- Investigate and identify the infrastructure required for other intermodal opportunities, such as park/bike/drop off and ride locations, to encourage modal transfer.

- Based on the recommended bus network from Stage 1, investigate what additional stop/station and operating infrastructure would be required to allow buses to operate in the same space as the light rail tracks.

- Identify recommendations and improvements to the walking and cycling network infrastructure to increase walkable and cycleable catchments.

- The Stage 2 investigation needs to consider relevant studies under Section 14 of this brief.

STAGE 3 – TRANSPORT MODELLING AND ANALYSIS

- Based on the outcomes of stages 1 and 2, update the Canberra Strategic Transport Model to undertake further patronage and user and non-user benefit evaluation (the morning peak model will be made available to the consultant). The transport model will be required to:
    - account for estimated future public transport demand guided by the Government's transport mode share targets established in Transport for Canberra;
    - undertake modelling and analysis of pricing options (eg. Public transport fares and parking)
    - undertake intersection analysis with light rail priority at all intersections along the route.

- Update the corridor micro simulation models with the outcomes of this study.

- The CSTM and microsimulation models may be required to be peer reviewed. Independent peer review does not need to be included in the cost estimate for the study.

STAGE 4 - BENEFIT EVALUATION

Based on the technical assessment, transport modelling and other outcomes and sources, the consultant is to undertake an updated user and non-user benefit evaluation. The consultant is to take into account the full range of benefits associated with each option. The benefits evaluation is to take account of any recommendations associated with any recommendations on the staged implementation of the transit corridor.

The consultant is to use national guidelines and modelling outputs to determine the savings of:

- Travel time;
- Vehicle Operating Cost (VOC);
- Crash cost;
- Emissions; and
- Other (in accordance with the most recently available Australian Transport Council Guidelines on appraisal of transport infrastructure projects).

The benefit assessment is to include (but not be limited to):

- Predicted revenue base on existing and proposed public transport fare levels;
- Sensitivity analysis to establish robustness;
- Additional sensitivity analysis on factors that improve economic viability;
- Estimate patronage (short, medium and long term); and
- Discussion of assumptions and limitations of this basic economic assessment.

Costs and cost-benefit analysis will be included in other work to be commissioned by the Capital Metro Project Office.

4.3.2. Stakeholder and community consultation

The project is to be complemented by a stakeholder and community consultation program to be developed by the consultant.

The consultation is to be run at the "consult" level of the IAP2 spectrum of public participation (http://www.iap2.org/associations/4748/files/IAP2%20Spectrum_vertical.pdf).

The consultation program should be consistent with the ACT Government community engagement guidelines, available at http://timetotalk.act.gov.au/guide-to-engagement/.

The consultation program will be agreed by the Capital Metro Project Office, with timing of events/engagement to be programmed as part of a broader community engagement program for Capital Metro.

4.3.3 Draft and Final Reports - Technical report

The consultant is to document the outcomes of the study in a draft and final technical report. A draft technical report will be made available prior to public consultation. The final report will be finalised following public consultation and review by the project team and stakeholders.

A 'plain english' summary of the report will be required at the draft and final stage. This will provide a 'plain english' outline of the overall project and findings that can be used for public engagement and reporting to broader non-technical audiences.

4.3.4 Project management INCLUDING MEETINGS

Provision is to be made for the following meetings:

- Inception meeting – early February 2013;
- On-site availability of the consultant's project manager for up to 20% of the project duration, subject to negotiation with ESDD;
- Fortnightly project management meetings or telephone conferences, at which the consultant will provide an up to date report tracking progress against each milestone in the agreed program;
- Meetings on as need basis with project steering committee and Directorate stakeholders, including presentations;
- Workshops to develop integrated bus/ light rail transport network service design; and
- Up to three meetings and presentations to Executive.

4.3.5 Study deliverables

The study deliverables will be confirmed at the project inception phase (as part of the project management/ quality plan). It is expected that the output will be provided in electronic and hard copy form (in MS Word, MS Excel and Adobe Acrobat pdf formats, that meet Web Content Accessibility Guidelines – refer http://www.w3.org/TR/WCAG/), will include:

- Materials to support community consultation using ACT Government branding templates to be supplied to the successful consultant; and
- Draft and final reports including but not limited to:
  - Executive Summary / Plain English summary;
  - Study objectives;
  - Scope of work summary;
  - Summary of Stakeholder and community consultation;
  - The methodology used to undertake the assessment, including all key inputs and assumptions;
  - A full range of references, including data and other reports;

- EMME and microsimulation models;
- Spreadsheet models;
- Key findings; and
- Recommendations for further work.

4.3.6 Materials

Documentation of the technical assessment is to be supported by drawings including plans and sections of the route, alignment, stops, stations and integration with other modes.

Provision is to be made for high quality graphic design and 2D/3D imaging for use in presentations, stakeholder and community consultation and the technical report.

Aerial photography, cadastral and other base mapping data will be provided by the Territory on the authority of the Territory's project manager. Sourcing the information from ESDD mapping services is the responsibility of the consultant. Allowances for information additional to this will be required.

5.0 DESIGN INFORMATION

5.1 STANDARDS

Works are to be undertaken in accordance with the standards and guidelines applicable in the Territory, these include but are not limited to:

- Design Standards for Urban Infrastructure
- Standard Specification for Urban Infrastructure
- Other relevant standards and design guides as appropriate.

5.2 BACKGROUND INFORMATION

A. Current project information

The Gungahlin to City Transit Corridor Study 2012 (GCTCS) provided the following key outcomes:

- Transit alignment – median;
- Economic results – benefit-cost ratios;
- Strategic transport modelling (EMME);
- Corridor population assumptions;
- Cost estimates to Class 4 and P50/P90[1]; and
- Infrastructure Australia submission for Nation Building II funding (copy to be provided to the successful consultant).

For further information about the GCTCS, please refer to http://www.transport.act.gov.au/studies_projects/northbourne_study.html where project updates and the April 2012 Design Concept Report can be obtained.

The draft/final technical report and other relevant project information from the GCTCS will be provided to the successful consultant.

The ACT Government has chosen to progress light rail for the Gungahlin to City transport corridor.

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[1] In line with Department of Infrastructure and Transport's *Best Practice Cost Estimation for Publicly Funded Road and Rail Construction, 2011.*

B. Concurrent studies

A program of projects across a number of discipline streams is currently being developed by the Capital Metro Project Office to advance the necessary planning for the commencement of light rail construction in 2016 (a commitment of the *Parliamentary Agreement for the 8th Legislative Assembly of the ACT Capital Territory*). The details of this work program will be provided to the successful consultant when finalised.

Two transport related projects of direct relevance will be undertaken in parallel with the *Light Rail Integration Study*:

- *Light Rail Product Identification Study* – to be commissioned as a separate consultancy to establish the parameters of the light rail product to inform future forward design; and
- Preliminary design of cycle lanes separated from the roadway on the verges along the corridor.

Further information about these studies will be provided to the market as part of tender processes in early 2013.

The Capital Metro Light Rain Integration Study consultant will liaise with and share study findings with the above project consultants subject to ESDD's approval.

C. REFERENCE Information

Key reference documents and models for consideration in this study include:

- Gungahlin to City Transit Corridor Study Concept Design Report
- Gungahlin to City Transit Corridor 2012 project updates 2 and 3
- Gungahlin Bus Station Study 2012
- Draft Northbourne Avenue Bus Priority Study (to be provided to successful tenderer on finalisation)
- Canberra Public Transport Futures Feasibility Study (Economic and Financial Implications of Transport Options) 2004
- ACT Light Rail Submission to Infrastructure Australia (2008)
- ACT Strategic Public Transport Strategic Network Plan, November 2009 (McCormick Rankin Cagney, 2009)
- Cost – Benefit Analysis of ACT Strategic Public Transport Plan (Parsons Brinkerhoff, 2010)
- Transport for Canberra policy 2012
- ACT Planning Strategy 2012
- Northbourne Avenue Existing Conditions Study 2011
- Belconnen to City bus way – Preliminary Assessment (2006)
- Territory Plan, http://www.actpla.act.gov.au/
- GIS data relating to the corridor and surrounds, including the pedestrian/cycling and road networks
- Canberra Strategic Transport Model (CSTM)
- ACT Bus Passenger Station/Stop Design Guidelines (McCormick Rankin Cagney, 2005 for ACTPLA)
- Australian Transport Council (ATC) Guideline for Transport System Management in Australia

Documents that are not publicly available will be provided to the successful tenderer.

5.3 SPECIAL REQUIREMENTS

A. Consultant proposal

Consulants' proposals are to include:

- Identification of key project experience which demonstrates a high level of expertise in the discipline areas relevant to this study, including transport network planning, transport engineering, strategic transport and microsimulation modelling, stakeholder and community consultation, report writing and editing;
- Project management documentation, including project quality plan, stakeholder and community engagement plan;
- Project plan identifying task outputs based on this brief;
- Hours and budget allocation for identified tasks and outputs;
- Identification of project team that will undertake and deliver the project;
- Summary of anticipated disbursements, travel, printing, design etc;
- Nomination of project report writer with high quality written communication skills and significant experience in writing government reports; and
- Referees to confirm relevant project skills and experience.

6.0 PROGRAM

6.1 PROGRAM DATES

ACTIVITY	MILESTONES	DATES
Issue brief	**IB**	December 12
Acceptance of brief		January 13
Submission of Project Quality Plan		February 13
Project inception		**February 13**
Study Development (Stages 1, 2, 3) Achieved		**June 13**
Draft Options – Report	**DOR**	**August 13**
Draft Final Options Report	**FOR**	**September 13**
Public consultation		**November 13**
Final Report	**FR**	**December 13**

Duration

Study period	12 months
Total project period including potential extensions of time due to Government approval and public consultation	16 months

Note: These milestones are indicative only and will be subject to amendments in consultation with TVE. The consultant is required to provide input on this program dates on any amendments as appropriate keeping the above practical completion (all stages) date unchanged.

7.0 BUDGET

7.1 PROGRAM PROVISION

The consultant shall provide a fee proposal, which includes all sub-consultant fees, travel, workshop expenses, report printing and production costs and other disbursements.

The consultant is required to provide a breakdown of the costs and allocation of fees for the project including the time allocation and hourly rate applicable to each study team member for each task.

No additional work shall be undertaken or additional fees paid except with the written agreement of the Territory and on the basis of a written application together with supporting information from the consultant. Fee variations for additional work done without agreement will not be considered. The client reserves the right to vary the scope of work upwards or downwards with variations to the fees to be agreed between the consultant and the client.

Payment for services will be in accordance with the following schedule reflecting the anticipated input required for each stage of the project.

Stage	Accumulative Total Fee
Study Development	40%
Submission of Draft Option Reports	70%
Final Report Approved	100%

7.2 DATE TO WHICH PROJECT ESTIMATES ARE TO BE ESCALATED

Estimates of cost are to be based on costs expected to apply at the program call tender date.

8.0 QUALITY ASSURANCE

8.1 INFRASTRUCTURE PROCUREMENT REQUIREMENTS

General

The Consultant shall undertake the design in accordance with Quality Assurance requirements detailed in Attachment 'A' (forms USF944 and USF960 as applicable). A Project Quality Plan for the Design Phase is required to be submitted within 2 weeks of engagement.

Design Changes

The consultant shall notify Shared Services Procurement (SSP) in writing where the need for a significant design change becomes evident and shall obtain SSP's written approval for any significant design change.

A significant design change is a change to an SSP approved design which;

(i) significantly affects the basis of the SSP design approval, or

(ii) significantly affects a formal commitment regarding the design made directly by SSP to another agency, or

(iii) Affects SSP's specified requirements.

At final option report stage the consultant is to certify that the design meets all statutory requirements and Brief requirements.

8.2 REQUIREMENTS FOR CONSTRUCTION CONTRACTS

When the estimated cost for the lump sum contract is above $100,000 the Consultant shall determine the quality requirements to be included in the tender documents.

Where the Technical Specification is not an integrated QA type specification, these requirements shall be detailed in forms USF944 and USF960 and shall incorporate any Infrastructure Procurement specified requirements that apply to construction works. (Refer 8.1 above).

9.0 LIAISON

All liaison with Shared Services Procurement is to be through the Project Officer:
Name: T Sri Tharan Telephone: 6207 6879
Facsimile: 6207 6500 Email: sri.tharan@act.gov.au.

Transport Planning contact officer is:
Name: Suzanne Jurcevic Phone: 6207 3317
Facsimile: 6207 7160 Email: suzanne.jurcevic@act.gov.au

The Project Officer shall be kept informed regularly during all phases of the project. Any enquiries related to the project should be directed to the Project Officer. Regular fortnightly updates and monthly meetings will be required throughout the study.

Attachment A – Quality Requirements Tables as necessary.

Attachment B – TAMS Requirements for Works As Executed Quality Records - Ref No. 08.

QUALITY REQUIREMENTS FORM USF944

PROJECT : Capital Metro Light Rail Integration Study

CLIENT: Environment and Sustainable Development Directorate PROJECT No: 21126

SERVICE ROLE: Consultant _____
[Project Director, Project/Construction/Works Manager, Consultant, Contractor]

QUALITY STANDARD : ***AS/NZS ISO 9001:2008 (as interpreted by HB90.3-2000)***

QUALITY REQUIREMENTS INDEX

Where information is to be specified enter **YES** in Column 1

Details to be Specified	Table / Form Title
Yes	Table 1 - Document Submission
	Table 2 - Design Verification Methods
Yes	Table 3 - Design Review Points
	Table 4 - Measurement/Design Data
	Table 5 - Notification of Intention to Commence Project Activities
	Table 6 - Traceability Requirements
	Table 7 - Processes Requiring Validation
Yes	Table 8 - Witness / Hold Points
	Table 9 - Principal Supplied Products
	Table 10 - Servicing Work
Yes	Table 11 - Quality Records
	USF957 - Certificate of Compliance

QUALITY REQUIREMENTS TABLE 1 (formerly USF945)

DOCUMENT SUBMISSION				
Document	**No. of Copies**	**When to be Submitted**	**To be Available for Inspection on Request**	**Comments**
Quality Plan Procedure	1	with proposal/tender.	Yes	
PQP for Design Phase, or the Total Project.	2	14 days after award of Consultancy.		To SSP Project Officer for approval
Quality Records *(refer to specific table)*		Refer to Table 11	Yes	Project Consultant to keep the appropriate records

QUALITY REQUIREMENTS TABLE 2 (formerly USF946)

DESIGN VERIFICATION METHODS	
The Consultant/Project Manager shall provide in the Design Verification Plan(s) to undertake design verification of the following components in accordance with the nominated method(s). Such verification shall not relieve the Consultant/Project Manager of the responsibility for design. ***(Refer ISO 9001:2008 Cl 7.3.5 and see HB90.3-2000 Page 60 for examples of design verification methods).***	
Design Components	**Nominated Design Verification Method**

QUALITY REQUIREMENTS TABLE 3 (formerly USF947)

DESIGN REVIEW POINTS

The Consultant/Project Manager shall include in their Design Verification Plan the following Design Reviews and the involvement of the parties nominated below. Such Design Reviews shall be arranged by the service provider and all parties are to be notified ten working days prior to the Design Review.

(Refer ISO 9001:2008 Cl 7.3.4 and HB90.3-2000 Pages 58-59 for guidance).

Design Component	Stage of Design	Nominated Parties to Participate in Design Review	Comments
Draft Report	100% complete	ESDD and Key Stakeholders	Refer to table 8
Final Report	100% complete	ESDD and Key Stakeholders	

QUALITY REQUIREMENTS TABLE 4 (formerly USF948)

MEASUREMENT / DESIGN DATA

The following measurements and/or design data are to be submitted for verification of adequacy.

Note: Such verification shall not relieve the Project Director / Consultant / Subconsultant / Specialist Consultant / Contractor (*delete as applicable*) of responsibility for providing design services/constructed works in accordance with the specification requirements.

(Refer ISO 9001:2008 Cl7.3.2 and HB90.3-2000 Pages 55-56 for guidance)

Required Data	Date to be Submitted	Entity to be submitted to

QUALITY REQUIREMENTS TABLE 5 (formerly USF949)

NOTIFICATION OF INTENTION TO COMMENCE PROJECT ACTIVITIES

The ..... shall notify the ..... in writing of the intention to commence the following project activities (eg WorkCover, Environment ACT etc):

Activity	Required Notice (Days)

QUALITY REQUIREMENTS TABLE 6 (formerly USF950)

TRACEABILITY REQUIREMENTS

Enter details of items for which it is necessary to trace the history, application, or location by means of recorded identification.

Refer to Quality Record Requirements (Table 11) for more specific requirements of Records of Traceability.

(Refer ISO 9001:2008 Cl7.5.3 and HB90.3-2000 Page 72 for guidance).

Item	Extent of Trace	
	Start	Finish

QUALITY REQUIREMENTS TABLE 7 (formerly USF951)

PROCESSES REQUIRING VALIDATION

"Validated processes" are those processes which cannot be fully verified by subsequent inspection and testing or processes where the deficiencies may only become apparent when the product is in use.

(Refer ISO 9001:2008 Cl7.5.2 and HB90.3-2000 Page 71 for guidance).

Process	Validation Requirements

QUALITY REQUIREMENTS TABLE 8 (formerly USF952)

WITNESS / HOLD POINTS

NOTIFICATION:-

..... working days notice of Witness (W) points is required.

..... working days notice of Hold (H) points is required.

Note : The Service Provider shall arrange Hold Point inspections.

(Refer ISO 9001:2008 Cl8.2.4 and HB90.3-2000 Pages 88-90 for guidance).

Stage of Project	Witness Point	Hold Point	Release by Whom
Final Option Report		Approval of Draft Options report	Shared Services Project officer

QUALITY REQUIREMENTS TABLE 9 (formerly USF953)

PRINCIPAL SUPPLIED PRODUCTS

Include here, or reference attached schedule(s) of, products to be supplied free issue to the contractor for incorporation into the project works.

The required method of handover/acceptance and the documentation to be completed is as follows.

(Refer ISO 9001:2008 Cl7.5.4 and HB90.3-2000 Page 73 for guidance).

Product	Quantity	Special Handling, Delivery or Storage Requirements	Point of delivery if other than site

QUALITY REQUIREMENTS TABLE 10 (formerly USF955)

SERVICING WORK

Procedures or instructions for undertaking the contract servicing works shall be developed for the following activities. (Note: procedures/instructions and their associated documents shall provide the necessary evidence that the servicing work meets the contract requirements):

Servicing Activity

QUALITY REQUIREMENTS TABLE 11 (formerly USF956)

QUALITY RECORDS

Type of Record	No. of Copies	Submit		Retention	
		To Whom	Date Required	Retain By Whom	Minimum Period (Years)
Project quality plan	1	SSP Project officer	14 days after the contract award	Consultant	7

ACT Government
Commerce and Works

IMPORTANT NOTICE

ADDENDUM 1 TO REQUEST FOR TENDER NO. 21126
CAPITAL METRO LIGHT RAIL INTEGRATION STUDY

Please note the following additional information for the above Request for Tender (RFT):

1. The closing date for the receipt of tenders has been extended until **2.00pm (Canberra Time) on Thursday 31 January 2013.**

2. Questions received from interested suppliers, and the Territory's formal responses to those questions are specified at Attachment 1 to this addendum notice.

For further information, please contact me, as the contact officer who is also named on the cover page of this RFT.

T Sri Tharan
Senior Project Officer
Shared Services Procurement

Email: sharedservicesprocurementinfrastructure@act.gov.au

20 December 2012

Attachment 1

ADDENDUM 1 TO REQUEST FOR TENDER NO. 21126

CAPITAL METRO LIGHT RAIL INTEGRATION STUDY

Questions and Formal Responses

Q1	Based on the Program (Section 6.0), public consultation will only occur after submission of the Draft Final Options Report. Is there no plan to engage the community during the development of the options?
Response	*No, Public consultation is planned only after the development of the draft and final options.*
Q2	Under Stage 3, one of the sub-dot points says, 'undertake modelling and analysis of pricing options (eg. Public transport fares and parking)'. How many options/modelling iterations is expected for this task?
Response	*Three options are expected for this task. Additional options and iterations should be costed as a separate component for variation if required.*
Q3	Are Sections 8.1 and 8.2 of the Project Brief relevant to this project?
Response	*They are relevant and Quality Assurance requirements are detailed on these sections.*
Q4	There is no mention of an industry briefing. Is this likely to occur?
Response	*At this stage no industry briefing is envisaged, however, if there is a need for the briefing Tenderers will be notified through an Addendum with sufficient notice.*
Q5	It is unclear whether prequalification is required for this tender. Can you please confirm?
Response	*Prequalification is not required.*
Q6	A 'numeric scoring scale' is referred to in Section 3.2.5 of the RFT, but not supplied.
Response	*The numeric scoring scale for tender assessment is given in Attachment A of this addendum.*
Q7	The program activities in Section 6.1 do not define a milestone date for Stage 4 (Evaluation of Benefits). Can you please clarify?
Response	*Stage 4 is to be completed by June 2013.*
Q8	Section 7.1 outlines accumulative total fees against three specific stages. Are these envisaged to be milestone payments, or can the successful consultant invoice periodically (say monthly) up to the defined maximum percentage for each stage?
Response	*Periodic invoicing up to the defined percentage for each stage is acceptable subject to the successful consultant to demonstrate the extent of works*

completion.

Q9 Can you please provide an update on the development status of the 'ACT Strategic Cycle Network Plan', as identified in Section 4.3 – Stage 1?

Response *The community consultation of draft options closes in December 2012. The preferred option will be finalised by May 2013 for further community consultation. The project is anticipated to be completed by August 2013.*

A9 What is the project budget?

Response *Maximum of $330,000 including GST.*

Attachment A

Numerical Scoring Scale for use in Tender Evaluation

Descriptor	Sample Commentary	Rating
Superior	Highly convincing and credible. Response demonstrates superior capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. Comprehensively documented with all claims fully substantiated. Insignificant risk.	10
Outstanding	Highly convincing and credible. Response demonstrates outstanding capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. Documentation provides complete details. All claims adequately demonstrated and substantiated. Insignificant risk.	9
Excellent	Response complies, is convincing and credible. Response demonstrates excellent capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. Some minor lack of substantiation but the Tenderer's overall claim is supported. Low risk.	8
Very Good	Response complies, is convincing and credible. Response demonstrates very good capability, capacity and experience, relevant to, or understanding of, the requirements of the Evaluation Criterion. Minor uncertainties and shortcomings in the Tenderer's claims or documentation. Low risk.	7
Good	Response complies and is credible but not completely convincing. Response demonstrates adequate capability, capacity and experience, relevant to, or understanding of, the requirements of the Evaluation Criterion. Tenderer's claims have some gaps. Low risk.	6
Adequate	Response has minor omissions. Credible but barely convincing. Response demonstrates only a marginal capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. Medium risk.	5
Reservations	Barely convincing. Response has shortcomings and deficiencies in demonstrating the Tenderer's capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. Medium risk.	4
Poor	Unconvincing. Response has significant flaws in demonstrating the Tenderer's capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. Medium risk.	3
Very Poor	Unconvincing. Response is significantly flawed and fundamental details are lacking. Minimal information has been provided to demonstrate the Tenderer's capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. High risk.	2
Inadequate	Response is totally unconvincing and requirements have not been met. Response has inadequate information to demonstrate the Tenderer's capability, capacity and experience relevant to, or understanding of, the requirements of the Evaluation Criterion. High risk.	1
Not Acceptable	Tenderer was not evaluated as it did not provide any requested information and/or contravened nominated restrictions. High risk.	0

ACT Government
Commerce and Works

IMPORTANT NOTICE

ADDENDUM 3 TO REQUEST FOR TENDER NO. 21126
CAPITAL METRO LIGHT RAIL INTEGRATION STUDY

Please note the following additional information for the above Request for Tender (RFT):

1. Questions received from interested suppliers, and the Territory's formal responses to those questions are specified at Attachment 1 to this addendum notice.

For further information, please contact me, as the contact officer who is also named on the cover page of this RFT.

T Sri Tharan
Senior Project Officer

Shared Services Procurement

Email: sharedservicesprocurementinfrastructure@act.gov.au

24 January 2013

Attachment 1

ADDENDUM 3 TO REQUEST FOR TENDER NO. 21126

CAPITAL METRO LIGHT RAIL INTEGRATION STUDY

Questions and Formal Responses

Q1 Regarding the Paramics modelling, Addendum 2 (A7) mentions that the existing Paramics model is for the 7-9 AM period;

- will a PM model be required to be developed, or an existing PM model be required to be interrogated/ modified as part of the scope for this project?

