC note that convergence is achieved after one more iteration. Convergence will be monitored for all forecasts\ • Public Transport capacity constraints has not been implemented, resulting in higher PT usage and potentially under predicting project benefits
Travel time, Congestion and reliability	• Speed flow curve analysis show that there is no expectation of “micro-speeds” on the freeway system • The model responds in a predictable way to changes in speed flow curves	• The average speeds in the model are typically slightly faster than observed speeds, and therefore travel time benefits could be underestimated

ITEM	Strengths	Challenges
VOC, crash costs, emissions	• Modelled volumes for all time periods meet VicRoads validation criteria • Modelled travel times show a good match to observed data	• The average weekday volumes in the model study area are slightly lower than observed volumes (affecting vehicle kilometres travelled), and therefore VOC, crash costs, emissions benefits could be underestimated
Agglomeration and Labour Supply	• Trip generation for WBW trips is within the confidence intervals of VISTA • Trip generation for HBW trips is within the confidence intervals of VISTA • Total HBW distribution, HBW distribution to the CBD and average trip lengths compare well against VISTA data	
Redundancy	• The network coding can be adjusted to estimate lane closures and full closures	• The model is not dynamic (it is static) and is not able to accurately model intense traffic congestion. Therefore benefits relating to redundancy may be underestimated

Based on the challenges for the modelling process, listed in Table 1.1, additional potential improvements may be made to the base model to better reflect certain aspects of the inner western suburbs, particularly:

- Consider validating to 2014 conditions
- Improve model demand and assignment convergence
- Review of trip generation rates for commercial vehicles for Port of Melbourne zones may improve consistency between the model's estimates of commercial vehicle volumes and observed volumes in the Swanson Dock precinct;
- Collection of additional information about locally generated commercial vehicles with the aim of improving consistency between the model's estimates of commercial vehicle volumes and observed volumes in the inner west;
- Review of WGF travel times, especially outbound in the PM peak, to try and account for the observed imbalance in inbound and outbound travel times;
- Review travel demand and travel times in the Burnley / Domain CL tunnels.

1.1 MODEL LIMITATIONS

The limitations of the model, identified in Table 1.1 have been examined and the following sections list amelioration measures and recommendations for interpretations of the model in the use of its outputs for economic and financial analysis.

1.1.1 Land Use Inputs For Long Term Forecasts

Modelling a future planning scenario requires the urban fabric for the entire modelled area to be defined fully for input to the model. The future distribution of population (including socio-economic profiles) and employment (by type) for each travel zone is needed. In addition, the locations of schools, higher education institutions and shopping centres also need to be identified and coded for input to the model. The location and scale of other special travel generators such as ports, hospitals and airports are also inputs to the model. On the supply side, all modes of the entire transport network envisaged for the scenario needs to be identified and defined separately.

This state of affairs means that the model produces travel demand forecasts for a pre-defined land use and transport network structure that is specified exogenously (i.e. external to the model). The model does not account for the impact of new transport infrastructure on accessibility and travel demand patterns. This may lead to understatements of travel demands in areas of the city with substantially improved accessibility. Forecasts of future land use inputs for modelling needs to include those impacts. If interpretation of changes in market forces and urban development pressures caused by changes in accessibility are not accurate, the model forecasts will be prejudiced. Simply projecting historical urban growth trends into the long term future is not sufficient when analysing the impacts of major road and public transport projects.

Some degree of "incompatibility" between the forecast land use and transport networks (and therefore exogenous modelling error) needs to be acknowledged and accounted for; generally, understanding of the complex interactions of changes in transport networks, accessibility and land use are not well-understood. The accuracy of the final outcome depends upon the skills of land use planners and urban economists as much as it does the travel modeller.

To ameliorate this issue, we anticipate that alternative demographic and land use scenarios will be tested.

1.1.2 Peak Spreading and Model Time Period

The model produces separate travel demand forecasts for the AM peak, PM peak, inter-peak and the evening off-peak. The daily demand modelled (i.e. number of journeys) is fixed for a given land use. Trips are separated into matrices for each trip purpose and these are then assigned to the time periods time periods using factors derived from household travel surveys.

Distribution of trips into origins and destinations and the models they use to travel depend on the spatial distribution of land use and the configuration and performance of the transport networks.   Consequently, traffic congestion and associated delays impact choice of destination and mode of travel, but not the time period of travel.

The model therefore does not account for peak spreading, the shifting of trips to alternative departure times aimed at avoiding excessive travel times and delays. In reality, as our cities grow, the number of trips will increase and cost-effective options for improving transport network capacity diminish, peak demand will extend to increasingly longer periods. Peak spreading applies to the road and public transport networks.

Because the model cannot currently account for peak-spreading, it will generally overstate forecasts of peak travel demands and under-predict forecasts of inter-peak and off-peak travel demands.

1.1.3 Inability to Accurately Model Intense Traffic Congestion

Strategic transport models are link-based models. In these models, travel speeds on road links (i.e. sections of road between intersections) are a function of the traffic volume on the links and the capacity. On each link, travel speed reduces as volume increases and this relationship is defined using a speed-flow curve.