A1 A PM model is not required to be developed however it is expected that the consultant will use modelling as a tool to analyse to achieve the objectives of this project. Please note this is not a modelling project, modelling is simply a supporting tool at the planning level.

Q2 It seems that the existing Paramics AM model covers the full road network area that is required to be modelled in Paramics for this project; is this assumption correct?

A2 The consultant's methodology needs to identify the extent of the modelling requires to deliver the objectives of the study. The Paramics modelling does not drive the projects. As noted above, modelling is simply a tool.

Q3 Should the consultant budget allow for re-calibration and/ or re-validation of the Paramics models to 2012 / 2013 data, or is the existing Paramics model to be considered a sufficient base?

A3 No. The existing model was calibrated on October 2012 and is considered a suitable base for use by the consultant.

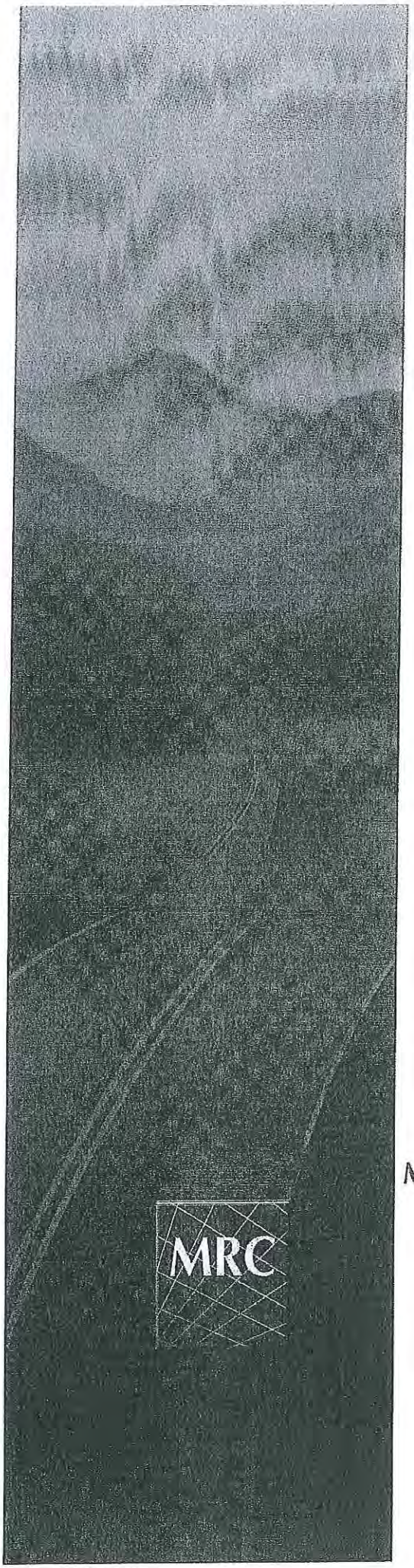
Q4 Benefit evaluation - is the consultant expected to quantify any of the other potential benefits arising from the proposal, other than the data obtained from out of the traffic modelling? Would a qualitative assessment of other benefits be acceptable.

A4 The consultant's methodology should include an acceptable evaluation process that includes both quantitative and qualitative assessment. The tender panel will assess the submissions in accordance with the robustness of the consultant's methodology in achieving the objectives of the study.

Q5 The brief discusses the need for 3D graphics. We are aware that provision of specific details surrounding light rail stops or stations for community consultation may be counter productive when the exact layouts of the stops is yet to be confirmed (i.e. we may be providing a level of detail in illustrations which may later prove to be incorrect). Could you please elaborate on the expected level of detail anticipated with respect to graphical outputs for the report, in particular the need for 3D illustrations.

A5 2D/3D imaging is required for the purpose of appropriately communicating the work of the study to stakeholders and the community in the stakeholder and community consultation. Refer to Project Updates 1-3 at www.transport.act.gov.au/policy_and_projects/transport_planning_studies/gungahlin_to_city_transit_corridor_study to view examples of previous images used for this project.

Q6	Benefit evaluation - The terms 'short', 'medium' and 'long term' are used to discuss patronage estimates? Do these align with the design years of 2018-19, 2021 and 2031?
A6	Short, medium and long terms refer to the design years 2021, 2026 and 2031 respectively.
Q7	It is anticipated that the future fare pricing structure is outside the scope of this study. Is this assumption correct?
A7	An indicative future fare pricing structure is to be developed by the consultant with the direction of the project management team. A detailed fare pricing study is not required.
Q8	Should the consultant budget for desktop publishing for the 'plain English' summary report, or is the consultant scope limited to providing the content of the report?
A8	High quality graphic design of the technical report is noted in Section 4.3.6 of the Brief as a requirement. Refer to Project Updates 1-3 at www.transport.act.gov.au/policy_and_projects/transport_planning_studies/gungahlin_to_city_transit_corridor_study to view examples of previous documents used in this project.
Q9	In relation to the Community and Stakeholder Engagement Plan, the Brief requests submission of a draft engagement plan with the tender submission. What level of detail is required to in order to facilitate the tender assessment – i.e. a table of contents, or do you require a worked up draft?
A9	A worked up draft of the Community and Stakeholder Engagement Plan is not required, however sufficient information to outline the proposed methodology for the community and stakeholder engagement is required.
Q10	The benefit evaluation is to include an assessment of emissions benefits. Has the PARAMICS model been set up and calibrated as an emissions model?
A10	No.



Transport Modelling and Analysis

2006/2011

Final Report

McCORMICK
RANKIN
CAGNEY

June 2009

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1 Introduction

MRC-Cagney was retained by TAMS Transport Regulation and Planning (TRAP) to carry out an update to the Canberra's Strategic Transport Model. The ACT Government is committed to providing Canberrans with an accessible, affordable, reliable and sustainable transport system. The Sustainable Transport Plan was developed in concert with the Canberra Spatial Plan and relies on up-to-date tools for forecasting travel demands, including the land-use/transport multi-modal transport model. Transport modelling is an important tool for analysis and investigation of effective implementation strategies that assist in achieving the above noted goals. The existing Canberra Strategic Transport Model had been previously calibrated against the 2001 base year and the primary objective of this project has been stated as "to develop a land-use/transport multi-modal transport model in EMME/3 for the ACT (including Queanbeyan) for 2006 & 2011".

An update of the Strategic Transport Model to the 2006 base year therefore includes a detailed review and update of all related data inputs such as land-use data for the study area. In addition, a review of the road and public transport networks has been undertaken to reflect base year conditions for 2006 followed by a step by step detailed model redevelopment of all related sub-models using the most recent and comprehensive travel data available for the planning area. A primary overarching objective of the work has been to ensure the model recalibration exercise is undertaken in a manner that provides for a higher degree of confidence in the modeling results obtained for both the current 2006 base year as well as in the application of the modelling framework for near term planning horizons (i.e. a 2011 planning horizon).

To meet stated objectives the steps followed and the results obtained are detailed in each of the following sections of this report:

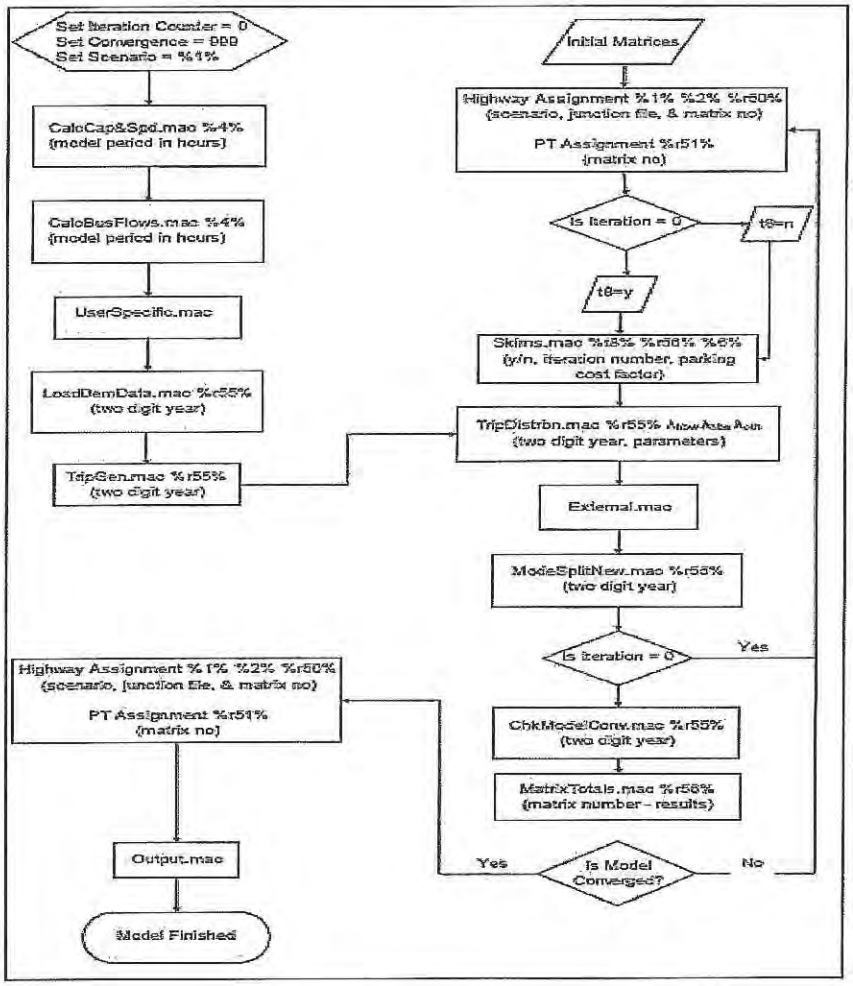
- Section 2: Model Structure
- Section 3: Networks Revisions
- Section 4: Input Data Review and Update
- Section 5: Model Procedures
- Section 6: Model Validation Results

2 Model Structure

The existing ACT Strategic Transport Model has been developed as a traditional four step travel demand model which has been calibrated against baseline data for 2001. The ACT model is a macroscopic travel demand forecasting model implemented within the EMME transportation planning software and has been used to forecast future longer term planning horizons of 2021 and 2031

The general model structure was defined in previous model development work and is presented in Figure 2.1: ACT Model Structure and past model development work. The model is macro driven and the primary macro used to run the model is a file named "canberra.mac". The focus of this assignment is to update ACT's Strategic Transport Model to 2006 base year conditions as well as to develop a future short term planning horizon commensurate with demographic projections for 2011 and planned road and public transport improvements to 2011.

Figure 2.1: ACT Model Structure

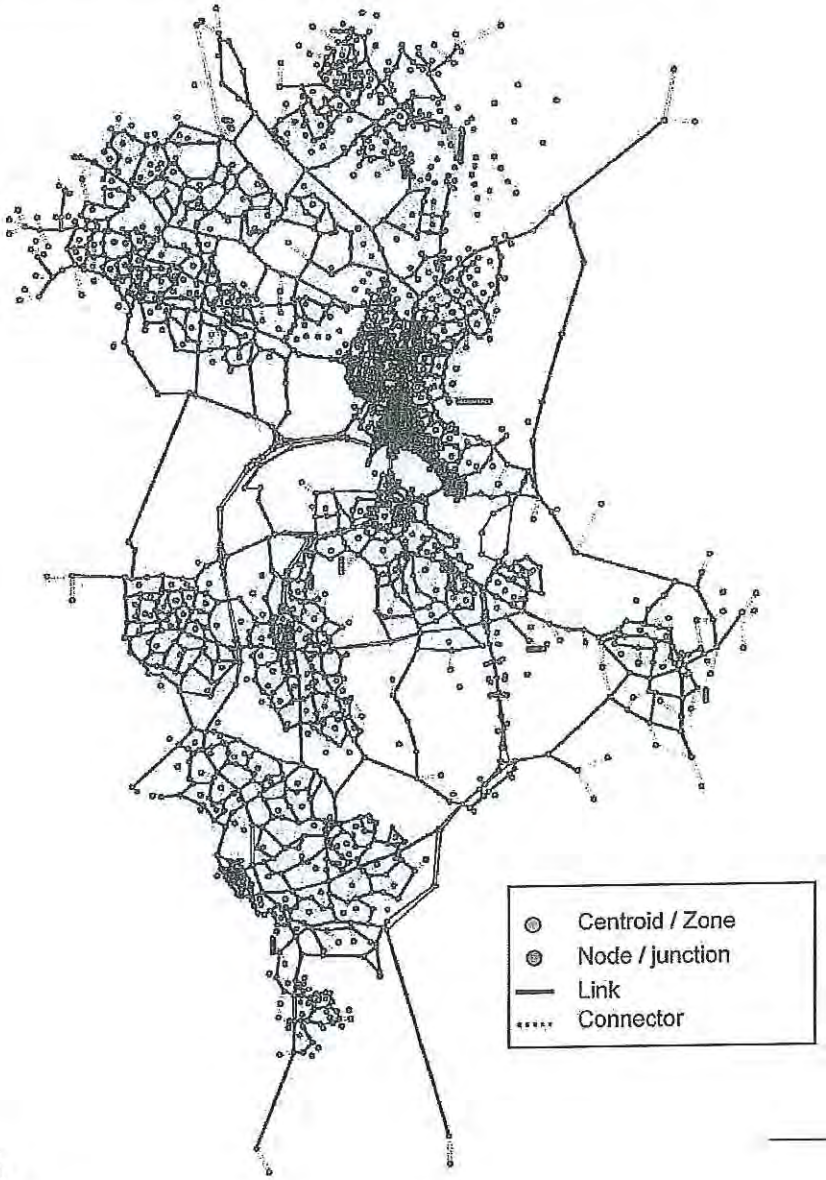


To facilitate the update of the modelling procedures, the ACT Strategic Transport Model Scenario 121 was identified by TAMS to serve as the base 2001 validated network from which all base year 2006 updates would be implemented.

The Scenario 121 as provided was comprised of the following modelling attributes:

- 2,680 nodes including 800 centroids (i.e. traffic zones representing major development node and residential neighbourhoods) and roadway junctions. Traffic zones varied in geographic size from 4,000 m^2 to 16.5 km^2 (with an average of approximately ½ km^2);
- 6,520 directional links (roadways) including 2,080 connectors which are responsible for loading traffic onto the transportation networks from the traffic zones;
- 119 public transport lines which reflect the ACTION public transport service for the AM peak operations (2005). These lines as coded in the model are composed of approximately 8,330 transit segments; and
- Approximately 635,560 extra attributes defined in the EMME databank (9 node attributes, 15 link attributes, 30 turn attributes, 2 public transport line attributes and a single transit segment attribute).

Figure 2.2: ACT Strategic Transport Model EMME 2001 Scenario



3 Networks Revisions

3.1 Road Network

3.1.1 Shape files

The model calibration and model update procedures were initiated in parallel with the migration of ACT road network and links attributes from ACT GIS files (ESRI shape files). However, the integration of the ACT GIS link id's with the Strategic Transport Model (EMME planning model) was completed in advance of the model redevelopment processes and as a result served as the base road network for the 2006 updated model.

The integration of the ACT road network within the modelling framework ensured a stronger fit between the ESRI shape files associated with the NAASRA road classes (1, 2, 3, 6 and 7) and the major road network elements defined in the Strategic Transport Model. A primary objective of the road network migration and related adjustments was to improve consistency between ACT GIS road network used by the ACT TAMS Asset Services Group to monitor road conditions and treatment needs with the strategic EMME model road network used by Planning Agencies to forecast future growth in transportation demands associated with both the road and pubic transport networks.

In addition to the link and node adjustments the strategic transport model coordinate system was also adjusted to be consistent with the ESRI system. This adjustment required a system wide correction to the EMME coordinate system networks as follows:

- 6.01X + 187,300
- 6.01Y + 572,100

A number of additional road network adjustments were carried out to ensure the best possible fit against the shape files provided for the various road categories noted. These adjustments also permitted a number of additional refinements to be made which included the following:

- Network updates to include newly constructed facilities (e.g. new roads not previously coded or part of the 2001 base network);
- Adjust major freeway junctions to better reflect the operation of the various on/off ramps and movements accommodated. However, it is noted that in some cases complex interchanges may be modelled in a simplistic manner where only permitted movements are coded without specifically including all the necessary ramp connections. These approaches are often applied within EMME to reduce the use of additional links and nodes which would be required to model the various ramp's exact configurations;
- The introduction of a limited number of additional nodes, generally for longer curvilinear roadway segments. The addition of these nodes provided a means to better fit EMME road links (represented as straight lines) to the actual underlying roadway curvature and thereby more representative roadway lengths.

3.1.2 Road Network Elements - Type, Speed and Capacity

The EMME modeling framework allows for the categorization of various elements of the roadway system according to various link descriptors. In general, the link types established in ACT's Strategic Transport Model (numbering from 1 to 21, see Table 3.1: Link Type – Speed,

Capacity, Peak Factor) reflect the roadway's functional classification within Canberra's roadway network. In addition, each of the link types has a number of predefined attributes which address each of the following:

- free flow speed (stored in the extra-attribute @fspd);
- link capacity (stored in the extra-attribute @lcap);
- peak factor (stored in the link parameter ul1).

Table 3.1: Link Type – Speed, Capacity, Peak Factor

Type	Description	Speed (kph)	Lane Capacity	Lane Configuration	Peak Factor
1	Parkway	110	1800	Single lane	1.10
2	Collector	40	1300	Single lane	1.27
3	Ramps	60	1300	Single lane	1.10
4	Rural highway	90	1700	Single lane	1.10
5	Arterial	80	1300	Single lane	1.20
6	Distributor	60	1000	Single lane	1.27
7	Local access	50	600	Single lane	1.24
8	Local access	40	600	Single lane	1.24
9	Rural Road	100	900	Single lane	1.10
10	Centroid Connectors	30	99999	Single lane	1.00
11	Arterial	80	1300	Multi-lanes	1.20
12	Distributor	60	1000	Multi-lanes	1.27
13	Local access	50	600	Multi-lanes	1.24
14	Local access	40	600	Multi-lanes	1.24
15	Local access	20	600	Not defined	1.24
16	Distributor(2)	70	1200	Single lane	1.20
17	Distributor(2)	70	1200	Multi-lanes	1.20
18	Ramp (Low Capacity)	30	1000	Not defined	1.10
20	Busway link	70	1000	Not defined	1.00
21	Walk to busway	4	1000	Not defined	1.00

Table 3.1 in addition to providing a tabular listing of the 20 roadway types previously defined (numbered 1 through 18 and 20 & 21) also highlights the speed, capacity, general lane configuration and peak factor associated with the individual roadway types. It is noted that following a review of each of the defined attributes a number of updates were implemented to 2006 conditions. These are highlighted as follows:

- Collectors and Local Access roads free flow speeds were reduced from 45 and 55 km/hr to 40 and 50 km/hr respectively based on the GIS network attributes provided;
- Ramps free flow speeds were in general increased from 45 km/hr to 60 kph, however it is noted that a limited number of exceptions are overwritten through the macro commands (i.e. those defined in Ramps.241 and imported using the "UserSpecific.mac" macro);
- Roadway types Collectors, Ramps and Arterials (i.e. no. 2,3.,5 and 11) were coded with typical lane capacities of 1300 vehicles per lane per hour (vplph);
- Roadway types Parkway, Ramps, Rural Highway, Rural Roads and Ramps with low capacity (i.e. 1,3,4,9 and 18) were assigned a peak factor of 1.10.

The User Specific macro remains as part of the model run stream and it has been revised to reflect the updates required for the 2006 base year conditions. This ensures ease of integration of any further revisions and/or adjustments to the road and transit network elements by either agency staff or external consultants.

The Strategic Transport Model was updated to reflect the ACT 2006 Speed Zones (see Figure 3.1) and a network plot of the updated roadway speeds is presented as Figure 3.2: EMME 2006 Strategic Transport Model Road Network Speeds.

Figure 3.1: ACT 2006 Speed Zone Map

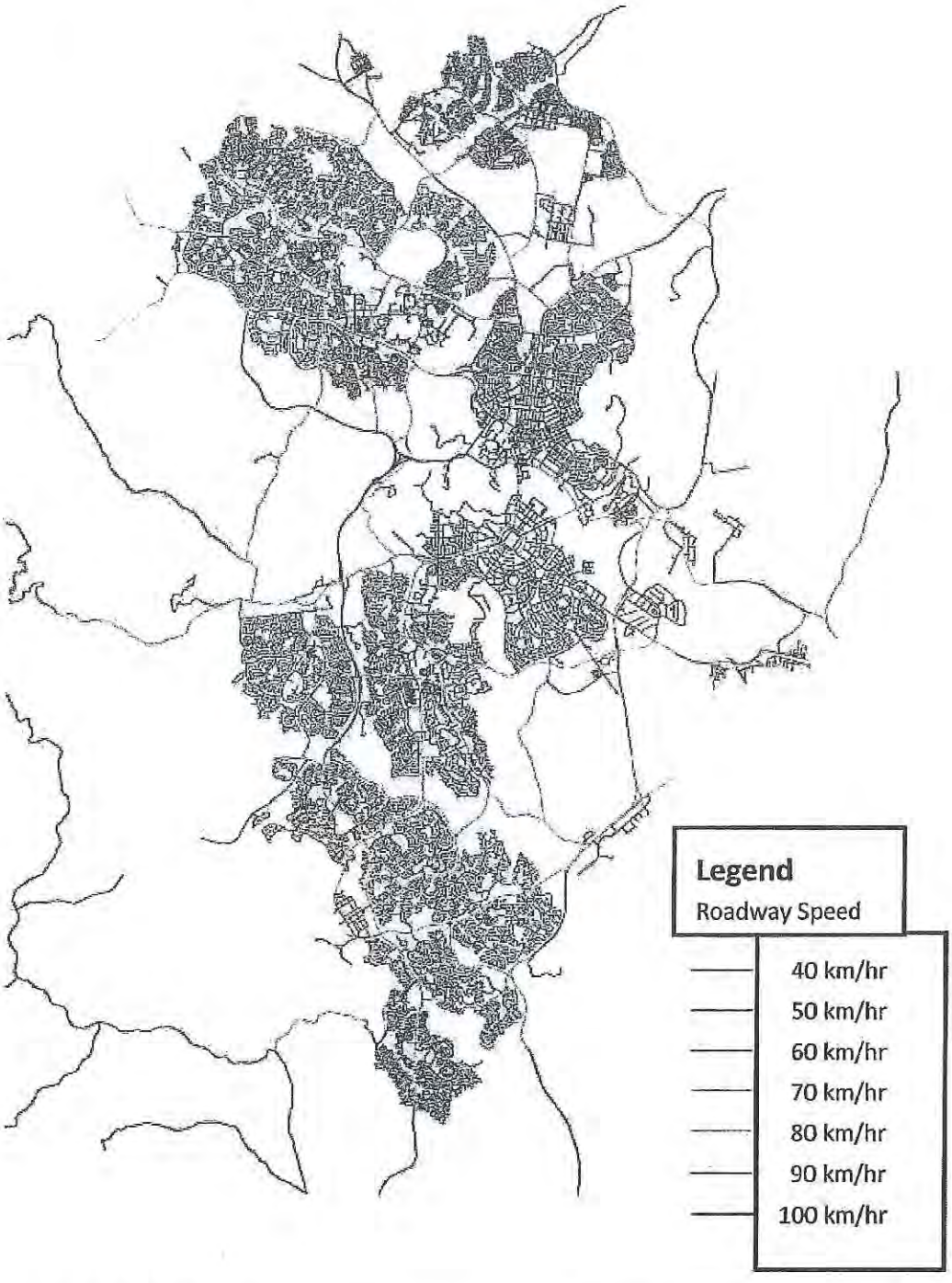
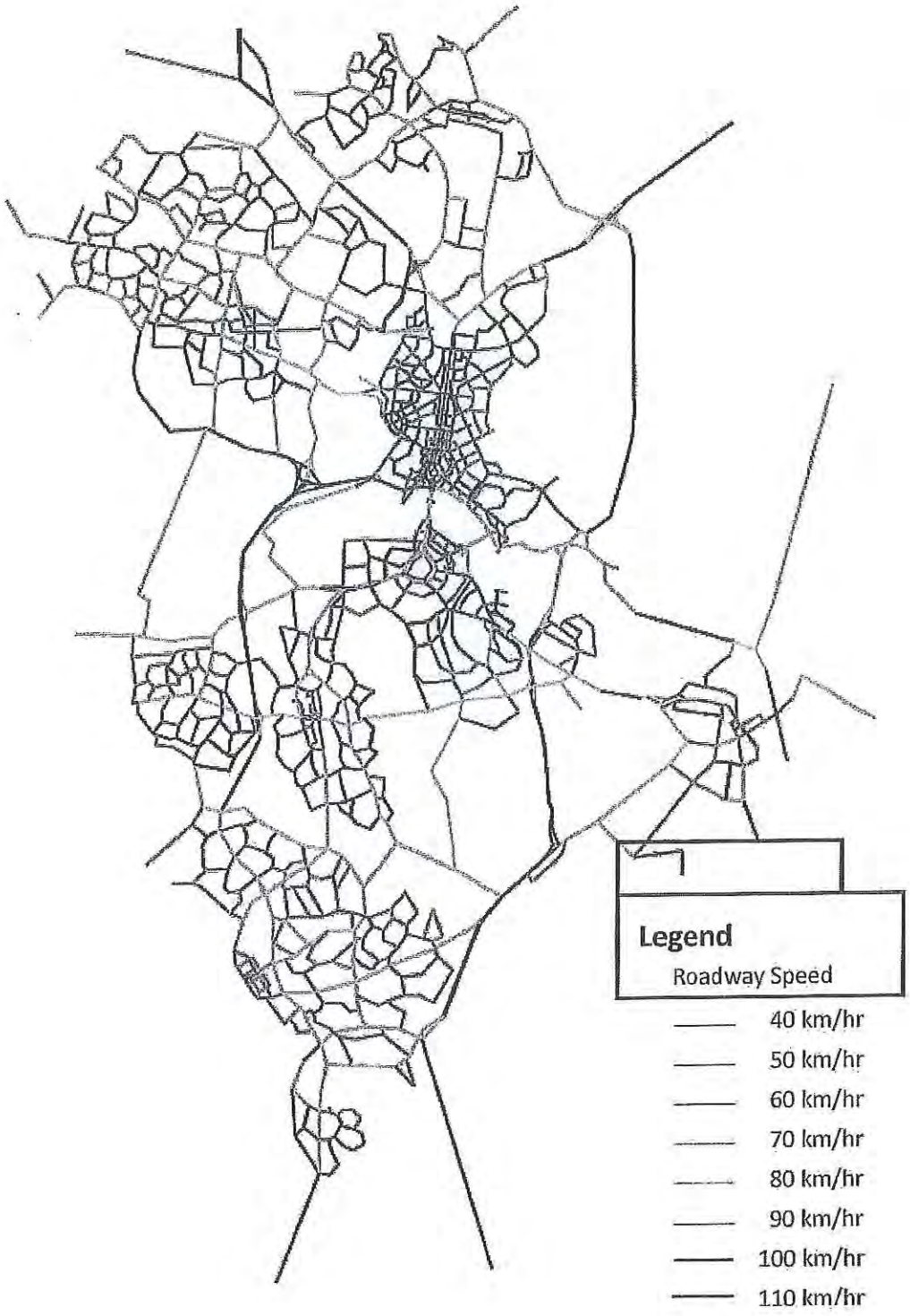


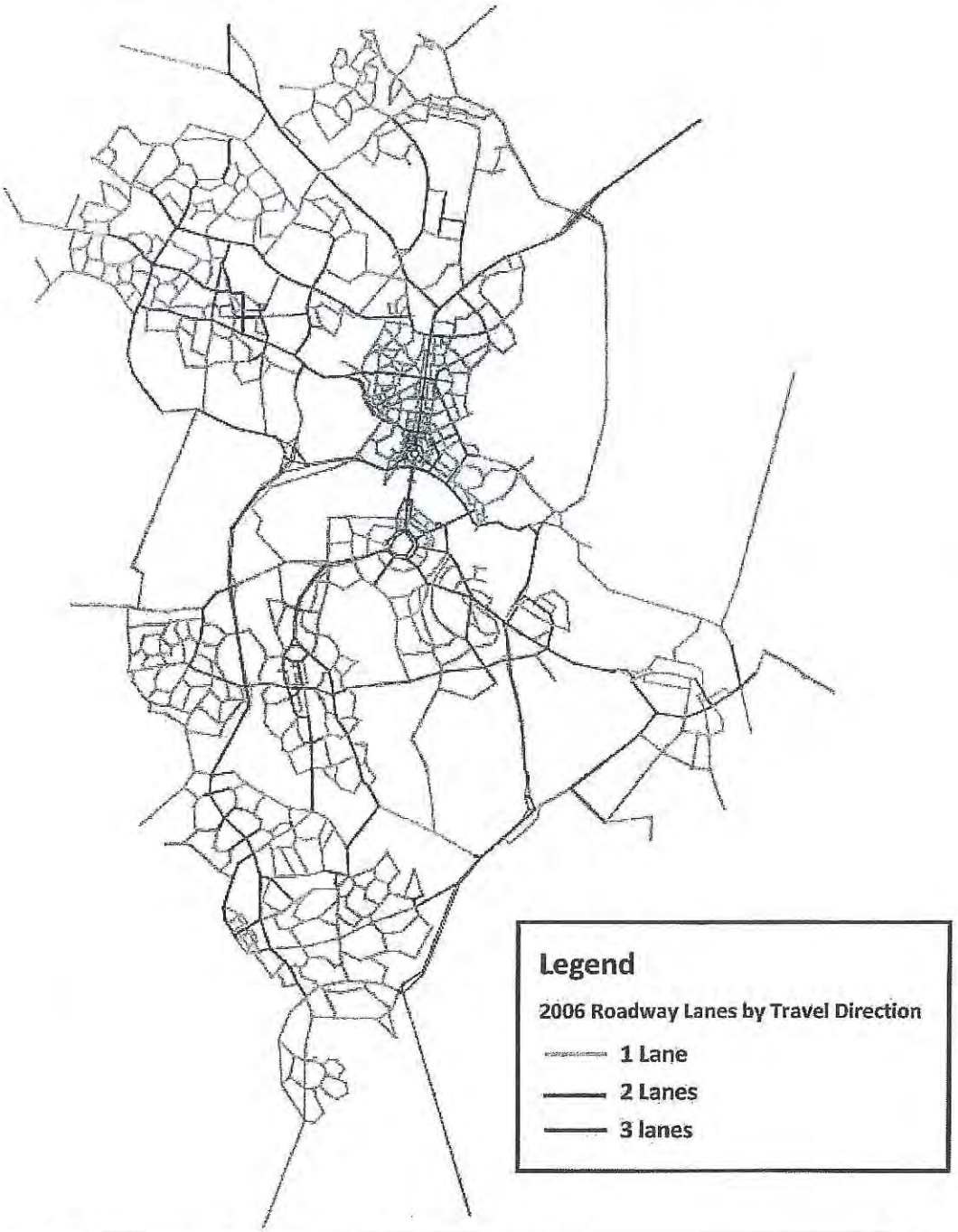
Figure 3.2: EMME 2006 Strategic Transport Model Road Network Speeds



3.1.3 Roadway Network - Number of Lanes

A review of the road network was undertaken with a view to update all roadway elements which currently reside with the Strategic Transport Model. A major element of this work included validation of the number of lanes associated with the current 2006 roadway system. Roadway link information was provided by ACT which identified the base year conditions for 2006. An EMME plot of the road network which highlights the roadway system and number of lanes for each direction of travel for the 2006 base is presented in Figure 3.3: EMME Model 2006 Road Network - Number of Lanes.

Figure 3.3: EMME Model 2006 Road Network - Number of Lanes

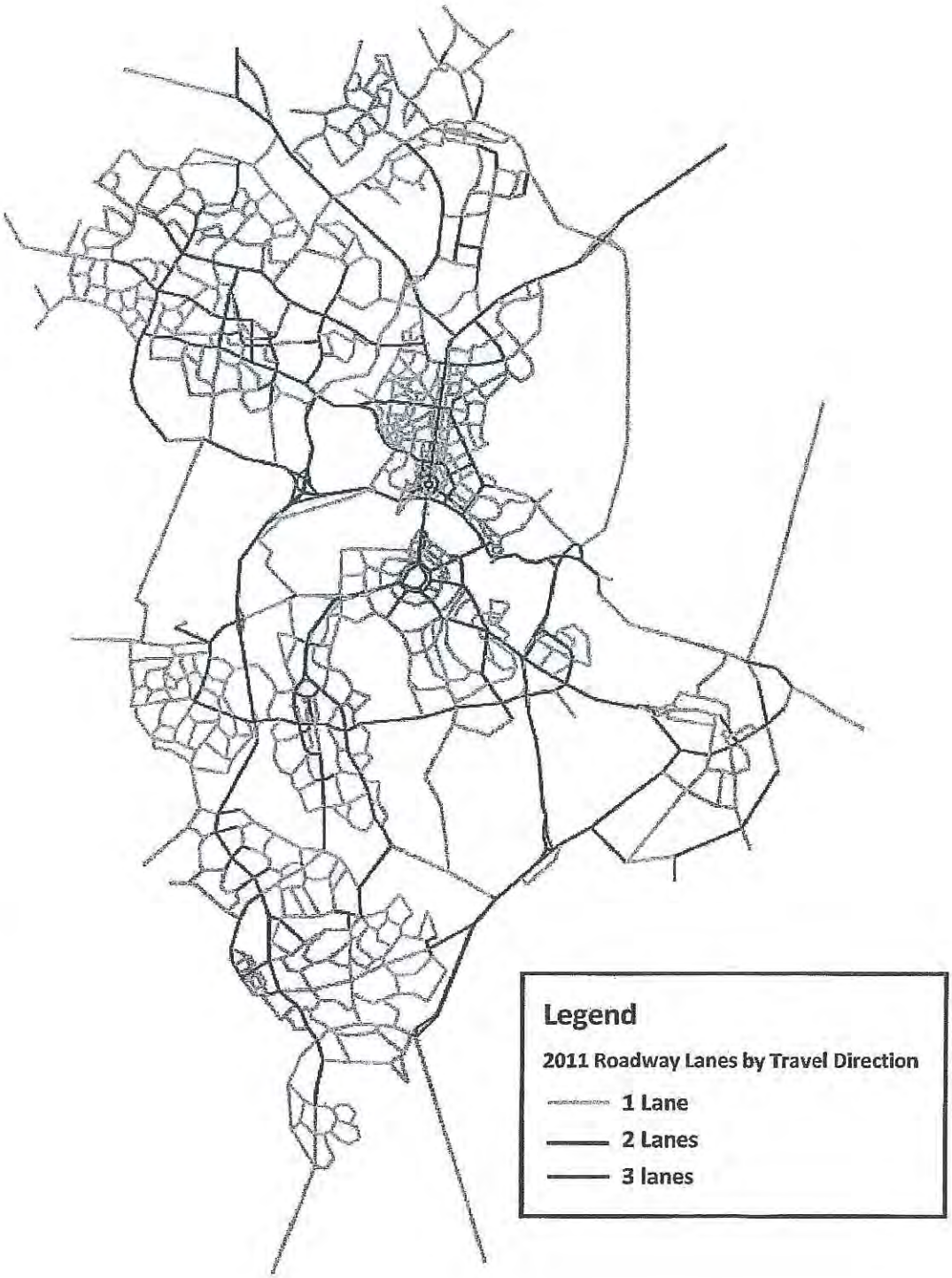


In addition to identifying the current 2006 base year road network as a basis to update the base year model, it was also necessary to identify the future 2011 road network to serve as the base for the 2011 planning horizon. TAMS reviewed current and future roadway improvement plans and were able to identify a number of roadways which are anticipated to be expanded over the planning period to 2011. These are outlined and described briefly below:

- Pialligo Avenue
  - duplication from Monaro Highway to Beltana Road;
  - duplication from Beltana Road to Brindabella Office Park southern entry;
  - across the Molonglo River to the traffic signals on the northbound carriageway on Monaro Highway widening from 2 to 3 lanes northbound and from 1 to 2 lanes southbound
  - Extension to Kings Highway
- Fairbairn Avenue
  - duplication between Majura Road and Morshead Drive;
  - duplication between Majura Road and Pialligo Avenue:
- Morshead Drive
  - Duplication between Dairy Road Bridge and Sylvia Curley Bridge;
  - Additional capacity (1.5 lanes for each direction) between Fairbairn Avenue and Pialligo Avenue.
- Gungahlin Drive:
  - extension to Belconnen Way and Ginninderra Drive
  - duplication through Glenloch Interchange (William Hovell Drive/Parkes Way/Tuggeranong Pkway);
  - duplication from Belconnen Way to Glenloch interchange
- Lanyon Drive
  - duplication between Monaro Highway and Tompsitt Drive
- Flemington Road
  - duplication from Wells Station Drive to Hamer Street
- Tharwa Drive/Drakeford Drive
  - duplication between Box Hill and Johnson Drive
- Horse Park Drive
  - extension east and west of Moncrieff (not fully completed by 2011)
- East of Moncrieff area
  - New roadways providing access to residential development (zone 614)
- Amy Ackman Street
  - New roadway providing access to residential developments (zone 618 and 619)
- South of Palmerston area
  - New roadway providing access to residential developments (zone 516 and 517)
- East Lake Area
  - New roadways providing access to residential developments
- Molonglo area
  - New roadways providing access to residential developments (zone 802)
- Flemington Road Area
  - New parallel roadway connecting Hamer Street to Hoskins Street, including extensions of Nullarbor Avenue and Wells Station Drive to connect to Flemington Road
- Mapleton Avenue Extension of connecting to Flemington Road
- Geelong Street Extension to Barrier Street
- Tompsitt Drive Extension
- New road between Cotter Road and Dixon Drive

The addition of the 2011 planned roadway elements noted above have been plotted with the number of lanes for all roadway types in Figure 3.4 EMME Model 2011- Road Network Number of Lanes.

Figure 3.4: EMME Model 2011 Road Network - Number of Lanes



3.1.4 Volume Delay Functions

A functional roadway hierarchy is the most common way in which volume delay functions are assigned to various elements of the roadway network. The volume delay function (VDF) is a mathematical representation of how roadways are expected to function with respect to increasing levels of traffic flow and relates traffic flows against typical lane capacities for various roadway types. Often a roadway hierarchy identifies how traffic should flow in a logical and efficient manner through the network, as well as how it should operate and be managed. In the most basic form it considers information about the roads setting (i.e., urban or rural) and the extent to which it provides access to adjacent land and travel mobility. The volume delay function considers a number of these elements and applies a speed flow curve that is dependant on free flow speeds and capacities as variables and quantifies the travel time associated with the roadway link.

The current Strategic Transport Model applies a number of VDF's and these are discussed as follows;

A significant portion of the roadway network (approximately 60% of all roadway links) have been assigned the volume delay function (VDF) #1 and has been defined as follows:

$$VDF\ 1 = \frac{length * 60}{posted\ \ speed} * \left[2 - 1.0333 - 16\left(1 - \frac{v}{c}\right) + \sqrt{16^2\left(1 - \frac{v}{c}\right)^2 + 1.0333^2} \right]$$

Where length is expressed in kilometres and posted speed in kilometres per hour

Traffic zone connectors (which represent approximately 31% of road network links) use the VDF #99 and is defined as follows:

$$VDF99 = length * 2$$

This formulation is not capacity restrained and assumes the free flow travel speed is approximately 30 km/hr.

Five additional VDF's were noted within the existing Strategic Transport Model and were assigned to a small number of roadway links (approximately 2% of the roadway system). These VDF's are as follows:

- VDF #10 (used along some segments of Athllon Dr.) calculates the delay as if the posted speed was 60kph.
- VDF #13, #14, #15 and #17 (used along some ramps and major arterials) applies the same volume delay function noted for VDF 1 with additional delays introduced.

As part of the update an additional VDF was created (VDF #98). The formulation of the VDF #98 effectively closes the roadway to all traffic by assigning an extraordinarily high travel time (999,999 minutes). This is a very effective means to "turn on" or "turn off" various road network facilities. This approach allows users to easily create future year base road network scenarios by selectively "turning on" various sets of infrastructure improvements, without having to individually code new future facilities each and every time. This approach therefore retains all existing and future transport facilities within all scenarios and only activates or "turned on" specific road or transport facilities as they are required. As you can appreciate, this approach reduces the level of effort required to establish future road networks and for obvious reasons is a highly effective means of maintaining accurate and consistent near and long term networks within ACT's Strategic Transport Model across all scenarios.

As a result all future links (for either 2011, 2021 or 2031 planning horizon) have been coded in all scenarios and have been assigned a VDF #98 within the base year 2006 which effectively denies vehicle access. When these facilities are required to be included in the modeling framework changes to the VDF can be made which effectively open the roadways to traffic.

VDF 98 = 999999 (no auto access)

3.1.5 Highway Generalized Cost

The highway generalized cost is calculated as follows:

$$GC_{hwy}=(T + \alpha \times D) \times VOT + P$$

where: T: zone to zone travel time in min
D: zone to zone distance in km
P: parking cost
α: distance weight factor = (VOC + FC x FCost) / VOT
and where: VOT: Value of Time = $10/hr or $0.17/min
VOC: Vehicle Operating Cost = $0.13/veh-km
FC: Fuel Consumption = 0.09 litres/veh-km
FCost: Fuel Cost = $1/litre (2006) and $1.5/litre (2011)

The fuel costs were retained as $1/litre for the 2006 base year and increased by 50 percent for the 2011 planning horizon. The recent volatility in fuel costs resulted in a further adjustment to the macros used to run the model to provide more flexibility for users to make adjustments to the fuel cost parameter directly. The fuel cost is now identified as an input variable which the user defines in order to run the macro (Canberra.mac). The updated macro as a result requires 7 parameters to be defined as part of the macro statement. These are noted below, in order of their location in the macro statement:

- Scenario number
- Junction data file number (600 for 2006 and 1100 for 2011)
- Modelling year (2006, 2011, 2021 or 2031)
- Number of hours of assignment (1 or 2)
- Maximum number of model iterations
- Parking charge factor
- Fuel cost

The inclusion of these parameters in the macro statement increases the ease at which various sensitivity testing may be carried out by users of the model.

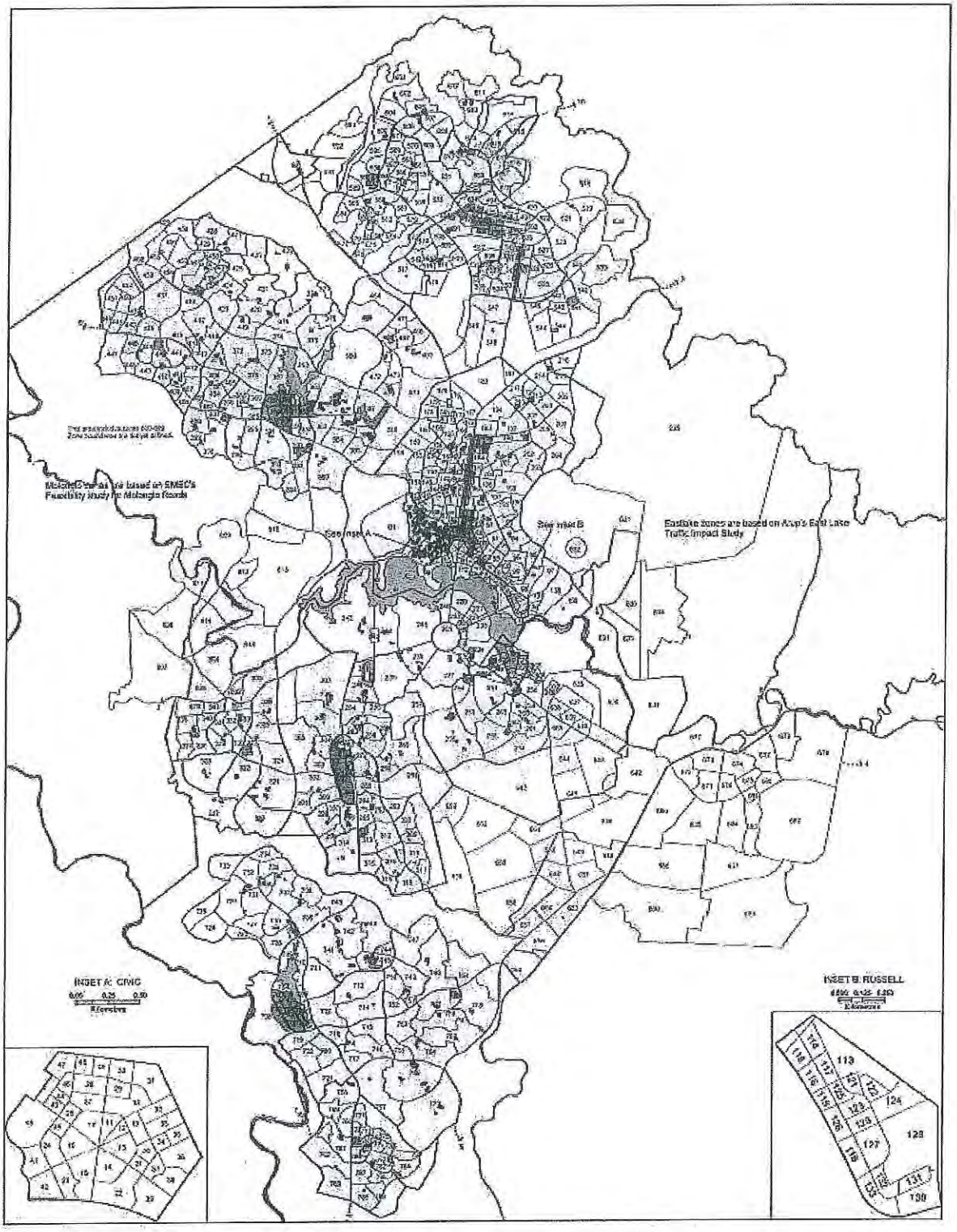
3.2 Traffic Zones and Connectors

A review of the traffic zone system was carried out as well as the assigned numerical value for each of the traffic zones. These data were validated against the traffic zone map provided by ACT. The ACT traffic zone system which reflects 2006 zone adjustments is presented in Figure 3.5: ACT 2008 Traffic Zone Map.

The traffic zone connectors represent the loading points of traffic and PT trips to the road and PT networks. In many cases the zone connectors reflect the underlying local road/pedestrian networks within residential neighbourhoods and represent the major access points to and from the adjacent road and PT networks. The traffic zone connectors were reviewed to ensure adequate connections to the major road network as well as to the PT stops serving the residential neighbourhoods. Major employment nodes and town centres were also

reviewed to ensure adequate connector links both pedestrian and road access to the adjacent road and PT networks.

Figure 3.5: ACT Zone Map 2008



3.3 Public Transport

3.3.1 Public Transport Network

The base year 2001 ACTION and DBL service operations were provided as Scenario 121 in the Strategic Transport Model. This base year public transport networks were comprised of 119 public transport lines with approximately 8,330 public transport line segments.

The public transport network was reviewed and updated to reflect the 2006 ACTION and DBL service operations. Consistent with the 2001 PT network, the three (3) public transport modes were retained. These PT modes are as follows:

- "b" mode is used for ACTION PT lines both regular and intertown lines
- "e" mode is used for ACTION PT express lines
- "f" mode is used for all DBL lines

In addition, PT interchanges are identified within the Strategic Transport Model as a means to provide node specific PT attributes aimed at encouraging PT transfers to occur at the major PT interchange locations. The specific PT interchanges identified and coded as part of the 2006 base year are as follows:

- Belconnen
- City
- City West
- Woden
- Tuggeranong
- Russell
- Barton
- Queanbeyan

The specific files used to identify the PT interchanges are placed in the "input folder" and follow a revised file naming convention which identifies the planning horizon at the beginning of the file name(i.e. " 6" for 2006 and "11" for 2011). 6ptint.241 and 11ptint.241 are the two files prepared for the 2006 base year and future 2011 planning horizon. Maintaining this file convention required modifications to both the "Canberra.mac" and "PTAssign.mac" macros.

The future 2011 planning horizon also requires the addition of PT interchanges at Gungahlin, Erindale and Dickson as well as revised PT lines and headways. Table 3.2 identifies the number of PT lines for each of the 2006 base year and 2011 planning horizon.