Strategic transport models generally do not directly account for queuing delays at intersections and do not, therefore, represent travel in separate lanes for separate turning movements. Consequently the model does not account for blocking back, where queues prevent the smooth passage of vehicles from one link to another. Typically, in extremely congested networks, strategic transport models over-estimate traffic speeds and under-estimate traffic delays.

1.1.4 Unconstrained PT Network Capacity

While it is possible to use the model to represent crowing and its impact on demand, it has not been used for this project. Currently, there is not enough evidence to reliably reproduce travellers' responses to crowing on public transport. In effect, the public transport network is unconstrained. As a result, demand for public transport may be overstated during the peak periods and understated during non-peak periods.

The impact of crowding on the public transport system is expected to be evaluated within the modelling process as a sensitivity test.

1.1.5 Unconstrained Parking Capacity

The model includes parking charges, which are added to the perceived generalised cost of car travel to selected travel zones (including the CBD, inner suburbs and Universities). The charge that is applied to individual zones is designed to not only reflect actual parking charges, but also any disincentive there may be for car travel resulting from a shortage of parking supply in a zone.

The component of the charge that represents capacity restraint is fairly arbitrary and is set to reflect the car parking demand/supply situation at the time the model was last validated. The model does not yet have a capability to balance parking demand and supply and does not adjust the parking charge for forecasting.

In the case of the Melbourne CBD, where the amount of parking in new developments is strictly controlled by the Melbourne City Council Planning Scheme, the parking demand/supply balance may change over time, making travel by car to the CBD more or less attractive. The model makes allowance for expected changes in CBD parking costs, but assumes that the demand/supply balance does not change in the future.

1.1.6 Paradigm Shifts in Travel Behaviour

The model has been calibrated using the VISTA household travel survey data including VISTA 07 and VISTA 09. The model's behavioural relationships therefore reflect peoples' attitudes and preferences at the time the VISTA surveys were conducted (between 2007 and 2010) and are based on relatively small-sample household survey from 5 years ago.

Some key model parameters, such as how people value their time and make trade-offs when deciding whether, where and how to travel, may change over time. In the model these travel behaviour characteristics and preferences are assumed to remain constant over time. The model makes no attempt to predict “paradigm shifts” in travel behaviour that might occur in the future. In fact the model assumes that such changes will not occur.

It is not only plausible, but likely, that travel behaviour will change in the future in response to such issues as concern for the environment, younger people driving less than previous generations, emerging technologies, improvements in fuel efficiency etc.

1.1.7 Toll Road Usage

The route choice model was uses the 2003 CityLink Usage Survey dataset for the evaluation of patronage on all toll roads on the road network. The survey collected revealed and stated preferences. VLC adopted the model toll diversion parameters based on the revealed preference only dataset, as these produced more acceptable results.

Since 2003, the validation of the toll model was updated to reflect the latest available count information. In so doing, it became evident that the model was systematically under-estimating toll road patronage using the original model parameters. This change may be the result of:

- Increased acceptance of toll roads or increased Value of Travel Time Saving (VTTS) of toll roads over time. This may relate to increases in real earnings, greater proliferation of e-Tags, or a general acceptance of tolls
- Induced destination switching – growth in traffic may also be a result of changes in travel patterns gradually induced by the toll roads. For example, projects such as CityLink and EastLink will affect major life-changing decisions such as the choice of home or work location. These decisions play out over an extended period of time. At the margin, those who alter their home / work location or other travel patterns as a result of toll roads will more naturally be toll road users (a person who refuses to pay tolls is unlikely to change their travel patterns as a result of a new toll road)

The need for such a significant change in model parameters suggests that the model’s toll choice parameters are not temporally stable and that forecasts of toll road patronage with toll regimes that are significantly different from the current regime may include substantial errors. However, it is worth noting that Melbourne was still relatively new to toll roads when the original CityLink Toll Usage surveys were conducted. It is to be expected that Melbournians will gradually become accustomed to tolls, increasing the likelihood of them paying the tolls.

1.1.8 Average Weekday traffic volumes

The Zenith model parameters are calibrated using VISTA surveys collected for an average weekday during school term (AWDT). This excludes weekends, school holidays and public holidays. The model is then validated against traffic volumes collected for an average weekday during school term), where non-typical surveys have been removed (e.g. outliers caused by incidents and faulty data collection). As a rule of thumb, VicRoads data indicates that average weekday (during school term) traffic volumes (AWDT) are approximately 5 to 10% higher than the average annual daily traffic (AADT).

1.1.9 Other Change in Assumptions

There are numerous exogenous factors affecting travel demand forecasting which are difficult to predict or quantify. Changes in government policy, for example, occur on a regular basis and can affect modelled outcomes. Even during this forecasting exercise, numerous policy changes were announced by the Victorian Government. For instance, in January 2015, VicRoads modified the truck curfews in the inner west. Other major assumptions, in particular fuel costs, can also prove difficult to foresee. Various factors impact the petrol price paid by motorists at the pump, including the Australian dollar exchange rate and perceptions of potential oil supply (Gargett 2010).