Table 3.2: Public Transport Networks 2006 and 2011

PT Service	2006 Base # of PT Lines	2011 # of PT Lines
ACTION Regular	86	65
ACTION Intertown lines	9	12
ACTION Express lines	15	20
DBL lines	11	11

See Appendix A for detailed line listings for Base Year 2006 and 2011 planning horizon

To assist in identifying PT lines the naming convention adopted follows a general convention noted below:

- **Regular and Intertown lines**: the line number followed by the direction (i.e. PT line No. 2 southbound is coded as "02s") or for PT lines that operate as loops and "L" is used instead of a direction (i.e. line No. 83 coded as "83L")
- **Express lines**: follow the same convention with an "E" as the prefix (i.e. an express line No.701 southbound is coded as "E701s")

- **DBL service (800 series)**: All DBL services are coded as 800 series and also use a prefix "D" (i.e. PT line No. 830 eastbound is coded as "D830e")

A detailed listing of the PT lines coded for both the Updated Base Year 2006 and the 2011 Planning Horizon is presented in Appendix A for each of the PT Line categories: "regular", intertown, express and DBL services. Headways coded for express lines and extended local lines (100 and 200 series) are based on an assessment of the number of buses typically scheduled across the AM peak period. It is noted that some PT services are scheduled within the AM peak hour while the model has been designed to reflect PT passenger demands across the full two hour peak period, consequently adjustments to headways were necessary for specific lines.

In addition to the coding of PT lines, various elements of the road and PT network provide benefits to PT services by providing various levels of segregation or separation from mixed general traffic flow. Three typical features of the Canberra PT system have been provided within the updated 2006 Base Year Model. The location and type of PT facility or priority measure are outlined as followed:

1. Dedicated public transport facilities
    - between Coulter Dr. and Belconnen interchange + bus lane along Benjamin Way northbound at Belconnen interchange approach
    - along Alinga St. and East Row near City Interchange
2. Bus lanes
    - along Yarra Glen northbound, Adelaide Ave. northbound and southbound, and Capital Cir.
    - Federal Hwy/Northbourne/Barton Hwy intersection, southbound
    - along Flemington Rd. southbound, from Morisset Rd. to Federal Hwy
    - Commonwealth Ave. northbound, from Kaye St. To Flynn Dr. ramp.
    - Callam St. at the approach of Woden interchange
3. Bus priority at intersections
    - at Eastern Valley Way/College Street intersection
    - at College Street/Haydon Drive intersection (existing bus lane and Bus signal city bound)
    - at Haydon Drive /Battye Street intersection
    - at Haydon Drive/Belconnen Way intersection
    - at Belconnen Way/GDE/Caswell Drive intersection (existing bus lane and Bus signal city bound + existing bus lane Belconnen bound)
    - at Belconnen Way/Barry Drive intersection
    - at Belconnen Way /Macarthur Ave intersection
    - at Barry Drive/Clunies Ross St intersection (existing bus lane and Bus signal Belconnen bound)
    - at Barry Drive/North Road/McCaughey St intersection
    - at Barry Drive/Marcus Clarke St intersection
    - at Marcus Clarke/Rudd St intersection
    - at Alinga St/Northbourne Avenue intersection
    - at Athllon Dr./Hindmarsh Dr. intersection

Additional PT priority measures were not identified for the 2011 Planning Horizon other than outlined above for the 2006 Base Year.

3.3.2 PT Travel Time Functions/ Cost Function

The Travel Time Functions (TTF) describes for the PT network the relationship between PT travel time and network elements similar to the VDFs and the roadway network. The 2001 Base Model applied a single TTF and followed the following formulation:

TTF 1= timau + us1

where ***"timau" or time auto*** *was the private vehicle travel time on the segment*
"us1" *or* ***user defined variable for PT segment*** *accounts for the average approach delay as a function number of vehicles on the approach leg to a junction*

In addition to retaining the TTF 1 as noted above a number of additional variations of the TTF are discussed as follows:

- In general, the average car travel time across an element of the road network (or average travel speed) based on rates of acceleration and deceleration as well as vehicle loads tend to be lower that typically achieved by public transport vehicles. A second TTF was developed and applied to arterials, highways and rural roads (corresponding to road types 1, 4, 5, 9 and 11). The TTF 2 was developed with the same functional relationship as TTF 1 with the exception that the time auto is increased by 10 percent for PT vehicles which represents a 10% delay for PT vehicle travel over private vehicle across similar elements of the road network. TTF 2 is presented as follows:

  TTF 2= timau*1.1 + us1

- To address PT service operating on elements of the road network additional adjustments are warranted to provide the travel time advantages accrued to PT services using either the segregated facilities, bus lanes and/or bus priority signals and queue jumpers.
  - where bus priorities at intersections or bus lanes exist (coded using the extra-attribute @bus) the average approach delays as identified by user attribute "***us1***" are reduced by a factor of four in recognition of the time advantage over private car travel accrued to PT operating on these segments of the road network.
  - also to account for the PT travel in segregated bus only lanes the TTF was revised to account for typical free flow travel speeds. TTF 3 was developed as follows:

    TTF 3= length*60/us3 + us1

    where ***us3*** *was assigned the link posted speed (@fspd)*

The functional format of the generalized PT cost function which is total travel time (applying a value of time) plus PT fare and remains unchanged from the previous model.

C_{PT} = Total travel time *VOT + PT Fare

This function is implemented as part of the PT skims (Skims.mac). The formulation includes all PT trip travel time elements within the macro and is expressed in detail as follows:

= [PT In-Veh Time+Walk Time*Weight Factor+Wait Time*Weight Factor+(Boarding Time-Transfer Time)*Weight Factor+(Transfer Time-First Wait Time)]* Value of Time + PT Fare

In the Skims macro this is implemented using the following matrices and scalars

= ((mf90+ms33*mf91+ms32*mf92+ms34*(mf93-mf125)+(mf125-mf124))*ms31+mf94)

where:

- mf90 = In-veh time,
- mf91 = walk time,
- mf92 = wait time,
- mf93 = boarding time,
- mf94 = fares,
- mf124 = first wait time,
- mf125 = transfer time,
- ms33 = walk weight
- ms32 = wait weight
- ms34 = boarding weight
- ms31 = Value of time

3.4 Overview of Network Elements – Updated 2006 Base Year

The updated modelling framework for the 2006 Base Year resulted in a number of revisions and additions to the EMME based road and PT networks. A comparison of the 2001 Base Year Model with the updated 2006 and future 2011 planning horizon is summarized in Table 3.3. The primary source of increases in network nodes and links is a reflection of both the updating process form 2001 to 2006 base year as well as the inclusion of future road and PT network elements within a common base year network. It was noted that the incorporation of a newly defined VDF that when applied "turns off" the link in terms of the assignment of car or PT traffic provides a means to fully define all future road network elements within the updated 2006 Base Year Model. This reduces the workload typically required to maintain and update various road and PT networks within separately defined planning scenarios.

Table 3.3: EMME Network Parameters

Network Element	2001 Base Year	Updated 2006 Base Year	2011 Planning Horizon
No. of Traffic Zones	800	835	835
No. of Nodes	1,880	2,044	2,044
No. of Traffic Zone Connectors	2,078	2,418	2,418
No. of Roadway Links	6,523	7,581	7,579
No. of Turns	2,506	2,710	2,701
No. of PT Lines	119	121	108
No. of PT Segments	8,329	8,628	7,501

4 Input Data Review and Updates

4.1 Existing and Future Demographic Projections

4.1.1 Population Levels

The population levels were provided by ACT for both the base year 2006 and future 2011 planning horizon. Table 4.1 summarizes the population level and five year growth rates for the previous 2001 Base Year, the updated 2006 Base Year and the projected 2011 planning horizon. The Strategic Transport Model relies on population projections as the primary independent variable from which trip productions are estimated for the AM peak period (2 hours).

Table 4.1: Population Levels and Growth Rates by District

District Description	District Number	Population and Five Year Percentage Growth				
		2001	2006	*% Growth 2001 to 2006*	Projected 2011	*% Growth 2006 to 2011*
Gungahlin	1	24,685	32,540	*32%*	47,920	*47%*
Belconnen	2	86,100	87,075	*1%*	90,285	*4%*
North Canberra	3	39,080	41,780	*7%*	46,490	*11%*
South Canberra	4	22,535	23,550	*5%*	27,090	*15%*
Woden	5	56,625	56,060	*-1%*	57,645	*3%*
Fyshwick & East Lakes	6 & 11	1,090	795	*-27%*	735	*-8%*
Tuggeranong	7	90,745	89,610	*-1%*	88,585	*-1%*
Queanbeyan	8	33,105	38,125	*15%*	42,150	*11%*
External Zones	9	*Demographic projections not required for external zones*				
Molonglo	10	-	-	-	1,680	*n/a*
Kowen	12	-	-	-	-	-
Canberra Total		**353,965**	**369,535**	*4%*	**402,580**	*9%*

The population data is coded to the traffic zone system (835 traffic zones) however is presented in Table 4.1 for the aggregated Districts to provided an overall indication of where population growth is occurring within the City of Canberra. In general terms the historical and projected district growth indicates the following:

- Population levels in Belconnen, Woden and Tuggeranong remains relatively stable across each of the planning horizons of 2001, 2006 and 2011.
- Fyshwick/East Lakes area while a very small district reflects over the short term planning horizon a reduction in the numbers of inhabitants which may be attributed to possible redevelopment opportunities in the future.
- Gungahlin and Queanbeyan have experienced significant population growth which is anticipated to continue through to 2011. This area has likely contributed significantly to growth in trips origins over the past five year planning period to 2006.

- Growth projections for both North and South Canberra reflect moderate increases over the short term planning horizon.

4.1.2 Employment, Retail, School Enrolment Levels

Total employment, retail floor space and school enrolment (primary, secondary and tertiary) are important variables in the modelling framework and provide a means to distribute trip productions generated for the AM peak period. Similar to population levels each of these variables are applied at the disaggregated traffic zone level and updated levels and projections were provided by ACT for both planning periods: the updated base year 2006 and the future 2011 Planning Horizon.

The following tables summarize the employment, retail floor space and school enrolment growth at the district level for 2006 and 2011, as well as providing a comparison with the previous 2001 Base Year Model data.

Table 4.2: Employment Levels and Growth Rates by District

District Description	District Number	Employment and Five Year Percentage Growth				
		2001	2006	*Growth 2001 to 2006*	Projected 2011	*Growth 2006 to 2011*
Gungahlin	1	5,265	6,155	*17%*	6,995	*14%*
Belconnen	2	25,960	27,495	*6%*	27,845	*1%*
North Canberra	3	49,595	62,170	*25%*	71,525	*15%*
South Canberra	4	32,240	35,200	*9%*	35,630	*1%*
Woden	5	25,785	26,980	*5%*	27,635	*2%*
Fyshwick & East Lakes	6 & 11	18,230	22,110	*21%*	24,310	*10%*
Tuggeranong	7	17,305	17,255	*0%*	18,475	*7%*
Queanbeyan	8	13,420	9,640	*-28%*	11,010	*14%*
External Zones	9	*Demographic projections not required for external zones*				
Molonglo	10	-	10		15	*50%*
Kowen	12	-	-	-	-	-
Canberra Total		**187,800**	**207,015**	**10%**	***223,440***	***8%***

The Queanbeyan District was the only district which reported a decrease in the employment over the five year period since 2001. The number of jobs located within the Queanbeyan District decreased by approximately 28% between 2001 and 2006. The projected number of jobs by 2011 for the Queanbeyan District is anticipated to rebound and experience an approximate 15% increase over 2006 levels however the net growth since 2001 will remain as a deficit of almost 18% below previous 2001 levels.

The three primary districts which experience the highest rates of employment growth include: Gungahlin, North Canberra and Fyshwick/East Lakes. North Canberra, for example was responsible for providing more than 50% of the total job growth or 1 in every 2 jobs added over the period between 2001 and 2006. It is also noted that the three planning districts are each projected to continue to experience employment rates of growth above ACT's average growth rate of 8% through to the 2011 planning horizon.

With continued employment growth for these districts, increases in morning peak period destinations to these regions would be a reasonable expectation over the period since 2001.

The growth retail developments are used in the modelling framework and while not as highly influential to trip patterns during the morning peak periods remains an important independent variable in trip distribution for the AM peak period. A summary of the changes over the period since 2001 is highlighted in Table 4.3.

Table 4.3: Retail Floor Space Levels and Growth Rates by District

District Description	District Number	Retail Floor Space and Five Year Percentage Growth				
		2001	2006	*Growth 2001 to 2006*	Projected 2011	*Growth 2006 to 2011*
Gungahlin	1	42,745	184,080	*235%*	6,995	*29%*
Belconnen	2	136,015	258,190	*65%*	27,845	*15%*
North Canberra	3	166,935	226,860	*32%*	71,525	*3%*
South Canberra	4	43,810	100,555	*111%*	35,630	*9%*
Woden	5	119,465	177,410	*42%*	27,635	*5%*
Fyshwick & East Lakes	6 & 11	118,550	494,585	*247%*	24,310	*20%*
Tuggeranong	7	124,315	181,825	*41%*	18,475	*4%*
Queanbeyan	8	56,200	77,180	*22%*	11,010	*12%*
External Zones	9	*Demographic projections not required for external zones*				
Molonglo	10	-	500	-	-	*50%*
Kowen	12	-	-	-	-	-
Canberra Total		**808,035**	**1,507,082**	***87%***	**1,703,760**	***13%***

The following observations were noted with respect to growth in retail floor space across the planning districts:

- The retail growth in Gungahlin, South Canberra and Fyshwick/East Lakes areas has occurred at an average rate higher than the ACT's average growth of 87% across the planning area by 2006.
- It is noted that the retail floor space variable is used to estimate home based shopping trips purposes as well as in the development of the non-home based other trip categories of travel during the AM peak period. In general these trip purpose travel components were noted as accounting for respectively 7% and 17% of AM peak period trips.
- In general, based on the experiences of most urban centres, PM peak periods or the evening peak period is comprised of higher levels of shopping trips (typically reflecting retail store hours) and consequently trip origins and destinations are more influenced by the distribution of retail land uses.

Like work trips, school travel is considered non-discretionary trips and consequently particularly during the AM peak period an important trip category. The primary independent variable for school trip attractions during the AM peak period is school enrolment levels and this variable is used to estimate the home based education trips within the modeling framework.

Table 4.5: Trip Generation Rates by Trip Purpose (2 Hr)

Trip Purpose		2001 * Trip Rates	2006 ** Trip Rates
Home Based	Work	0.203	0.239
	Education	0.132	0.104
	Shopping	0.015	0.040
	Other	0.151	0.085
Non Home Based	Business Appointments etc	0.096	0.107
	Other	0.014	0.039
Trip Rates All Trip Purposes		0.611	0.614

* Rates based on 1996 HH Survey and applied in the 2001 model calibration

** Rates developed based on 2005 Transport Information Database

4.2.2 Income Level Adjustment Factors

The Base Year 2001 Model identified three income levels; low, medium and high. The proportion of households within each of these income levels was provided across all traffic zones used by the model. The distribution and variation in income levels allowed for a further correction or adjustment of the derived trip rates. A similar adjustment factor using income levels had also been applied to the PT usage rates again as a means to provide mode use sensitivity across the three income categories.

A review of trip making characteristics as reported in the ACT Travel Survey (2005 Transport Information Database) provided the basis to determine appropriate adjustment factors for each of the income levels used in the 2001 Model. The income levels reported in the 2005 TID were grouped according to the three broad income levels used in the planning model.

Table 4.6 highlights and summarises the adjustment factors applied in the previous 2001 and those reflecting the updated 2006 Base Year Model. A review of the adjustment factors developed for the 2006 update indicates that i) higher income households made more trips as noted in the increasing scale of the factor as the income group rises and ii) that PT trips were higher for low income households as the 2006 adjustment factor decreases with household income. This tendency while in contrast to the 2001 Base Year Model trend is representative of what is generally accepted as typical travel behaviour.

Table 4.6: Income Based Adjustment Factors for Trip Rates & PT Usage

Income Level	Income Based Trip Rate Factors		Income Based PT Usage Factors	
	2001*	2006**	2001*	2006**
Low (less than $25,999 pa)	0.916	0.593	0.883	1.332
Medium ($ 26,000 to $ 51,999 pa)	1.007	1.142	0.845	0.959
High (greater $52,000 pa)	1.082	1.327	1.273	0.649

* Trip factors developed for 2001 model calibration

** Trip factors developed based on 2005 Transport Information Database

A summary of the growth in enrolment levels for the planning districts are presented in Table 4.4. The enrollment growth in Gungahlin, North Canberra and Woden areas has occurred at a rates higher than the ACT's average growth of 12% for the five year period ending in 2006 as well as the projected 4% city wide five year growth period to 2011.

School trips account for approximately 17% of AM peak period trips. It is also noted that a high proportion of travel for school trip purposes are typically accommodated by public transport services as younger persons have a higher likelihood to take public transport.

Table 4.4: Enrolment Levels and Growth Rates by District

District Description	District Number	Retail Floor Space and Five Year Percentage Growth				
		2001	2006	*Growth 2001 to 2006*	Projected 2011	*Growth 2006 to 2011*
Gungahlin	1	2,685	4,499	*68%*	5,680	*26%*
Belconnen	2	29,791	31,671	*6%*	34,160	*8%*
North Canberra	3	29,773	36,235	*22%*	35,995	*-1%*
South Canberra	4	9,640	9,512	*-1%*	10,270	*8%*
Woden	5	9,505	13,253	*39%*	14,290	*8%*
Fyshwick & East Lakes	6 & 11	n/a	1,664	*n/a*	1,340	*-19%*
Tuggeranong	7	16,600	16,290	*-2%*	16,530	*1%*
Queanbeyan	8	6,950	4,123	*-41%*	4,170	*1%*
External Zones	9	*Demographic projections not required for external zones*				
Molonglo	10	-	-	-	-	-
Kowen	12	-	-	-	-	-
Canberra Total		**104,944**	**117,247**	***12%***	**122,435**	***4%***

4.2 Trip Generation Formulation and Adjustment Factors

4.2.1 Trip Generation Rates

The trip generation functions applied in the 2001 base year model were reviewed for the AM peak period. It is noted that the trip generation functions are derived for the morning peak period (two hours). Updated trip data was obtained from the ACT Travel Survey and was reviewed as part of the 2005 Transport Information Database (TID). The TID was interrogated for various reported trip purposes and new rates were compiled based on the survey responses obtained. In some cases, the identification of trip purposes relied on a review of the reported trip destination in the survey and comparisons were made with the previous developed rates applied in the 2001 Strategic Transport Model.

Both the previous trip generation rates applied in the 2001 Model and the updated rates are summarized in Table 4.5. The overall total trips per capita (all purposes) identified for the peak period (two hours) are similar however, the proportion of trip purposes reported differ between the 2006 rates determined compared with the previous rates applied in the 2001 Base Model. A slight shift between work and school trips was also noted.

4.2.3 Age Group Adjustment Factors

The Base Year 2001 Model also stratified the population data by five primary age groupings, namely: less than 14 years old, 15-24 years old, 25-44 years old, 45-64 years old, and greater than 65 years old. Similar to income, age is a strong independent variable for trip making characteristics. The age profiles of various neighbourhoods were reviewed and updated to reflect 2006 conditions based on the information contained in the ACT 2006 Census Data. This data was provided at Statistical Local Area (SLA) level of aggregation and the traffic zone system was partitioned ((using the EMME partition named "GF") such that the aggregated traffic zones reflect the SLA boundaries. The SLA boundary file is presented in Appendix B for Canberra.

Trip generation factors based on age groups were updated using ACT Travel Survey from the Transport Information Database developed in 2005. The table below highlights the differences between the factors used in 2001 model and those developed for the updated 2006 base year model.

Table 4.7: Age Based Adjustment Factors for Trip Rates & PT Usage

Age Groups	Age Based Trip Rate Factors		Age Based PT Usage Factors	
	2001*	2006**	2001*	2006**
less than 14	0.773	0.756	0.942	0.781
15 to 24	1.121	0.704	0.873	1.537
25 to 44	1.272	1.316	0.955	1.091
45 to 64	0.937	1.198	1.072	0.795
greater than 65	0.710	0.336	1.158	0.705

* Trip factors developed for 2001 model calibration

** Trip factors developed based on 2005 Transport Information Database

4.3 Parking Charges in Town Centres

In the previous 2001 Strategic Transport Model, parking charges were applied to travel to/from Civic District alone. The parking charge applied was an approximate $1.40 per trip originating or destined to those zones, independently of the trip purpose and reflected the cost associated with car usage and the requirement for parking.

Within the modelling framework a full matrix (mf31) is used to track parking costs for all traffic zones with the Civic District. In addition, trips destined to the Civic district are also redistributed based on the availability of parking as provided within adjacent traffic zones. The 2001 Strategic Transport Model employs a macro to facilitate the distribution of trips to the traffic zone system based on the parking supply. These two files (one macro) which address parking charges and trip distribution issues are briefly described as follows:

- The macro *"ApplyParkingChanges.mac"* uses a secondary input file *"CivicParkFactors.prn"* which defines the parking supply within traffic zones adjacent to the core areas of Canberra. The parking supply was updated within the *"CivicParkFactors.prn"* file for the 2006 Base Year Model using the information presented in Figure 4.1: 2006 Parking Supply for the Civic Area. The macro applied effectively facilitates trip rerouting to the adjacent traffic zones to

ensure a balance between parking availability and the car trips attracted to the traffic zones in the immediate area of the Civic Area.

Figure 4.1: 2006 Parking Supply for Civic Area

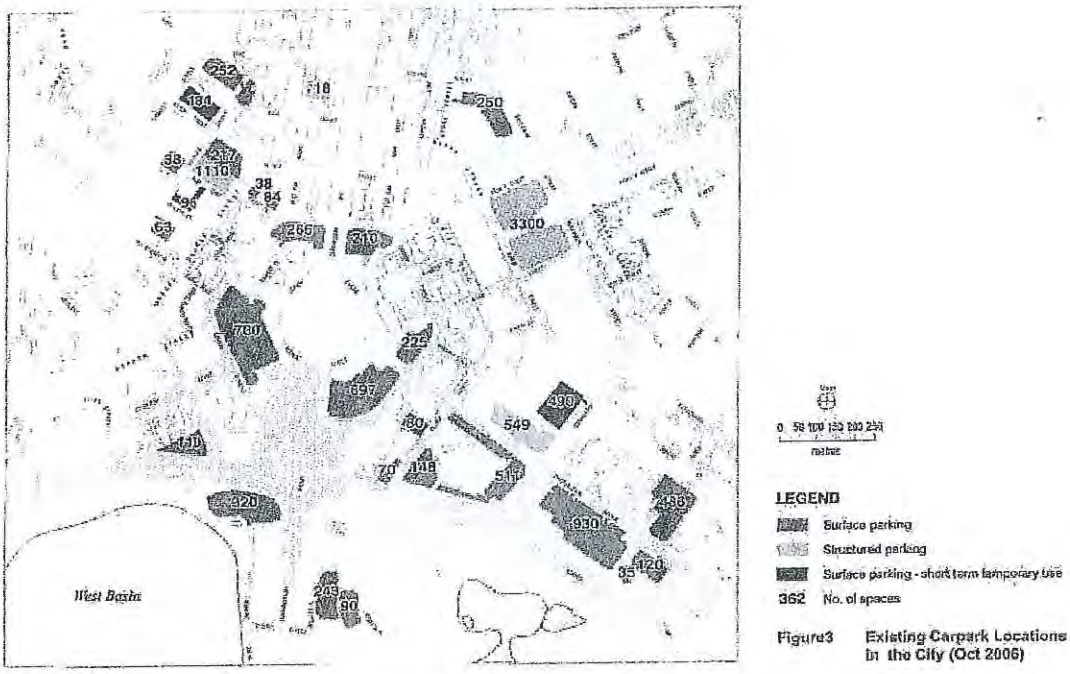


Figure3 Existing Carpark Locations in the City (Oct 2006)

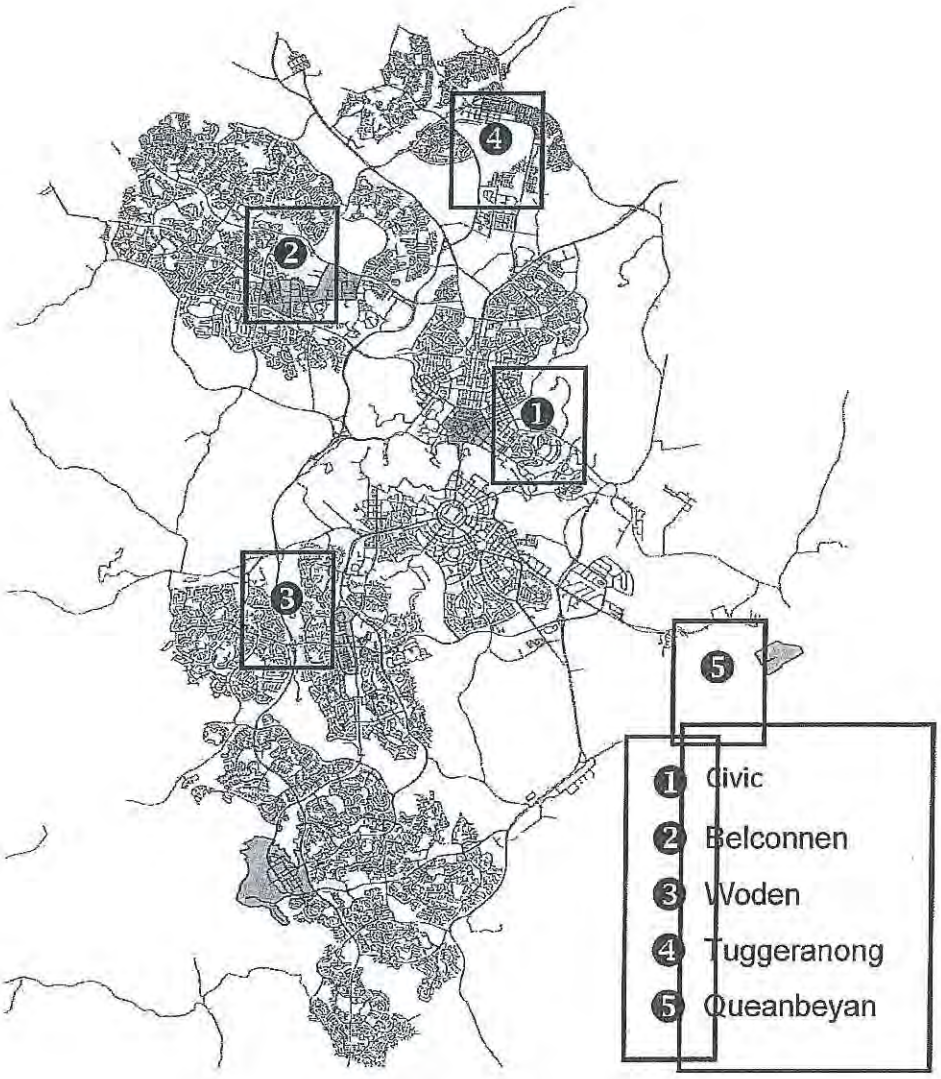
Parking charges, coded in the matrix mf31, were also reviewed and updated to ensure that all car trips destined to the specific predefined areas (i.e. Civic area and Town Centres) during the AM peak period. Table 4.8 provides a summary of the parking rates or charge used to update the 2006 Base Year Model. These rates or charges were not revised based on the short term planning horizon associated with the 2011 planning horizon.

Table 4.8: Average Parking Charge Assumptions

Town Centre	Previous 2001 Base Year Model	2006 Base Year & 2011 Planning Horizon
Civic	$ 1.40	$ 1.50
Belconnen	Free	$ 0.75
Woden	Free	$ 0.75
Tuggeranong	Free	$ 0.75
Queanbeyan	Free	$ 0.75
Other town centres	Free	Free

A map of the Town Centres and the traffic zone boundary file is presented as Figure 4.2 and highlights the specific areas identified in Table 4.8.

Figure 4.2: Zones with Parking Charges in 2006 and 2011



4.4 Junction Data Updates

The 2001 Canberra Strategic Transport Model as defined uses additional junction data to assist in the identification of appropriate levels of delays to apply to traffic using major junctions within the planning model. The junction files were reviewed and updated based on the previous network changes incorporated into the updated 2006 Base Year Model. Consistent with past practices the identification of the junction file input data, the macros and file structures were reviewed and updated as follows:

- "600" is used to define the junction file for the updated Base Year 2006
- "1100" is used in reference to the 2011 planning horizon

In addition, turn penalties at junctions were reviewed following the incorporation of network changes noted in the previous sections for both the 2006 and 2011 planning horizons. The file "loadtur.mac" was updated and contains additional turn movements to ban specific traffic

movements in and out of highway ramps which may have occurred as a result of increasing delays experienced on the highway network.

4.5 External Trips

The Canberra Strategic Transport Model is defined primarily for the urbanised area and, while including future development areas, the model has not been designed to explicitly model trip generation and distribution to/from areas outside the Canberra area. The Model accounts for external generated traffic through the 10 external traffic zones (numbered 1 thorough 10) which effectively represent the external gateways to Canberra. These major road access points are reflected in the modeling process by quantifying (typically through the use of roadside traffic observations) the volume of traffic using these gateway roadways. The ACT road network may include other minor roadways leading to or away from Canberra such as Wallaroo Road which for practical purposes based on very limited usage can be excluded from the urban model framework.

The traffic volumes associated with the primary external gateways are summarised in Table 4.9 and numbered from 1 through 10 for both the Base Year 2006 as well as the 2011 planning horizon. Those traffic zones and roadway links have assigned the observed traffic volumes as obtained and estimated in some cases from 2006 observed traffic counts for the 2006 Base Year. The projected 2011 traffic volumes were estimated based on historical growth rates observed at the gateway locations over the past few years where traffic data was available.

Table 4.9: External Zones

Gateway Location and Traffic Zone Number		Traffic Volumes AM Peak Period (2hr)			
		2006 Updated Base Year		2011 Projection	
External Traffic Zone	Roadway Links	Inbound	Outbound	Inbound	Outbound
1	Barton Hwy[1]	1,140	615	1,370	740
2	Federal Hwy[2]	1,315	525	1,340	540
3	Cotter Rd[2]	90	175	95	180
4	Kings Hwy[3]	1,040	1,020	1,145	1,120
5	Tharwa Rd[2]	90	90	95	95
6	Monaro Hwy[2]	440	350	450	360
7	Point Hut Rd[2]	90	90	95	95
8	Sutton Rd[2]	-	-	-	-
9	Parkwood Rd[2]	90	90	95	95
10	Gundaroo Rd[2]	45	45	50	50

Notes: 1. Car traffic growth rate of 20% over five year planning period
2. Car Traffic growth rate of 2% over five year planning period
3. Car Traffic growth rate of 10% over five year planning period
Sutton Rd - Traffic data not available

5 Model Procedures

5.1 Incorporation of 2006 as the Base Year Model

The modelling framework developed as part of the 2001 Base Year Model had specifically accommodated and permitted the specification of planning horizons for 2011, 2021 and 2031. Consequently the updated modelling procedures and macros were revised to designate 2006 as the Base Year Model. Each of the following macros were reviewed and edited to incorporate 2006 as the base year model within the modelling framework:

- *"Canberra.mac"* is the general macro used to run the full model. *Canberra-95p.mac* and *Canberra-965p.mac* are both similar to the original *"Canberra.mac"* with slight revisions to adjust input demographics and to incorporate captive PT users as part of the model run
- *"Tripgen.mac"* is the trip generation macro
- *"Tripdistrbn.mac"* is the trip distribution macro
- *"ModeSplitNew.mac"* is the model split model function used in the 2001 Model
- *"Runass2.mac"* is called to run the assignment algorithm
- *"ApplyParkingChanges.mac"* is used to apply the parking changes or trip redistribution to the adjacent roadway system based on the parking supply of adjacent traffic zones
- *"ChkModelConv.mac"* is used to calculate convergence parameters

5.2 Recalibration of Trip Distribution Function

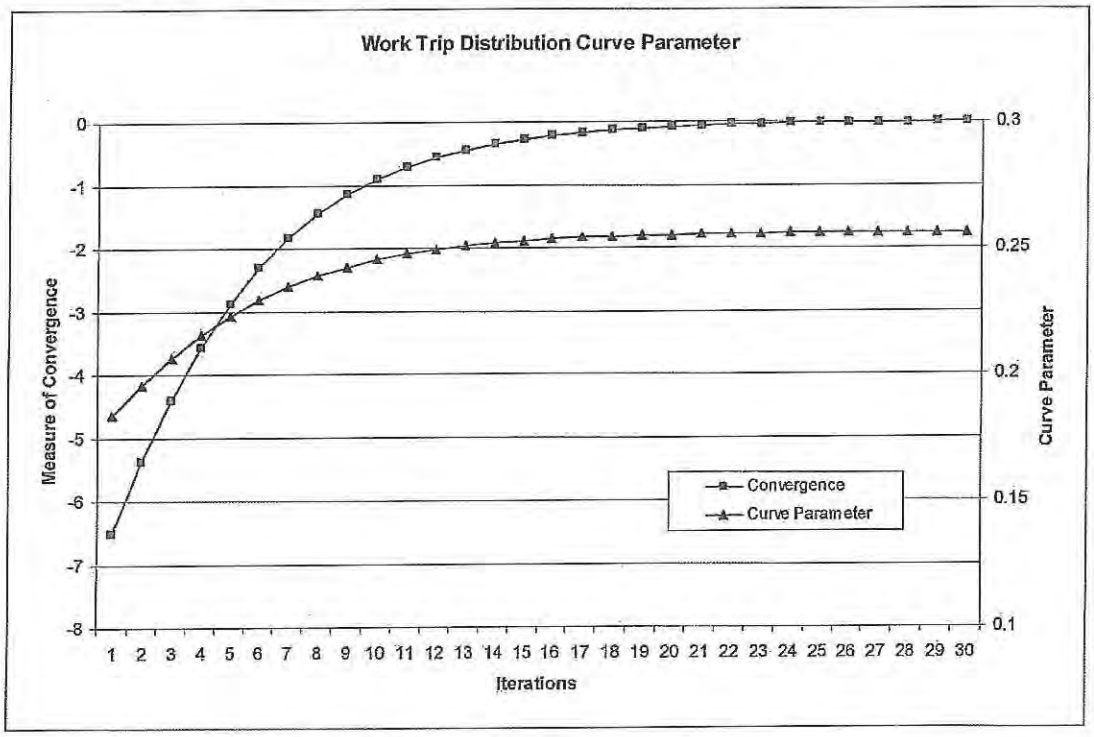
5.2.1 Trip Distribution Sub Model

The trip distribution functions used in the current 2001 Strategic Transport Model were reviewed as part of updating the procedures for the 2001 Base Year Model. Three specific trip distribution curve parameters had been previously defined for the 2001 Model Calibartion exercises for work, education and other trip purposes. These parameters had been recalibrated as part of the Canberra Strategic Transport Model – Public Transport Improvements Study using the surveys available at that time, including the 2001 Journey to Work Survey. As part of the update procedures for the 2006 Base Year Model, the 2006 Journey to Work Survey was reviewed and applied as means to recalibrate the trip distribution function as it relates to work trips. More updated travel data with respect to school trips and other trip purposes has not been collected since the 2001 calibration and consequently these parameters remain unchanged.

The trip distribution curve parameters as a result of the recalibration efforts resulted in a slight change to the curve parameter as noted below:

- Updated Work trip purposes: - 0.256 (previous model distribution function -0.230). A plot of the convergence and the curve parameter is documented in Figure 5.1: Work Trip Distribution Curve Parameter Calibration
- Education:(previously calibrated function - 0.608 remains in use with the 2006 update)
- Other: (previously calibrated function - 0.494 remains in use with the 2006 update)

Figure 5.1: Work Trip Distribution Curve Parameter Calibration*



* Based on updated 2006 Journey to Work Travel Survey data

5.2.2 Internalization and Intra-zonal Cost Functions

Some coefficients, coded into the matrix mf132 and called by the macro Skims.mac, were developed to increase internalization in Weston and Queanbeyan areas. Trip internalization refers to the proportion of travel that starts and ends within a single traffic zone or for larger district trips those that start and end within the district. The matrix also contains coefficients to reduce internalization in Civic area.

The intra-zonal cost function is determined based on "nearest neighbour" routine which identifies the least cost between two adjacent zones. The intra-zonal cost is then estimated as approximately 25% of the least cost by the macros intrazonalcost.mac.

5.3 Recalibration of Modal Split Function

The 2001Canberra Strategic Transport Model – Public Transport Improvements Study developed three mode split functions based on each of the three primary trip purposes; namely work trips school or education trips and other trip purposes. The comprehensive travel surveys available for the 2001 calibration, including the 2001 Journey to Work Survey facilitated the calibration efforts. The mode split function is generally defined as follows:

$$P_{PT} = \frac{1}{1+e^{\lambda(C_{Hwy}-C_{PT})+\alpha}}$$

where: P_{PT} = *proportion of public transport trips*
λ = *spread parameter*
C_{Hwy} = *highway generalised cost*
C_{PT} = *public transport generalised cost*
α = *mode constant*

The availability of the 2006 Journey to Work Survey provides a means to update the mode split function based on the reported travel behaviour for 2006. The mode split function as recalibrated for the 2006 travel behaviour is summaried in Table 5.1 for work trip purposes, while the parameters for remaining trip purposes remained unchanged.

Table 5.1: Mode Split Function Parameters

Trip purpose	Spread Parameter	Constant
Work	-0.27 *(ms35)*	0.66 *(ms52*ms35)*
Education	-0.2 *(ms36)*	0.2 *(ms53*ms36)*
Other	-0.3 *(ms37)*	3 *(ms54*ms37)*

Figures 5.2 and 5.3 highlight the relationships identified within the 2006 Journey to Work survey data which supported the revisions to the mode split functions for work trips. The probability of mode choice selection based on a function of the generalised cost functions for PT and car modes.

Figure 5.2: PT over Car Trips Probability as a Function of Cost Differences

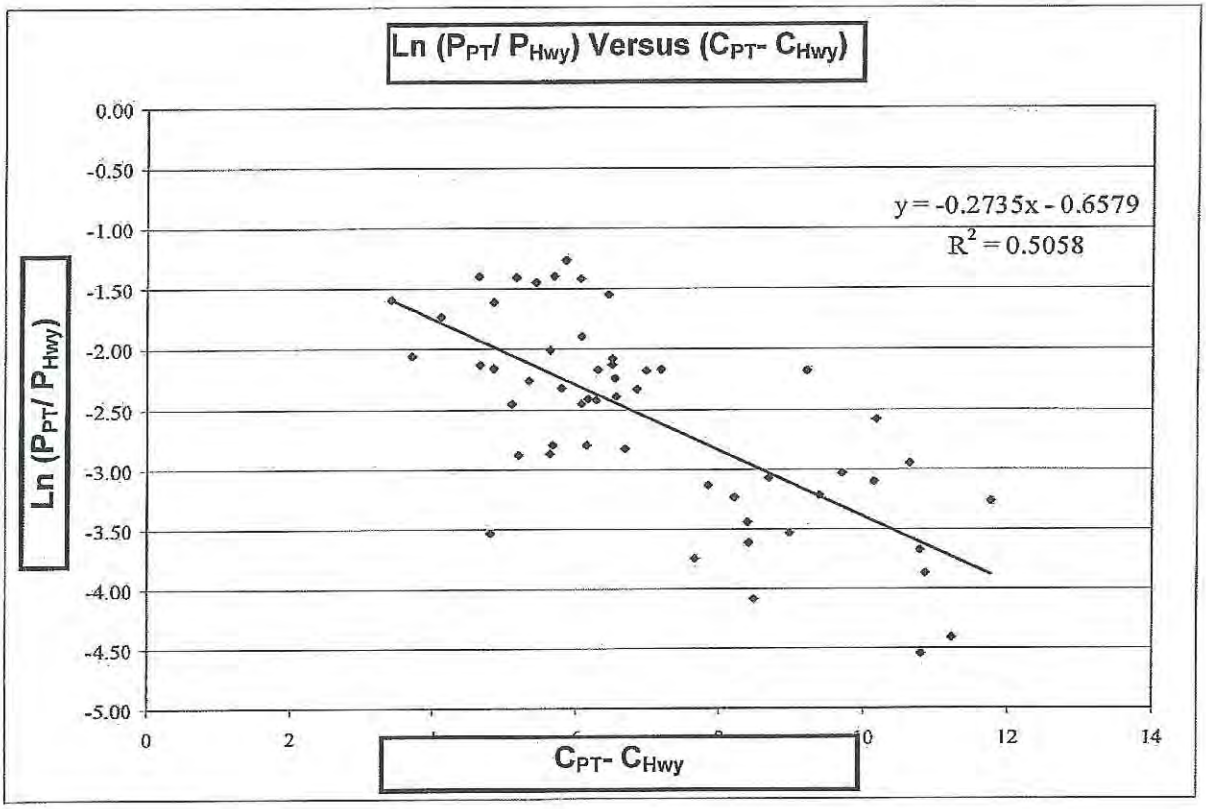
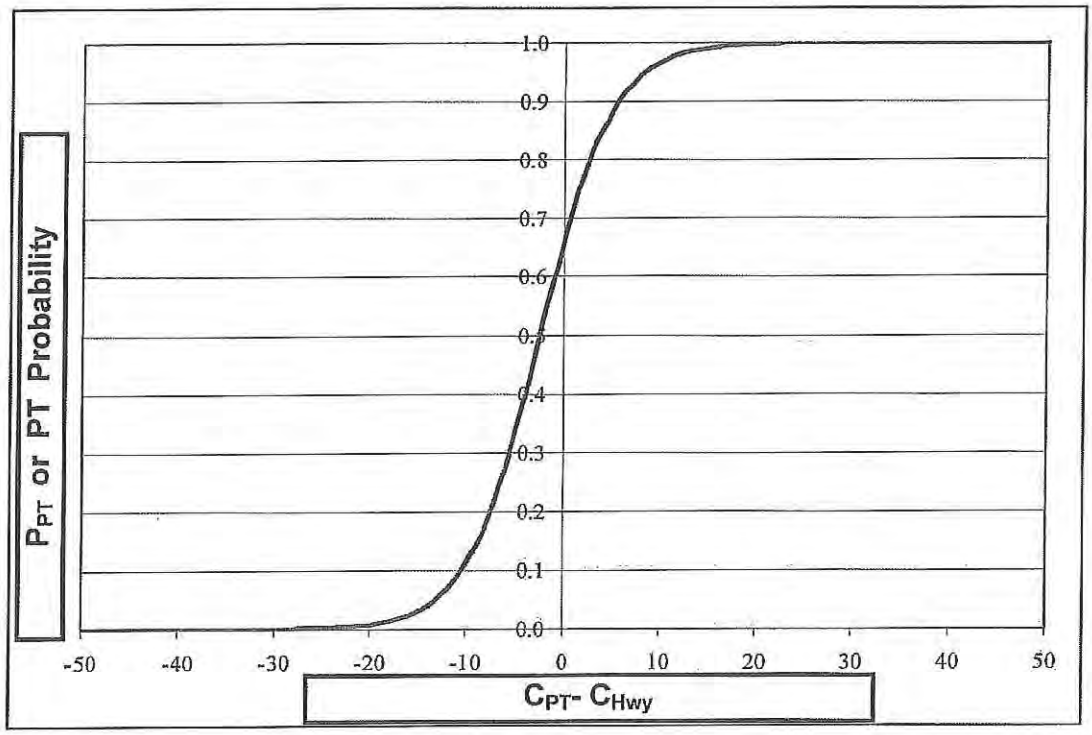


Figure 5.3: Work Trips PT Mode Split Function – Logit Model



5.4 Model Procedures and Summary of Revisions

The "run stream" for the Canberra Strategic Transport Model remains relatively unchanged in terms of the steps followed by users to carry out the day to day modelling. Each of the macros, input files as well as a number of the matrices accessed were reviewed and where appropriate updated to reflect the 2006 Base Year. The file naming convention has been retained as part of the 2006 Update and where necessary a number of changes and revisions were undertaken to allow for continued use of the previous "run stream" employed to carry out model runs. A summary of the various files accessed and changes implemented as part of the 2006 Base Year updating process and calibration are highlighted in Table 5.2.

Table 5.2: Summary of File Structure and Content Revisions

File Type	File Name	Description of the Revisions/Changes
macro	*Canberra.mac* *Canberra-95p.mac* *Canberra-965p.mac*	o 2006 Base Year substitution for previous 2001. o macro editing to support 2006 interchange file in PTAssign.mac. o trip distribution curve parameter for work trips redefined – used to call Tripdistrbn.mac o fuel cost parameter specified in macro statement
macro	*CalcCap&Spd.mac*	o incorporate changes to capacity, speed and peak factors based on review of various road types

File Type	File Name	Description of the Revisions/Changes
macro	*UserSpecific.mac*	o incorporate changes to the network based on updates since 2001 which entailed removal of manual adjustments to network parameters including a review and retention of required exceptions such as ramp speeds, etc.
Input file	*OtherJuncVDF6.211* *OtherJuncVDF11.211*	o incorporate network updates – called by UserSpecific.mac
Input file	*PFNorthb.211*	o incorporate network updates – called by UserSpecific.mac
Input file	*6popn.prn / 11popn.prn* *6Jobs.prn / 11Jobs.prn* *6retail.prn / 11retail.prn* *6Enrol.prn / 11Enrol.prn* *6recreate.prn/11recreate.prn* *6se1.prn / 11se1.prn* *6se2.prn / 11se2.prn* *6se3.prn / 11se3.prn* *6se4.prn / 11se4.prn* *6se5.prn / 11se5.prn* *6inclow.prn / 11inclow.prn* *6incmed.prn / 11incmed.prn* *6inchigh.prn / 11inchigh.prn*	o updated land use data, age and income distribution – called by LoadDemdata.mac o file structure and naming convention is retained for the updated Model Base Year 2006
macro	*TripGen.mac*	o 2006 Base Year substitution for previous 2001 o fuel cost parameter updated
Input file	*ScalarMxs.311*	o updated trip generation rates: general rate total (ms01) and for each trip purpose (ms02 to ms07) o updated trip adjustment factors based on age categories (ms08 to ms12) o updated trip adjustment factors based on income levels (ms13 to ms15) o work mode split function updated paramters (ms35 and ms52) o updated PT usage adjustment factors based on age categories (ms40 to ms44) o updated PT usage adjustment factors based on income levels (ms45 to ms47) o input file called by in the macro TripGen.mac
matrix	*mf132*	o coefficients developed to reflect trip internalization levels in Weston, Queanbeyan and Civic area – referenced in the macro Skims.mac
matrix	*mf31*	o parking charges location and cost updates to 2006 Base Year Model and are referenced in macro Skims.mac

File Type	File Name	Description of the Revisions/Changes
macro	*Intrazonalcost.mac*	o nearest neighbour methodology adopted to quantify intrazonal cost functions (~25% of travel to adjacent zones)– note intrazonal trips are not assigned to networks (these trips start and end within the same traffic zone).
Input file	*6ExtOrigs.prn / 11ExtOrigs.prn* *6ExtDestins.prn/11ExtDestins.prn*	o external related travel from/to zones located outside the Canberra area – referenced in the macro external.mac
macro	*TripDistrbn.mac*	o 2006 Base Year substitution for previous 2001
macro	*ModeSplitNew.mac*	o 2006 Base Year substitution for previous 2001
macro	*ApplyParkingChanges.mac*	o 2006 Base Year substitution for previous 2001
Input file	*CivicParkFactors.prn*	o parking distribution in Civic Area updated to reflect 2006 Base Year – referenced in ApplyParkingChanges.mac
macro	*ChkModelConv.mac*	o 2006 Base Year substitution for previous 2001
macro	*Runass2.mac*	o 2006 Base Year substitution for previous 2001
Input file	*inter600.prn / inter1100.prn* *node600.prn / node1100.prn* *turn600.prn / turn1100.prn*	o junction data updated to reflect 2006 Base Year in AMBaseJunc600.xls and for 2011 Planning Horizon AMBaseJunc1100.xls – referenced in macros inttype.mac and loadj.mac
macro	*j_out.mac*	o macro editing to limit mathematical divisions by zero
macro	*loadtur.mac*	o incorporate 2006 updates and to identify and prohibit specific movements such as use of highway ramps to avoid congested flow on highways.
macro	*PTAssign.mac*	o incorporate updates to file naming conventions particularly for 2006 and 2011 interchange file. o updates to junction data and delay reductions accrued to PT services where bus lanes and/or bus priorities exist.
Input file	*6ptint.241* *11ptint.241*	o updated files used to track interchange delays for various planning horizons. Previous 2001 Model relied on a single input file ptint.241 – called by PTAssign.mac
Input file	*Ramps.241*	o to overwrite ramp posted speed for a limited number of exceptions – referenced in macro UserSpecific.mac
Input file	*trafAM06.prn*	o incorporate network and traffic counts updates for 2006 – referenced by macro vdiff.mac

File Type	File Name	Description of the Revisions/Changes
macro	*MatrixTotals.mac*	o revised average trip length calculation
macro	*output.mac*	o incorporate updates to screenline crossings in 2006 and 2011 networks o updated numbering convention for files produced, this eliminates an overwriting issues by the main macro which occurred at the end of the run. o revised vehicle-km travelled calculation

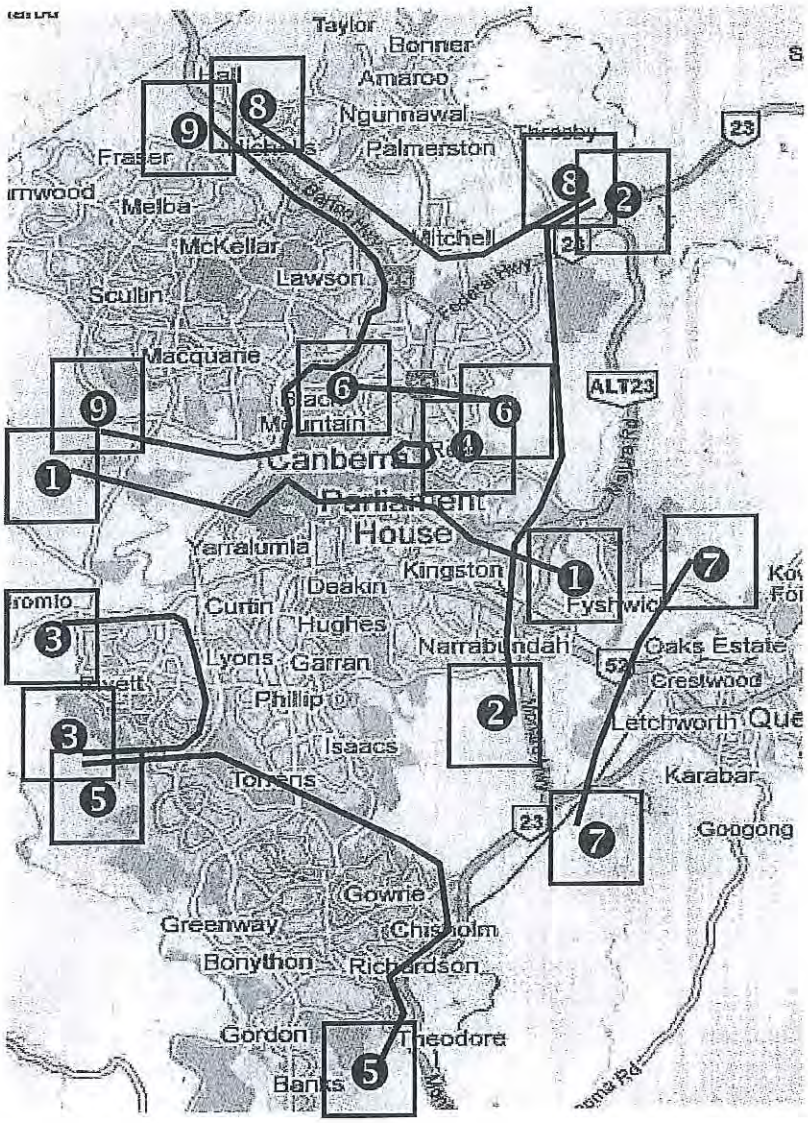
6 Model Validation Results

6.1 Validation for Base Year 2006 Conditions

6.1.1 Screenline Validation - Car Trips

As has been the practice in past model development updates, the City of Canberra has established a number of screenlines along strategic travel corridors. In most cases, the location of individual screenlines allow for isolation of specific sectors of the city and consequently provide a means to validate observed travel patterns and volumes against modeled traffic volumes. Observed traffic counts were obtained for individual roadways intersecting with each of the 9 Screenlines established for this study and are presented in Figure 6.1: Major Strategic Screenlines- Car Travel.

Figure 6.1: Major Strategic Screenlines – Car Trips



A review of the comprehensive traffic count program undertaken along major arterial roadways indicated that a large majority of the roadways had been counted in either 2004, 2005, 2006 or 2007. In only a few cases, the traffic count observations had been conducted prior to 2004 (i.e. 1999 and 2003). It is noted that the Canberra Strategic Transport Model has been developed for the AM peak period reflecting a two hour traffic period. The peak hour to peak period relationship along individual corridors was used where required to prepare estimates for the AM peak period for each of the Screenline locations. A summary of the comparison of the observed Screenline traffic volumes and the modelled volume is presented in Table 6.1: 2006 Base Year Screenline Traffic Volumes (Vehicles). The peak directional travel flow during the AM peak as would be expected is inbound (towards the City Centre) and is approximately 65 percentage of the two way traffic volume over the two hour AM peak period.

Table 6.1: Base Year 2006 Screenline Traffic Volumes (Vehicles)

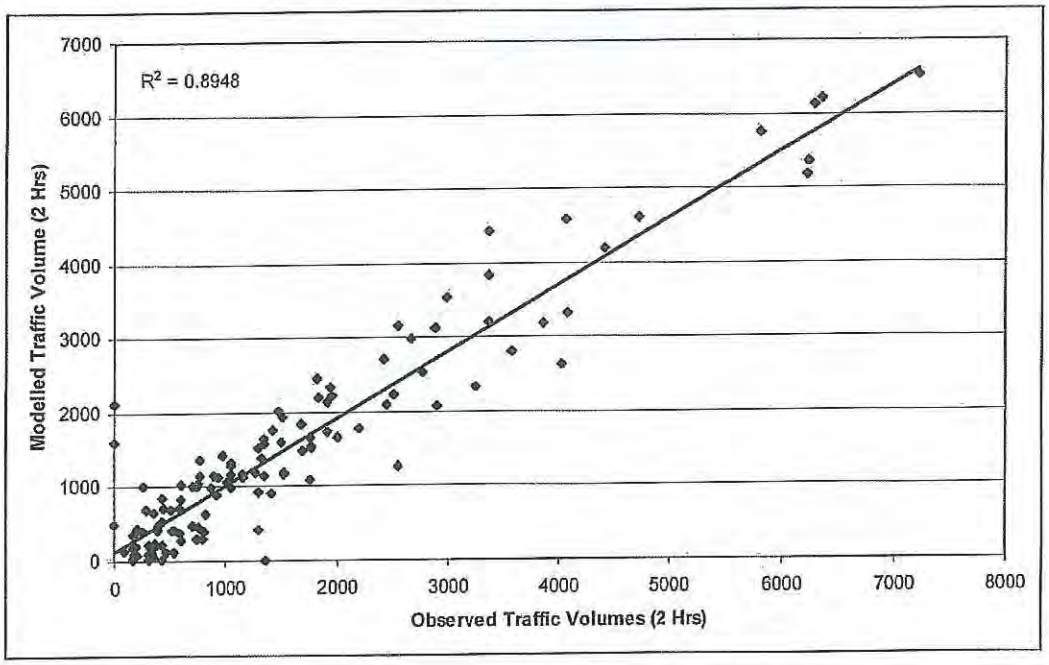
Screenline			Traffic Volume (2 Hours)		Observed Minus Model		
Number		Name/Location	Observed Traffic	Model Traffic	Volume	%	GEH
Inbound	1	Lake Burley Griffin	20,870	19,820	1,015	5%	7
	2	SE Canberra	12,460	12,255	210	2%	2
	3	Weston Creek	6,780	7,145	-365	-5%	4
	4	Civic	18,780	17,760	1,020	5%	8
	5	Tuggeranong	19,320	20,245	-925	-5%	7
	6	MacArthur/ Wakefield Ave	10,975	10,730	245	2%	2
	7	Queanbeyan	9,280	9,440	-160	-2%	2
	8	Gungahlin	9,350	9,120	230	2%	2
	9	Belconnen	19,070	18,460	610	3%	4
Total Inbound			**126,885**	**124,975**	**1,910**	**2%**	**5**
Outbound	1	Lake Burley Griffin	17,400	14,430	2,970	17%	24
	2	SE Canberra	10,605	8,840	1,765	17%	18
	3	Weston Creek	3,050	3,605	-555	-18%	10
	4	Civic	10,675	9,725	950	9%	9
	5	Tuggeranong	5,995	7,795	-1,800	30%	22
	6	MacArthur/ Wakefield Ave	5,830	4,520	1,315	23%	18
	7	Queanbeyan	3,190	3,520	-330	-10%	6
	8	Gungahlin	4,225	4,420	-195	-5%	3
	9	Belconnen	11,100	13,165	-2,065	-19%	19
Total Outbound			**72,070**	**70,020**	**2,050**	**3%**	**8**

Note: All Traffic rounded to nearest 5 vehicles
Inbound traffic direction refers to travel orientation towards the City Centre

As with most planning models the peak travel direction with the higher observed traffic volumes are typically more reasonably represented in the model. The non-peak "outbound" traffic volumes show more variation across individual screenlines than the peak direction. In addition, it should be pointed out that the base 2006 observed traffic volumes are an estimate based on a series of traffic counts undertaken over a number of years as well as in some cases expanded to reflect the two hour peak period.

A plot of the observed traffic volume against the model volumes for individual roadways crossing the 9 strategic screenlines are presented in Figure 6.1: Observed versus Modelled Traffic Volumes for the AM peak period (2 hours). The plot highlights the variation of the observed versus modelled traffic and presents each of the travel directions individually for all roadway crossings for each of the 9 Strategic Screenlines. An R squared value of 0.89 indicates an acceptable level of validation level between the modelled volumes and the estimate of the observed traffic for each of the roadways covered by the 9 Screenlines. A tabular listing of the screenline roadway crossings, the estimated existing traffic volumes and the modeled traffic volumes for the updated 2006 base year have been included as Appendix C.

Figure 6.1: Observed Peak Period Traffic Volumes versus Modelled Traffic Volumes

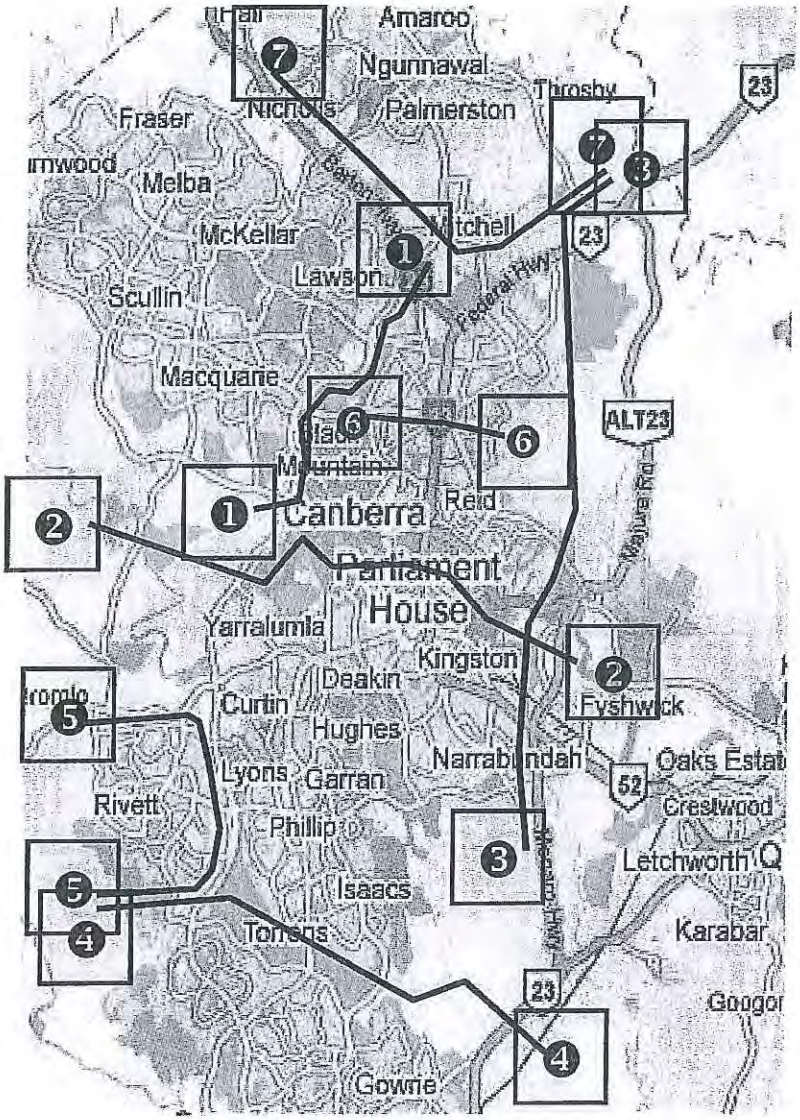


6.1.2 Screenline Validation - Public Transport Passenger Trips

The Public Transport Screenlines identified to facilitate the validation of the updated 2006 Base Year model were established following a review of the availability of PT passenger counts for the base year 2006. Passenger count data had been provided by ACT for all major PT lines serving Canberra and were tabulated in a format which identified passenger loads for all PT services crossing each of the individual screenlines. The 7 Major Strategic Screenlines – PT Services established for Canberra are presented in Figure 6.2: Major Strategic Screenlines- PT Services.

A review of the observed PT volumes crossing the various screenlines was undertaken with a view to establish a representative 2006 base year passenger flow estimates at each of the 7 Strategic Screenlines identified. In addition, while the DBL PT Services have been included in the updated 2006 Base Year Model, it was noted that estimates of current ridership estimates for DBL operated lines were not available and consequently they have been excluded for the 2006 PT validation. It was also noted that the DBL services as modelled represented approximately 2,200 passenger trips or about 6% of the total PT passenger volumes crossing the seven PT Screenlines.

Figure 6.2: Major Strategic



Screenlines – PT Services

A summary of the comparison of the estimated Screenline PT passenger volumes and the modelled volumes are presented in Table 6.2: 2006 Base Year Screenline PT Volumes (Passengers). The peak directional travel flow during the AM peak as would be expected is inbound (towards the City Centre) and is approximately 75 percentage of the two way passenger volumes crossing the screenlines. Much of the PT services are oriented to the City Centre and the strong directional split is reasonable.

In general a review of the estimated PT flows against the modelled results suggest an overestimation of public transport trips across most screenlines, however it is also noted that further investigations of city-wide PT mode splits suggest otherwise. Comparisons were undertaken with respect to the reported city wide mode splits for Canberra and past surveys indicated that the current level of PT mode split for Canberra was reported at approximately 9.7%. The updated 2006 Base Year Model has a modelled PT mode split of approximately 8 % of all city wide travel. As a result, the slight overestimate along the strategic screenlines may be attributed to current assumptions associated with the development of the PT estimates for specific screenline crossing locations.

Table 6.2: Base Year 2006 Screenline PT Volumes (Passengers)

Screenline			Passenger Volumes (2 Hours)		Observed Minus Model		
Number		Name/Location	Observed (Passgr)	Model (Passgr)	Volume (Passgr)	%	GEH
Inbound	1	Belconnen	2,335	2,565	230	10%	5
	2	Lake Burley Griffin	2,730	3,610	880	32%	16
	3	SE Canberra	250	425	175	70%	10
	4	Tuggeranong	2,075	3,230	1,155	56%	22
	5	Weston Creek	565	655	90	16%	4
	6	MacArthur/ Wakefield Ave	2,130	1,725	-405	-19%	9
	7	Gungahlin	1,090	1,460	370	34%	10
Total Inbound			**11,175**	13,670	2,495	22%	22
Outbound	1	Belconnen	855	1,125	270	32%	9

	2	Lake Burley Griffin	1,350	1,400	50	4%	1
	3	SE Canberra	60	1,195	1,135	1892%	45
	4	Tuggeranong	335	500	165	49%	8
	5	Weston Creek	20	135	115	575%	13
	6	MacArthur/ Wakefield Ave	355	385	30	8%	2
	7	Gungahlin	430	160	-270	-63%	16
Total Outbound			**3,405**	4,900	1,495	44%	23

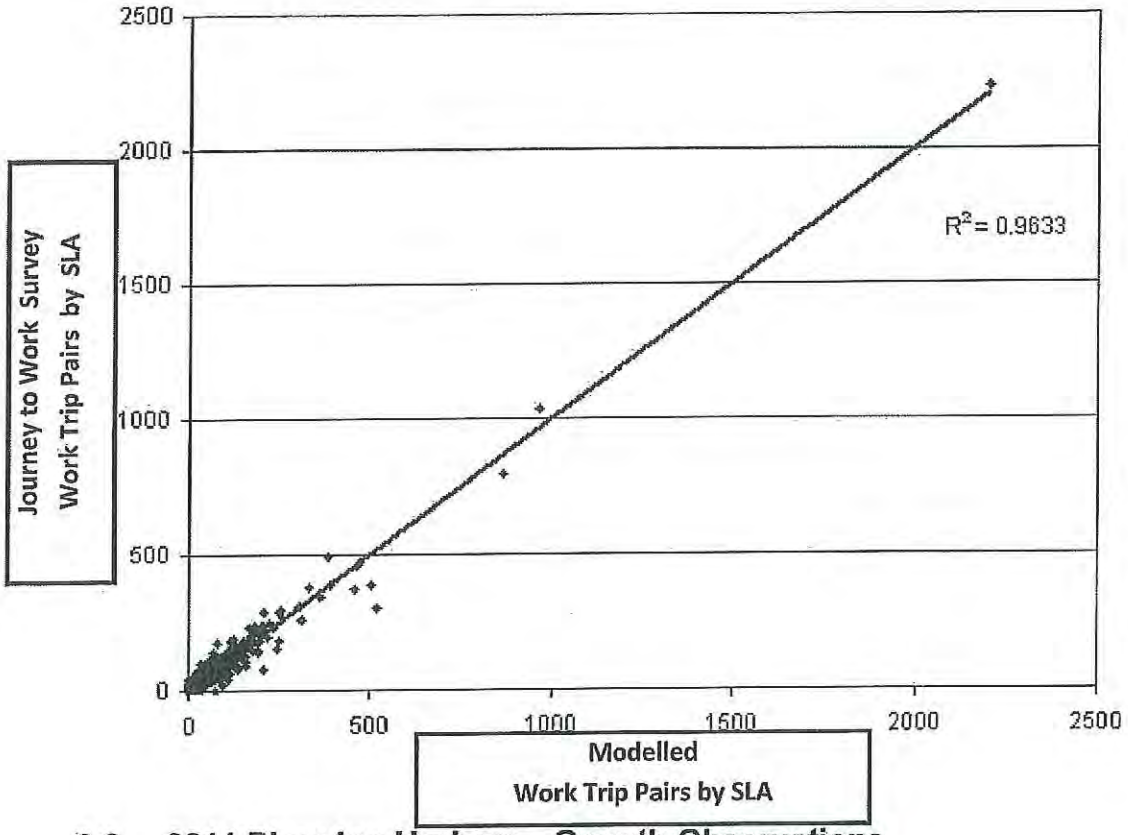
Note: All PT volumes rounded to nearest 5 passengers
Inbound traffic direction refers to travel orientation towards the City Centre
DBL Services have been excluded from estimates and modelled PT volumes noted above

6.1.3 2006 Journey to Work Survey

As highlighted and presented in previous sections of this report the update of the 2006 Base Year Model included a review and analysis of the trip behaviour and patterns obtained from the 2006 Journey to Work Survey. The traffic zone system used in the Strategic Transport Model was aggregated consistent with the Statistical Local Area (SLA) geographic referencing used in the Journey to Work Survey. As a result the trip distribution for work trip purposes as modelled could then be directly validated against the reported trip distribution patterns obtained form the Journey to Work Survey.

Figure 6.4 highlights the high level of consistency between the modeled work trip distribution and that observed in the 2006 Journey to Work Survey. The reported R squared value of 0.96 indicates an extremely strong correlation between the two data sets and strongly supports the use of the updated trip distribution functions for work trips.

Figure 6.3: Work Trip Distribution –Journey to Work Survey versus updated 2006 Model



6.2 2011 Planning Horizon – Growth Observations

The review of the projected demographic land use changes planned to occur over the planning period to 2011 was undertaken. The purpose of this review was to provide a basis to compare the results (both Car travel and PT passenger trips) obtained from the application of the updated Strategic Transport Model for the 2011 planning horizon. A growth in population and/or employment was attributed to each of the planning areas and compared against the observed changes in forecast trips. Tables 6.4 and Table 6.5 summarize the growth in travel by trip origin and by trip destinations over the five year planning horizon at the planning district level of analysis.

Table 6.3: 2011 Growth in Trip Origins by Planning Area

Planning Area	2006	2011	Growth	Observation/Rationale
Gungahlin	19,220	27,930	45%	+47% net population growth
Belconnen	48,320	49,760	3%	+4% net population growth
North Canberra	27,945	31,265	12%	+11% net population growth
South Canberra	16495	18,520	12%	+15% net population growth
Woden	31795	32,485	2%	+3% net population growth
Fyshwick + East Lakes	3755	4,140	10%	+10% net employment growth
Tuggeranong	49460	48,605	-2%	-1% net loss in population levels
Queanbeyan	22015	24,375	11%	+11% net population growth
Molonglo	-	945	n/a	1,680 new residents in the area
Total	**219,005**	**238,025**	**9%**	

Table 6.5: Major Strategic Screenlines - 2011 Growth in Car Trips

Screenline			Traffic Volume (2 Hours)		Growth in Traffic Volumes	
Number		Name/Location	2006	2011	Volume	%
Inbound	1	Lake Burley Griffin	19,820	20230	410	2%
	2	SE Canberra	12,255	12465	210	2%
	3	Weston Creek	7,145	6700	-445	-6%
	4	Civic	17,760	19485	1,725	10%
	5	Tuggeranong	20,245	18880	-1,365	-7%
	6	MacArthur/ Wakefield Ave	10,730	11645	915	9%
	7	Queanbeyan	9,440	10125	685	7%
	8	Gungahlin	9,120	12660	3,540	39%
	9	Belconnen	18,460	19530	1,070	6%
Total Inbound			**124,975**	**131,720**	**6,745**	**5%**
Outbound	1	Lake Burley Griffin	14,430	14915	485	3%
	2	SE Canberra	8,840	10185	1,345	15%
	3	Weston Creek	3,605	3570	-35	-1%
	4	Civic	9,725	10105	380	4%
	5	Tuggeranong	7,795	7570	-225	-3%
	6	MacArthur/ Wakefield Ave	4,520	4350	-170	-4%
	7	Queanbeyan	3,520	3665	145	4%
	8	Gungahlin	4,420	4985	565	13%
	9	Belconnen	13,165	13640	475	4%
Total Outbound			**70,020**	**72,985**	**2,965**	**4%**

Table 6.6: Major Strategic Screenlines - 2011 Growth in PT Trips

Screenline			Passenger Volumes (2 Hours)		Growth in PT Passenger Volumes	
Number		Name/Location	2006	2011	Volume	%
Inbound	1	Belconnen	2,565	2835	270	11%
	2	Lake Burley Griffin	3,610	4000	390	11%
	3	SE Canberra	425	640	215	51%
	4	Tuggeranong	3,230	3145	-85	-3%
	5	Weston Creek	655	880	225	34%
	6	MacArthur/ Wakefield Ave	1,725	2500	775	45%
	7	Gungahlin	1,460	2340	880	60%
Total Inbound			**13,670**	**16,340**	**2670**	**20%**
Outbound	1	Belconnen	1,125	1160	35	3%
	2	Lake Burley Griffin	1,400	1680	280	20%
	3	SE Canberra	1,195	1655	460	38%
	4	Tuggeranong	500	475	-25	-5%
	5	Weston Creek	135	325	190	141%
	6	MacArthur/ Wakefield Ave	385	355	-30	-8%
	7	Gungahlin	160	115	-45	-28%
Total Outbound			**4,900**	**5,765**	**865**	**18%**

Table 6.4: 2011 Growth in Trip Destinations by Planning Area

Planning Area	2006	2011	Growth	Observation/Rationale
Gungahlin	11,205	14,930	33%	+14% net employment growth +29% retail growth +26% enrollment growth
Belconnen	40,245	42,345	5%	
North Canberra	53,180	59,635	12%	+15% net employment growth
South Canberra	26,610	27,960	5%	
Woden	28,830	30,005	4%	
Fyshwick + East Lakes	15,450	17,075	11%	+10% net employment growth +20% net retail growth
Tuggeranong	30,150	30,900	2%	
Queanbeyan	13,320	14,875	12%	+14% net employment growth
Molonglo	-	295	n/a	
Total	**218,990**	**238,020**	**9%**	

In addition to highlighting the growth by planning district, the 2011 forecast growth in travel across the previously identified Major Strategic Screenlines has also been tabulated in Table 6.6 and Table 6.7. The forecast growth across all screenlines analysed indicates that over the five year planning period to 2011, car trips are forecast to increase by 8% (approximately 7,300 trips) in the peak direction of travel and PT passenger flows in the peak inbound direction are forecast to increase at a higher rate of growth 15% (an approximate 2,200 increase in 2006 estimated PT riders). A further review of the forecast 2011 growth in car trips for various individual screenlines indicated the following:

- Significant car growth across the Gungahlin Screenline (almost 40% increase for Inbound traffic) which is consistent with the projected strong growth in population over the five year planning period. PT growth is also noted (almost 60%) again reflecting the growth in residential development and the radial PT services penetrating the central area of Canberra. Non-peak (outbound) car traffic is also forecast to increase by 19% and reflects strong employment growth for this region;
- Strong growth in travel across the Civic Screenline is consistent with the projected employment growth in North Canberra over the five year planning period to 2011.
- The forecast travel across the Tuggeranong Screenline represents a reduction in peak period person trips for both travel by car and PT services. Both a net loss in population as well as demographic changes over the five year planning period contribute to this reduction in AM peak period forecast.
- Growth in public transport passenger volumes are forecast for the MacArthur/ Wakefield Screenline (southbound or inbound peak travel direction). Growth in travel is split between car and PT modes and as a proportion represents almost 50% increase in PT trips highlighting the increase in competiveness PT services have attained over the car mode. Also it is noted that continued growth in population for both Gungahlin and North Canberra sectors of the City also contributed to growth in travel across the MacArthur/ Wakefield Screenline.

6.3 General Overview of Base Year and Model Results

The base year 2006 demographics were provided by TAMS and indicated an approximate growth over the 2001 conditions of 4.5 percent for population while the employment levels grew at a higher rate of slightly more than 10 percent over the same five year period. The total growth in person trips associated with the AM peak period as predicted by the updated 2006 Base Year model indicated an approximate increase of 9% in total trips as well as a similar growth for car trips. The updated 2006 model also forecast PT mode split of approximately 8 % for 2006 which compares well against other available estimates of 9.7% PT mode split as presented in the Booz Allen Hamilton Report and the 6.1% PT mode split as identified for the in-scope trips associated with Belconnen to Civic Survey. The 2006 model results also report a 10.5 % PT mode split when only work trips are considered and this PT mode split compares well with current estimates of the PT mode split of 10.4% as reported by the 2006 Journey to Work Survey.

The 2006 Model update also results in a slight shift among the modelled trip purposes with a slightly higher share for work trips with 39 % of all AM peak period being classified as work trips. This proportion is higher than the 2001 Model results of 33 %, however compares well with the 1997 HITS which had estimated 35% of the peak period trips were for work purposes. Increases in estimates of the employed labour force participation rates over the planning period considered may also have contributed to the reported 2006 mode update increase in work trips during the AM peak period.

The 2006 reported model travel times for both PT and car modes compare well with previous estimates provide by the 2001 model where available. The travel time estimates available from the Belconnen to Civic Survey are associated with a select set of O-D pairs and as a result are not adequately influenced by the shorter trip lengths within sectors of the city.

The results of the 2011 forecast indicate overall trip growth (9% between the 2006 and 2011 planning horizon) tracks the projected growth in population and employment rates of 8.8 and 7.9%, respectively over the five year planning period. The growth in PT ridership, the planned infrastructure improvements over the planning period as well as the spatial distribution of the projected population and employment all contribute to the reported slight reduction in average car travel times. It is noted that while the PT ridership is estimated to increase by approximately 13 % at a rate higher than total person trip growth of 9%, the PT mode share only increases marginally to 8.3 %, however the PT mode split associated with work trips is more sensitive over the planning period increase to 11.7 in 2011 compared with a reported 10.5% in 2006. The lower PT mode split % increase reflects the growth in both Car and PT trips.

Table 6.7: General Comparison of Estimated Base Year Statistics with Modelled Results

	2001 Model Calibration*	2006 Model Calibration**	Growth 2001 to 2006	2011 Model Forecast	Growth 2006 to 2011	Comments (other sources of observed data)
Population (Census)	354,000	370,000	4.5%	402,600	8.8%	***Base Year Demographics and projections provided by ACTPLA***
Employment (Census)	187,800	207,000	10.2%	223,400	7.9%	
Total Person Trips	212,000	219,000	3%	238,000	8%	***Mode Splits (MS)***
Car Trips	153,500	156,000	2%	169,500	8%	***9.7% Peaks:*** Booz, Allen, Hamilton Elasticity Report
Average Trip Length	8.73 km	10.54 km	-	10.16 km	-4%	***7% Daily:*** Booz, Allen, Hamilton Elasticity Report
Public Transport Trips	6,850	16,900	147%	19,600	14%	***6.1% Peaks:*** Belconnen to Civic Bus Passenger Survey
Mode Split –PT	3.2%	7.8%	-	8.3%	-	
Work Trips	n/a	85,250	-	92,700	8%	***135,600 One-way Work Trips***: 2006 Journey to Work Survey
Mode Split–PT	n/a	10.5%	-	11.7%	-	***10.4% MS for Work Trips:*** 2006 Journey to Work Survey
Trip Purpose						HITS (1997)
– work	33 %	39 %		39 %		35 %
– education	22 %	17%		17 %		11%
– other	45 %	44%		44 %		54%
Average Car Travel Times	11.3m	11.90m	6%	11.52m	-3%	16 min Belconnen to Civic
Average PT Travel Times	n/a	17.4m (in veh)	-	17.5m(in veh)	0%	30 min Belconnen to Civic
	n/a	28.5m (in veh & walk)	-	29.1m(in veh & walk)	2%	

* Previous 2001 Calibration Study
** Current 2006 Calibration Study

Appendix A

A-1 Public Transport Networks 2006 Base Year and 2011

Table A1.1: Regular Service PT Lines 2006 /2011

2006 "Regular" Service PT Lines

	Line	Description	Mode	Hwy
1	216e	Extended 16 EB	b	20
2	16w	Line 16 WB	b	30
3	17e	Line 17 EB	b	45
4	217e	Extended 17 EB	b	40
5	17w	Line 17 WB	b	45
6	21L	Line 21 Loop	b	30
7	22L	Line 22 Loop	b	30
8	23L	Line 23 Loop	b	30
9	24L	Line 24 Loop	b	30
10	25e	Line 25 EB	b	60
11	225e	Extended 25 EB	b	45
12	25w	Line 25 WB	b	60
13	126e	Extended 26 EB	b	20
14	26w	Line 26 WB	b	45
15	227e	Extended 27 EB	b	45
16	27w	Line 27 WB	b	45
17	28e	Line 28 EB	b	30
18	28w	Line 28 WB	b	60
19	30e	Line 30 EB	b	15
20	30w	Line 30 WB	b	30
21	31e	Line 31 EB	b	30
22	31w	Line 31 WB	b	30
23	33n	Line 33 NB	b	30
24	33s	Line 33 SB	b	30
25	34n	Line 34 NB	b	30
26	34s	Line 34 SB	b	30
27	35n	Line 35 NB	b	30
28	35s	Line 35 SB	b	30
29	36n	Line 36 NB	b	30
30	36s	Line 36 SB	b	30
31	37n	Line 37 NB	b	30
32	38n	Line 38 NB	b	15
33	38s	Line 38 SB	b	15
34	39n	Line 39 NB	b	30

2011 "Regular" Service PT Lines

	Line	Description	Mode	Hwy
1	02n	Line 02 NB	b	15
2	02s	Line 02 SB	b	15
3	03n	Line 03 NB	b	20
4	03s	Line 03 SB	b	20
5	04ne	Line 04 NE	b	20
6	04nw	Line 04 NW	b	15
7	04se	Line 04 SE	b	20
8	04sw	Line 04 SW	b	15
9	05n	Line 05 NB	b	15
10	05s	Line 05 SB	b	15
11	06n	Line 06 NB	b	30
12	06s	Line 06 SB	b	30
13	07e	Line 07 EB	b	30
14	07w	Line 07 WB	b	30
15	08n	Line 08 NB	b	30
16	08s	Line 08 SB	b	30
17	09e	Line 09 EB	b	30
18	09w	Line 09 WB	b	30
19	10e	Line 10 EB	b	20
20	10w	Line 10 WB	b	30
21	13e	Revised Line 13 EB	b	30
22	13w	Revised Line 13 WB	b	30
23	14n	Revised Line 14 NB	b	30
24	14s	Revised Line 14 SB	b	30
25	16e	Line 16 EB	b	30
26	16w	Line 16 WB	b	30
27	17e	Line 17 EB	b	30
28	17w	Line 17 WB	b	30
29	21L	Line 21 Loop	b	30
30	22L	Line 22 Loop	b	30
31	23L	Line 23 Loop	b	30
32	24L	Line 24 Loop	b	30
33	225e	Extended Line 25 EB	b	30
34	225w	Extended Line 25 WB	b	45

2006 Con't
"Regular" Service PT Lines

35	39s	Line 39 SB	b	30
36	40e	Line 40 EB	b	30
37	40w	Line 40 WB	b	30
38	41e	Line 41 EB	b	30
39	41w	Line 41 WB	b	30
40	42e	Line 42 EB	b	60
41	42w	Line 42 WB	b	60
42	43L	Line 43 Loop	b	30
43	243s	Extended 43 SB	b	45
44	44e	Line 44 EB	b	45
45	244e	Extended 44 EB	b	60
46	44w	Line 44 WB	b	30
47	45L	Line 45 Loop	b	30
48	47L	Line 47 Loop	b	30
49	48e	Line 48 EB	b	30
50	48w	Line 48 WB	b	30
51	51e	Line 51 EB	b	20
52	51w	Line 51 WB	b	20
53	52e	Line 52 EB	b	20
54	52w	Line 52 WB	b	20
55	53e	Line 53 EB	b	20
56	53w	Line 53 WB	b	20
57	54e	Line 54 EB	b	20
58	54w	Line 54 WB	b	20
59	55e	Line 55 EB	b	20
60	55w	Line 55 WB	b	20
61	56e	Line 56 EB	b	20
62	56w	Line 56 WB	b	20
63	60n	Line 60 NB	b	45
64	160n	Extended 60 NB	b	45
65	60s	Line 60 SB	b	30
66	61n	Line 61 NB	b	30
67	61s	Line 61 SB	b	30
68	62n	Line 62 NB	b	45
69	162n	Extended 62 NB	b	45
70	62s	Line 62 SB	b	30
71	63n	Line 63 NB	b	25
72	63s	Line 63 SB	b	40
73	64n	Line 64 NB	b	30
74	64s	Line 64 SB	b	30

2011 Con't
"Regular" Service PT Lines

35	226e	Extended Line 26 EB	b	30
36	226w	Extended Line 26 WB	b	45
37	227e	Extended Line 27 EB	b	30
38	227w	Extended Line 27 WB	b	45
39	28e	Line 28 EB	b	30
40	28w	Line 28 WB	b	60
41	30e	Line 30 EB	b	15
42	30w	Line 30 WB	b	30
43	31e	Line 31 EB	b	30
44	31w	Line 31 WB	b	30
45	39L	Line 39 Loop	b	15
46	51e	Line 51 EB	b	20
47	51w	Line 51 WB	b	20
48	52e	Line 52 EB	b	20
49	52w	Line 52 WB	b	20
50	59e	Line 59 EB	b	20
51	59w	Line 59 WB	b	20
52	60n	Line 60 NB	b	30
53	60s	Line 60 SB	b	30
54	61n	Revised Line 61 NB	b	30
55	61s	Revised Line 61 SB	b	30
56	62n	Line 62 NB	b	30
57	62s	Line 62 SB	b	30
58	64n	Revised Line 64 NB	b	30
59	64s	Revised Line 64 SB	b	30
60	67n	Revised Line 67 NB	b	30
61	67s	Revised Line 67 SB	b	30
62	68n	New Line 68 NB	b	30
63	68s	New Line 68 SB	b	30
64	69n	New Line 69 NB	b	30
65	69s	New Line 69 SB	b	30

2006 "Regular" Service PT Lines Con't

75	65n	Line 65 NB	b	30
76	265n	Extended 65 NB	b	60
77	65s	Line 65 SB	b	30
78	66n	Line 66 NB	b	30
79	66s	Line 66 SB	b	30
80	67n	Line 67 NB	b	30
81	267n	Extended 67 NB	b	60
82	67s	Line 67 SB	b	30
83	80n	Line 80 NB	b	30
84	80s	Line 80 SB	b	30
85	83L	Line 83 Loop	b	30
86	86L	Line 86 Loop	b	30

Table A1.2: Intertown PT Lines 2006 /2011

2006 "Intertown" Service PT Lines

	Line	Description	Mode	Hwy
1	300n	Intertown 300 NB	b	60
2	312n	Intertown 312 NB	b	25
3	312s	Intertown 312 SB	b	25
4	313n	Intertown 313 NB	b	25
5	313s	Intertown 313 SB	b	25
6	314n	Intertown 314 NB	b	25
7	314s	Intertown 314 SB	b	25
8	315n	Intertown 315 NB	b	20
9	315s	Intertown 315 SB	b	20

2011 "Intertown" Service PT Lines

	Line	Description	Mode	Hwy
1	312n	Intertown 312 NB	b	30
2	312s	Intertown 312 SB	b	20
3	315n	Intertown 315 NB	b	30
4	315s	Intertown 315 SB	b	20
5	318n	Intertown 318NB New	b	30
6	318s	Intertown 318SB New	b	20
7	319n	Intertown 319NB New	b	30
8	319s	Intertown 319SB New	b	20
9	371n	Intertown 371NB New	b	20
10	371s	Intertown 371SB New	b	30
11	372n	Intertown 372NB New	b	20
12	372s	Intertown 372SB New	b	30

Table A1.3: DBL Service PT Lines 2006 /2011

2006 "DBL" Service PT Lines

	Line	Description	Mode	Hwy
1	D830e	DBL Line 830 EB	f	60
2	D830w	DBL Line 830 WB	f	30
3	D831e	DBL Line 831 EB	f	60
4	D831w	DBL Line 831 WB	f	60
5	D833e	DBL Line 833 EB	f	60
6	D833w	DBL Line 833 WB	f	60
7	D834L	DBL Line 834 Loop	f	60
8	D835L	DBL Line 835 Loop	f	60
9	D836n	DBL Line 836 NB	f	30
10	D838L	DBL Line 838 Loop	f	60
11	D839L	DBL Line 839 Loop	f	30

2011 "DBL" Service PT Lines

	Line	Description	Mode	Hwy
1	D830e	DBL Line 830 EB	f	40
2	D830w	DBL Line 830 WB	f	30
3	D831e	DBL Line 831 EB	f	60
4	D831w	DBL Line 831 WB	f	30
5	D833e	DBL Line 833 EB	f	60
6	D833w	DBL Line 833 WB	f	60
7	D834L	DBL Line 834 Loop	f	30
8	D835L	DBL Line 835 Loop	f	60
9	D836n	DBL Line 836 NB	f	30
10	D838L	DBL Line 838 Loop	f	60
11	D839L	DBL Line 839 Loop	f	30

Table A1.4: Regular Service PT Lines 2006 /2011

2006
"Express" Service PT Lines

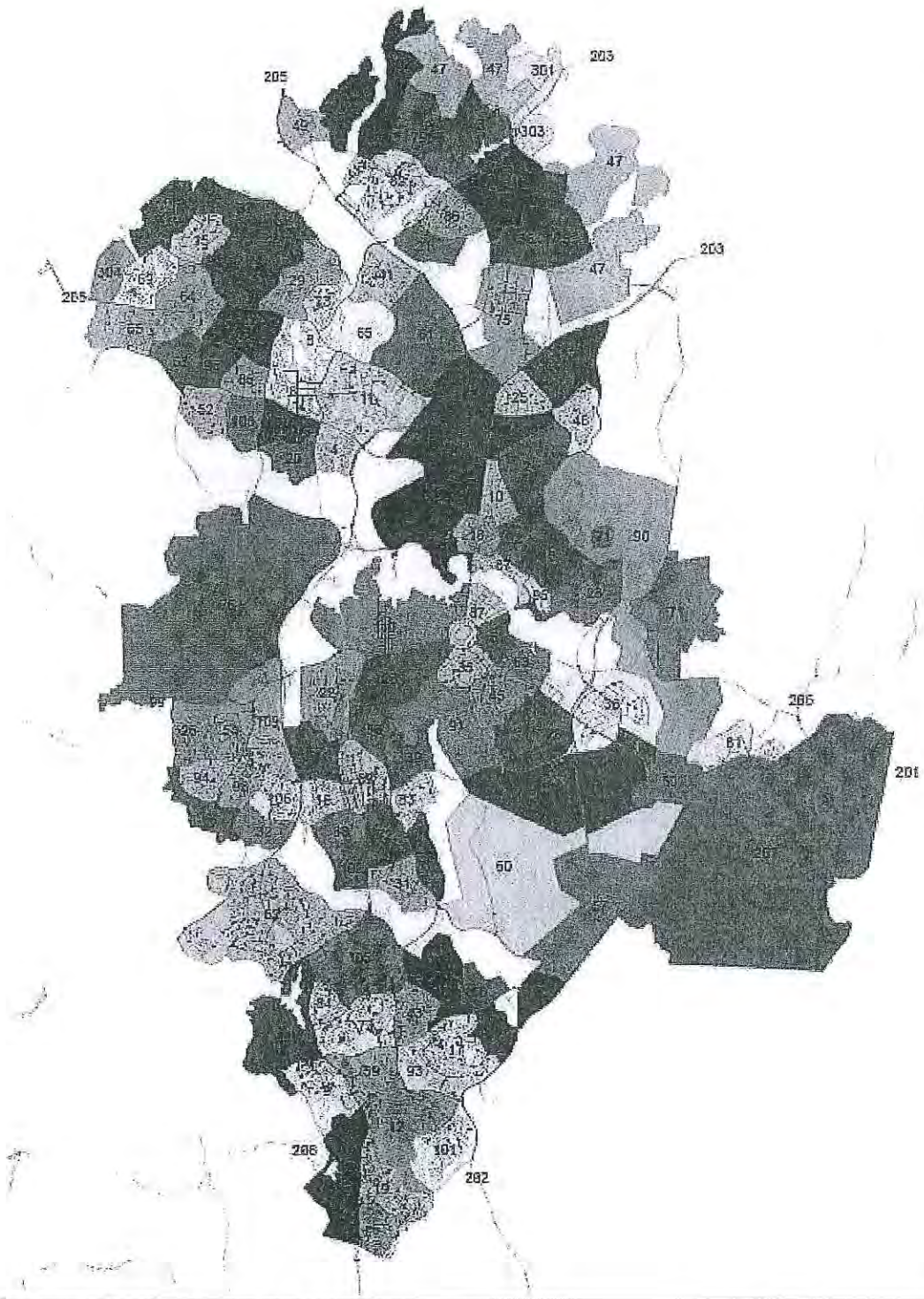
	Line	Description	Mode	Hwy
1	E170n	Xpresso 170 NB	e	60
2	E701s	Xpresso 701 SB	e	40
3	E702s	Xpresso 702 SB	e	40
4	E703s	Xpresso 703 SB	e	30
5	E705n	Xpresso 705 NB	e	40
6	E705s	Xpresso 705 SB	e	40
7	E720n	Xpresso 720 NB	e	30
8	E729e	Xpresso 729 EB	e	60
9	E749n	Xpresso 749 NB	e	60
10	E749s	Xpresso 749 SB	e	40
11	E768n	Xpresso 768 NB	e	60
12	E769n	Xpresso 769 NB	e	40
13	E785n	Xpresso 785 NB	e	60
14	E787n	Xpresso 787 NB	e	60
15	E788n	Xpresso 788 NB	e	60

2011
"Express" Service PT Lines

	Line	Description	Mode	Hwy
1	E170n	Xpresso 170 NB	e	30
2	E701s	Xpresso 701 SB	e	30
3	E702s	Xpresso 702 SB	e	30
4	E703s	Xpresso 703 SB	e	20
5	E705n	Xpresso 705 NB	e	30
6	E705s	Xpresso 705 SB	e	30
7	E710e	Xpresso 710 EB	e	20
8	E720n	Xpresso 720 NB	e	20
9	E729e	Xpresso 729 EB	e	40
10	E732n	Xpresso 732 NB	e	30
11	E737e	Xpresso 737 EB	e	20
12	E749n	Xpresso 749 NB	e	40
13	E749s	Xpresso 749 SB	e	40
14	E757s	Xpresso 757 SB	e	40
15	E768n	Xpresso 768 NB	e	30
16	E769n	Xpresso 769 NB	e	30
17	E785n	Xpresso 785 NB	e	40
18	E786n	Xpresso 786 NB	e	30
19	E787n	Xpresso 787 NB	e	40
20	E788n	Xpresso 788 NB	e	30

Appendix B

Figure B-1 ACT 2006 Statistical Local Area Map



Appendix C

Table C-1 : 2006 Screenline Traffic Volumes by Station Location

SL		Nodes From	Nodes To	Location (travel direction)	2006 Observed Volume	2006 Model Volume	Difference (Estimated – Model) Volume	Difference (Estimated – Model) %	GEH
1 - Lake Burley Griffin	Inbound	1848	1798	Monaro Highway (NB)	4,080	3,330	-750	-18%	12
		1715	1723	Kings Avenue (NB)	1,955	2,215	260	13%	6
		1692	1658	Commonwealth Avenue (NB)	7,225	6,525	-700	-10%	8
		1678	1651	Lady Denman Drive (NB)	935	1,135	200	21%	6
		1743	1648	Tuggeranong Parkway (NB)	6,285	6,135	-150	-2%	2
		1800	1352	Coppins Crossing (NB)	390	475	85	22%	4
		Total Northbound			20,870	19,815	-1,055	-5%	7
	Outbound	1798	1848	Monaro Highway (SB)	3,250	2,325	-925	-28%	18
		1723	1716	Kings Avenue (SB)	6,350	6,205	-145	-2%	2
		1660	1693	Commonwealth Avenue (SB)	1,775	1,545	-230	-13%	6
		1651	1678	Lady Denman Drive (SB)	1,155	1,135	-20	-2%	1
		1647	1744	Tuggeranong Parkway (SB)	3,570	2,810	-760	-21%	13
		1352	1800	Coppins Crossing (SB)	1,295	410	-885	-68%	30
		Total Southbound			17,395	14,430	-2,965	-17%	24
2 - East Canberra	Inbound	2128	2060	Hindmarsh Drive (WB)	1,945	2,340	395	20%	9
		1904	1901	Canberra Avenue (WB)	4,420	4,200	-220	-5%	3
		1738	1737	Moreshead Drive (WB)	1,910	2,135	225	12%	5
		1740	1677	Fairbairn Avenue (WB)	2,510	2,240	-270	-11%	6
		1038	1037	Federal Highway (WB)	1,300	930	-370	-28%	11
		2648	2651	Horse Park Drive (WB)	385	410	25	6%	1
		Total Eastbound			12,470	12,255	-215	-2%	2
	Outbound	2060	2128	Hindmarsh Drive (EB)	4,030	2,630	-1,400	-35%	24
		1901	1904	Canberra Avenue (EB)	1,480	2,010	530	36%	13
		1737	1738	Moreshead Drive (EB)	1,530	1,170	-360	-24%	10
		1677	1740	Fairbairn Avenue (EB)	1,300	1,525	225	17%	6
		1037	1038	Federal Highway (EB)	515	410	-105	-20%	5
		2651	2648	Horse Park Drive (EB)	1,755	1,095	-660	-38%	17
		Total Westbound			10,610	8,840	-1,770	-17%	18
3 - Weston Creek	Inbound	1919	1852	Eucumbene Drive (From WC)	240	390	150	63%	8
		1862	1861	Streeton Drive (From WC)	2,770	2,530	-240	-9%	5
		1937	1938	Heysen Street (From WC)	585	370	-215	-37%	10
		2094	2096	Hindmarsh Drive (From WC)	2,420	2,710	290	12%	6
		2134	2201	Namatjira Drive (From WC)	765	1,140	375	49%	12
		Total from Weston Creek			6,780	7,140	360	5%	4
	Outbound	1852	1919	Eucumbene Drive (Into WC)	165	175	10	6%	1
		1861	1862	Streeton Drive (Into WC)	925	885	-40	-4%	1
		1938	1937	Heysen Street (Into WC)	200	400	200	100%	12
		2096	2094	Hindmarsh Drive (Into WC)	870	995	125	14%	4
		2201	2134	Namatjira Drive (Into WC)	890	1,155	265	30%	8
		Total to Weston Creek			3,050	3,610	560	18%	10

SL		Nodes From	Nodes To	Location (travel direction)	2006 Observed Volume	2006 Model Volume	Difference (Estimated – Model) Volume	Difference (Estimated – Model) %	GEH
4 - Civic	Inbound	1477	1476	Northbourne Avenue (Inb)	4,070	4,595	525	13%	8
		1486	1487	Mort Street (Inb)	425	225	-200	-47%	11
		1507	2522	Car Park (Inb)	535	115	-420	-79%	23
		1511	1509	Petrie Street (Inb)	1,275	1,180	-95	-7%	3
		1628	1624	Ainslie Avenue (Inb)	740	1,010	270	36%	9
		1629	1626	Akuna Street (Inb)	735	290	-445	-61%	20
		1623	1613	Constitutition Avenue (Inb)	770	1,370	600	78%	18
		1575	1568	C'wealth Ave Ramps (Inb)	1,340	1,585	245	18%	6
		1580	1582	Commonwealth Avenue (Inb)	3,360	3,835	475	14%	8
		1550	1555	Edinburgh Avenue (Inb)	2,545	1,275	-1,270	-50%	29
		1547	1552	Gordon Street (Inb)	180	65	-115	-64%	10
		1545	1551	Ellery Crescent (Inb)	180	195	15	8%	1
		1444	1446	Hutton Street (Inb)	750	445	-305	-41%	12
		1456	1457	Marcus Clarke (Inb)	1,700	1,480	-220	-13%	6
		1465	1463	Moore Street (Inb)	180	90	-90	-50%	8
		Total to Civic			**37,210**	**17,755**	**-1,030**	**-3%**	**6**
	Outbound	1476	1477	Northbourne Avenue (Outb)	2,200	1,785	-415	-19%	9
		1487	1486	Mort Street (Outb)	365	235	-130	-36%	8
		2522	1507	Car Park (Outb)	170	20	-150	-88%	15
		1509	1511	Petrie Street (Outb)	425	30	-395	-93%	26
		1624	1628	Ainslie Avenue (Outb)	190	205	15	8%	1
		1626	1629	Akuna Street (Outb)	360	200	-160	-44%	10
		1613	1623	Constitutition Avenue (Outb	695	470	-225	-32%	9
		1594	1591	C'wealth Ave Ramps (Outb)	805	385	-420	-52%	17
		1588	1584	Commonwealth Avenue (Outb)	3,365	3,195	-170	-5%	3
		1555	1550	Edinburgh Avenue (Outb)	465	120	-345	-74%	20
		1552	1547	Gordon Street (Outb)	170	45	-125	-74%	12
		1551	1545	Ellery Crescent (Outb)	260	1,010	750	288%	30
		1446	1444	Hutton Street (Outb)	430	840	410	95%	16
		1457	1456	Marcus Clarke (Outb)	600	825	225	38%	8
		1463	1465	Moore Street (Outb)	170	355	185	109%	11
		Total from Civic			**10,670**	**9,720**	**-950**	**-9%**	**9**

Table continues on next page

SL		Nodes From	Nodes To	Location (travel direction)	2006 Observed Volume	2006 Model Volume	Difference (Estimated – Model) Volume	Difference (Estimated – Model) %	GEH
5 - Tuggeranong	Inbound	2164	2201	Namatjira Drive (Into WC)	890	1,155	265	30%	8
		2184	2138	Tuggeranong Parkway (NB)	5,815	5,755	-60	-1%	1
		2221	2168	Athllon Drive (NB)	2,990	3,540	550	18%	10
		2253	2224	Erindale Drive (NB)	3,855	3,185	-670	-17%	11
		2314	2285	Isabella Drive (NB)	2,890	3,115	225	8%	4
		2391	2395	Johnson Drive (NB)	1,050	1,290	240	23%	7
		2393	2395	Tharwa Drive (NB)	1,840	2,205	365	20%	8
		Total Northbound			19,330	20,245	915	5%	7
	Outbound	2201	2164	Namatjira Drive (From WC)	765	1,140	375	49%	12
		2138	2184	Tuggeranong Parkway (SB)	1,520	1,940	420	28%	10
		2168	2221	Athllon Drive (SB)	1,300	1,530	230	18%	6
		2224	2253	Erindale Drive (SB)	745	1,045	300	40%	10
		2285	2314	Isabella Drive (SB)	700	1,000	300	43%	10
		2395	2391	Johnson Drive (SB)	525	420	-105	-20%	5
		2395	2393	Tharwa Drive (SB)	440	715	275	63%	11
		Total Southbound			5,995	7,790	1,795	30%	22
6 - Macarthur Street Ave	Inbound	1428	1427	Ebden Street (SB)	925	890	-35	-4%	1
		1424	1423	Cowper Street (SB)	1,320	1,390	70	5%	2
		1332	1415	Limestone Avenue (SB)	2,905	2,075	-830	-29%	17
		1328	1326	Dooring Street (SB)	95	130	35	37%	3
		1321	1405	Northbourne Avenue (SB)	3,360	4,435	1,075	32%	17
		1316	1314	David Street (SB)	580	715	135	23%	5
		1306	2507	Pedder Street (SB)	205	435	230	112%	13
		1304	2508	Macpherson Street (SB)	785	295	-490	-62%	21
		1296	1295	Miller Street (SB)	595	280	-315	-53%	15
		1289	1290	Dryandra Street (SB)	205	90	-115	-56%	9
		Total Southbound			10,975	10,735	-240	-2%	2
	Outbound	1427	1428	Ebden Street (NB)	350	660	310	89%	14
		1423	1424	Cowper Street (NB)	425	535	110	26%	5
		1415	1332	Limestone Avenue (NB)	1,410	905	-505	-36%	15
		1326	1328	Dooring Street (NB)	315	210	-105	-33%	6
		1405	1321	Northbourne Avenue (NB)	1,775	1,530	-245	-14%	6
		1314	1316	David Street (NB)	260	400	140	54%	8
		2507	1306	Pedder Street (NB)	315	95	-220	-70%	15
		2508	1304	Macpherson Street (NB)	350	65	-285	-81%	20
		1295	1296	Miller Street (NB)	315	105	-210	-67%	14
		1290	1289	Dryandra Street (NB)	315	10	-305	-97%	24
		Total Northbound			5,830	4,515	-1315	-23%	18

Table continues on next page

SL		Nodes From	Nodes To	Location (travel direction)	2006 Observed Volume	2006 Model Volume	Difference (Estimated – Model) Volume	Difference (Estimated – Model) %	GEH
7 - Queanbeyan	Inbound	2203	2226	Tharwa Road/Lanyon drive (WB)	1,820	2,460	640	35%	14
		2068	2067	Canberra Avenue (WB)	4,730	4,605	-125	-3%	2
		2072	1986	Oaks Estate Rd (WB)	820	630	-190	-23%	7
		1988	1917	Piallago Avenue (WB)	1,910	1,745	-165	-9%	4
		Total Westbound			9,280	9,440	160	2%	2
	Outbound	2226	2203	Tharwa Road/Lanyon drive (EB)	1,010	1,075	65	6%	2
		2067	2068	Canberra Avenue (EB)	1,345	1,650	305	23%	8
		1986	2072	Oaks Estate Rd (EB)	335	95	-240	-72%	16
		1917	1988	Piallago Avenue (EB)	505	700	195	39%	8
		Total Eastbound			3,195	3,520	325	10%	6
8 - Gungahlin	Inbound	3302	3301	Curran Dve (SB)	1,505	1,595	90	6%	2
		3895	3894	Gundaroo Dve (SB)	1,420	1,770	350	25%	9
		3000	2402	Gungahlin Dve (SB)	2,670	2,995	325	12%	6
		1035	1088	Flemington Road (SB)	2,005	1,665	-340	-17%	8
		2685	2648	Horse Park Drive (EB)	1,755	1,095	-660	-38%	17
		Total Southbound			9,355	9,120	-235	-3%	2
	Outbound	3301	3302	Curran Dve (NB)	290	700	410	141%	18
		3894	3895	Gundaroo Dve (NB)	1,150	1,160	10	1%	0
		2402	3000	Gungahlin Dve (NB)	1,345	1,155	-190	-14%	5
		1088	1035	Flemington Road (NB)	1,055	995	-60	-6%	2
		2648	2651	Horse Park Drive (WB)	385	410	25	6%	1
		Total Northbound			4,225	4,420	195	5%	3
9 - Belconnen	Inbound	2764	3830	Kuringa Drive (WB)	1,050	1,170	120	11%	4
		936	3894	William Slim Drive (WB)	965	1,415	450	47%	13
		1082	1083	Ellenborough Street (WB)	1,530	1,190	-340	-22%	9
		2410	1156	Ginninderra Drive (WB)	1,760	1,665	-95	-5%	2
		1284	3909	Belconnen Way (WB)	6,240	5,350	-890	-14%	12
		2927 1432 1432	1530 2928 1525	William Hovell Drive (WB)	6,230	7,255	1,025	16%	12
		1352	1356	Coppins Crossing (SB)	1,295	410	-885	-68%	30
		Total Westbound			19,070	18,455	-615	-3%	4
	Outbound	3830	2764	Kuringa Drive (EB)	1,050	1,330	280	27%	8
		3894	936	William Slim Drive (EB)	2,450	2,095	-355	-14%	7
		1083	1082	Ellenborough Street (EB)	590	1,030	440	75%	15
		1156	2410	Ginninderra Drive (EB)	1,030	1,110	80	8%	2
		3909	1284	Belconnen Way (EB)	1,685	1,840	155	9%	4
		2920 2922 1530	2926 1432 1432	William Hovell Drive (Outb)	3,910	5,285	1,375	35%	20
		1356	1352	Coppins Crossing (NB)	390	475	85	22%	4
		Total Eastbound			11,105	13,165	2,060	19%	19

4.0

ACT Government
Commerce and Works

IMPORTANT NOTICE

ADDENDUM 2 TO REQUEST FOR TENDER NO. 21126
CAPITAL METRO LIGHT RAIL INTEGRATION STUDY

Please note the following additional information for the above Request for Tender (RFT):

1. Questions received from interested suppliers, and the Territory's formal responses to those questions are specified at Attachment 1 to this addendum notice.

For further information, please contact me, as the contact officer who is also named on the cover page of this RFT.

T Sri Tharan
Senior Project Officer
Shared Services Procurement

Email: sharedservicesprocurementinfrastructure@act.gov.au

16 January 2013

Attachment 1

ADDENDUM 1 TO REQUEST FOR TENDER NO. 21126

CAPITAL METRO LIGHT RAIL INTEGRATION STUDY

Questions and Formal Responses

Q1 There does not seem to be an architectural or public domain design component- done by others, is this another project scope?

A1 Preliminary public domain design work was undertaken for the 2011/12 feasibility study and will be provided to the successful consultant. Architectural or public domain design does not form part of this project and will be undertaken in separate work.

Q2 There does not seem to be a transport and land use/land planning integration component to the scope eg development uplift from urban renewal to create new jobs and housing – is this being done elsewhere. It seems that CMPO will provide this data?

A2 This was undertaken during the 2011/12 feasibility study. If necessary, it will be further refined in early 2013 and provided to the successful consultant as an input to this project.

Q3 Is funding for the project likely from a capital works program or from development returns or both or PPP?

A3 The funding mechanisms for the project are subject to further Government investigation and they do not affect the scope of this study.

Q4 Is there any further background documentation that you can provide to aid the bidding process?

A4 Background information has been provided in the Project Brief. Further information about the project can be found at http://www.transport.act.gov.au/studies_projects/northbourne_study.html

Q5 What is the extent of peer review expected and how is this expected to be implemented within the programme?

A5 Independent peer review of the draft CSTM including micro simulation may be required to confirm the model inputs and outputs prior to finalisation, as determined necessary by the project manager. The timing of the peer review and impacts on the programme will be agreed between the project manager and the consultant team.

Q6 Do you wish to provide an indicative number of options to be assessed and/or taken forward to evaluation?

A6 Three options are expected for this task. Additional options and iterations may be required as a project variation.

Q7 Can you provide more information on the extent of the microsimulation modelling - How many models are there, what software do they run in, what is the physical extent that the models cover, and what periods of time do they include?

A7 Two microsimulation models were developed as a part of the 2011/12 feasibility study. The models cover the City Centre (Northbourne Ave) to Gungahlin Town centre (Flemington Rd - Hibberson Street) corridor at 2021 and 2031 for the morning peak period (7-9am). One of these models includes a diversion of the rapid transit line via Challis St, Dickson.
Both models used the Paramics Micro-simulation software.

Q8 Can you provide more clarity on the interface with the cost and cost-benefit analysis stream of work?

A8 The transport modelling and benefit evaluation from this study will be utilised for a cost benefit analysis project to be undertaken separately. Another separate study will be commissioned in early 2013 to provide refined cost estimates which will also input into the cost benefit analysis project. The cost benefit analysis project will coordinate with both study teams in late 2013.

Q9 With regards to the stakeholder consultation, is the brief for the consultant to run and manage, or only design the consultation programme?

A9 The consultant is expected to design and implement a consultation program with the advice and assistance of the project management team as required. Please note that consultation with the community is expected to be at the "consult" level of the IAP2 spectrum of public participation.

Q10 What formats are the walkability and GIS mapping data in?

A10 ArcGIS

Q11 Can we be provided with background CSTM documentation?

A11 **Attachment 2 to this addendum is the Transport Modelling and Analysis 2006/2001 Final Report, MRC.** This report provides background information on the CSTM model recalibration undertaken in 2009. CSTM model recalibration based on the 2011 Census data is currently being undertaken by consultants (SMEC) and will be provided to the successful consultant in February 2013 once it is finalised.

Q12 If the project manager is to be located within Transport Planning Branch for 20% of the time (potentially one day a week) then is it likely that project management meetings will occur during that co-location? Can you please clarify the purpose of the on-site availability of the project manager? Do you foresee technical involvement or a stakeholder liaison role?

A12 The purpose of the on-site availability is to provide ongoing interaction and technical involvement between the consultant team and the project management team, including but not limited to the project issue register, risk register and modelling assumptions; and it is anticipated that project management meetings would be scheduled to coincide with the consultant's on site presence.

Q13 The brief refers to existing micro-simulation models. What simulation packages are these coded in?

A13 It is called "PARAMICS".

Q14 Can the Territory confirm who will provide data from the CTSM on patronage impact of options in Stage 1? Is running the model at this stage to be included as a contract cost?

A14 The Territory will provide the base model in Emme. Developing appropriate scenarios, running the model and analysing of the outputs are in the contract scope.

Q15 The brief stipulates that the Stage 1 and Stage 3 travel demand modelling will be undertaken using the Canberra Strategic Transport Model (CSTM) in EMME. If a consultant submits a proposal that uses an alternative model and modelling platform, that they believe is more suited to the task at hand, then will their proposal be automatically rejected on the grounds that it in non-conforming.

A15 The CSTM is an EMME model. Hence, for the stage 1 analysis, the model data source is in EMME. The tenderer needs to demonstrate how they will extract the necessary data from CSTM and then upload the results back into the CSTM as part of the stage 1 and 3 works to ensure that the requirements of the brief are fulfilled. The Tenderers are welcome to submit alternative submissions that meet the above requirements.

Q16 Are the consultants' costing proposals to include Task 4.3.2 - *Stakeholder and community consultation*

A 16 Yes, consultants are to provide a cost for the preparation and implementation of the stakeholder and community consultation.

Q17 Can you please confirm that the successful tenderer for this study will remain eligible to bid for future stages of the Light Rail project?

A17 As this study is at its preliminary stage, the conditions of this RFT do not have such restrictions to preclude a consultant for tendering for future work. However, the Territory cannot guarantee that the conditions will remain the same for future studies.

Q18

RFT section 3.2.5 Evaluation Criteria – the addition of scoring in the Evaluation table didn't add up to 100, please have them corrected?

A18

RFT section 3.2.5 Evaluation Criteria

Replace the evaluation table in section 3.2.5 of the RFT with the following revised weighted scoring:

The table below shows the criteria that will be used to assess responses.

WEIGHTED CRITERIA	WEIGHTING
Methodology (how the project is to be delivered): The proponent is to provide a concise written response as to how it will manage this project. The proponent shall demonstrate it can meet the project requirements including community engagement and stakeholder requirements.	20
Stakeholder Consultation: Demonstrated ability to plan and conduct consultations with Agency Stakeholders and Public Stakeholders and achieve a successful outcome.	10
Quality Plan and written communication: The submission should contain a quality plan outlining how a high quality output including quality report would be prepared, reviewed and produced at the end of the study. The Submission should also demonstrate high level written communication skills and experience in writing for Government.	10
Detailed Program: Task allocation to members of the actual team; and Detailed fee proposal and fee allocation to individual tasks.	10

Technical skills of the actual project team (people, systems, specific abilities). The proponent is to provide evidence of the technical ability of those staff proposed to undertake duties under this engagement. This is to include CVs of the staff highlighting relevant experience on similar studies. The response shall detail the role/responsibilities and activities each member will be responsible for.	20
Relevant experience (previous similar studies by the key team members): The consultant is to provide details of similar studies that it has undertaken, including referees and contact details for similar projects.	15
Fee for Services offered	15
TOTAL	100%

[redacted]

From: [redacted]
Sent: Tuesday, 3 December 2013 6:27 PM
To: [redacted]
Cc: [redacted]
Subject: RE: EMME Zones

[redacted]

Zones 808, 840 and 841 do not appear in the ESDD land use compendium.

- Zone 808 is Hills/Ridges/Buffer between Cook and William Hovell Drive (essentially a spare zone)
- Zone 840 is the AFP facility and CIT in North Weston. I am not sure of the status of the CIT but the AFP facility probably should be included in ESDD's next compendium update.
- Zone 841 is the North Weston Pond in Molonglo (another spare zone)

Zones 341 and 801 are both defined in the ESDD compendium but do not have land use. In the model, they have zone connectors between Cotter Road and Dixon Drive (defined as Hills/Ridges/Buffer). I am not sure why they are not in the shapefile.

Regards,

[redacted]
SMEC Australia Pty Ltd
[redacted]

From: [redacted]
Sent: Monday, 2 December 2013 5:29 PM
To [redacted]
Cc: [redacted]
Subject: EMME Zones

Hi [redacted]
There seem to be some differences between the zones in the BAU spreadsheet and those in the shapefiles you sent me earlier.

- Zones 808, 840 & 841 are in the Shapefiles but not in the spreadsheets.
- Zones 341 & 801 are in the spreadsheets but not in the shapefiles.

Plse urgently send me the correct shapefiles or alternatively advise if the spreadsheets require correction.
Thank you
[redacted]

[redacted]

From: [redacted]
Sent: Tuesday, 3 December 2013 3:46 PM
To: [redacted]
Cc: [redacted]
Subject: Stage 1 - Options Assessment Methodology
Attachments: 3002353 Stage 1 Technical Note Rev2 (Body).pdf

Hi [redacted]

Attached is the last update that we did on the Stage 1 Technical Note (26 August 2013) before we started revising the land use. This last update already addressed your previous comments, including the ones relating to the options assessment methodology. I believe this methodology was developed after [redacted] discussed the issues with you. Could you please review, particularly Chapter 3 (Option Evaluation), and confirm that you're happy to proceed with the options assessment methodology described in this chapter?

I didn't include the Appendix C in the attachment to reduce the file size.

Regards,

[redacted]
SMEC Australia
Suite 2, Level 1, 243 Northbourne Avenue, Lyneham, ACT, 2602, Australia
[redacted] | www.smec.com | LinkedIn

SMEC SNOWY MOUNTAINS ENGINEERING CORPORATION

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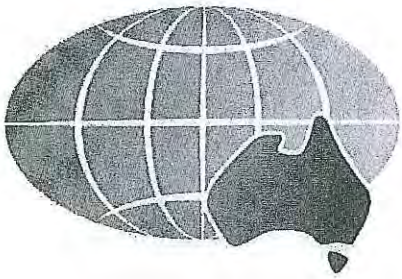

SMEC

Stage 1 Technical Note

For: Capital Metro Agency (CMA)

26 August 2013

Project Name:	Capital Metro Light Rail Integration Study
Project Number:	3002353
Report for:	Capital Metro Agency (CMA)

PREPARATION, REVIEW AND AUTHORISATION

Revision #	Date	Prepared by	Reviewed by	Approved for Issue by
0	18/07/2013	[redacted]	[redacted]	
1	30/07/2013	[redacted]	[redacted]	
2	26/08/2013	[redacted]	[redacted]	

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TABLE OF CONTENTS

APPENDICES

1 INTRODUCTION

1.1 Background

The ACT Strategic Public Transport Network Plan (SPTNP) was developed in 2009 to define the necessary steps to achieve the ACT Government's sustainable transport goals, particularly those relating to public transport (PT). The SPTNP identified four types of public transport services that all would interconnect to provide a holistic system for travel within the ACT, including:

RAPID – services that is both frequent and fast all day with limited stops-primarily intended to provide the 'intertown' links between town centres.

FREQUENT LOCAL – service that is frequent all day with stops more often (e.g. at local bus stops) – intended to serve local, high-density corridors.

PEAK EXPRESS – service that only runs during peak commute hours and only in the peak commute direction with long, not-stop segments between stops..

COVERAGE – services that includes all-day local routes that circulate through low – density suburbs where patronage potential is low, and runs at low frequency, generally every 30 minutes during peak periods and every 60 minutes during off-peak periods.

The RAPID and FREQUENT LOCAL services combined are called the *Frequent Network*.

The SPTNP does not prescribe a specific technology (i.e. buses or light rail) on any of the services it has recommended, although it suggests that light rail could be an option for "any or all of the identified Rapid corridors, whose length and stopping patterns are similar to those of light rail transit worldwide.'

Over the last few years several feasibility studies have been conducted geared towards delivering improved Rapid services along key routes. One major study, commissioned in 2010 was the *Northbourne Avenue Bus Priority and Cycleway Facility Feasibility Study* which was aimed at recommending feasible bus priority measures along Northbourne Avenue. During the course of this study, the ACT government decided to pursue the light rail option not only along this corridor but also along Flemington Road, which led to the undertaking of the *Gungahlin to City Transit Corridor Study*.

This study builds on the *Gungahlin to City Transit Corridor Study* using the central median LRT alignment as the preferred option.

1.2 Study Objectives

This study investigates matters relating to the integration of the light rail corridor into the future PT network. It identifies three different light rail scenarios and considers how each could be integrated into the existing and future public transport network. Each scenario consists of a unique stop/station pattern that is supported by multi-modal integration. These scenarios are assessed under a variety of qualitative and quantitative methods to be presented at stakeholder workshops in order to identify a preferred network option.

In addition to the integration with public transport, this study also considers the integration of light rail with other modes- walking, cycling, and vehicle-based multi-modal trips. Existing conditions and best practices are presented to support multi-modal access.

2 LRT INTEGRATION WITH OTHER MODES

2.1 General Impacts of LRT on the Bus Network

The introduction of LRT is effectively the adoption of an alternative technology on the section of the Red Rapid north of the CBD. The Red Rapid serves an important transportation role primarily supporting movement to the City and town centres along the corridor, as well as providing a crosstown service to Fyshwick. Because of the speed (few stops) and frequency of the Red Rapid, it also supports wider coverage areas accessed by a transfer.

The introduction of LRT generally impacts the bus network by replacing the northern section of the Red Rapid line (between Gungahlin and City) with LRT. With the central median alignment of the LRT, existing interchanges in City and Dickson may require greater travel distance for connections.

This report considers three network scenarios:

- Option 1 – Base Case Scenario
- Option 2 – Whole Network Focus
- Option 3 – LRT Focus

In addition to truncating the Red Rapid service, additional impacts on the existing networks are discussed in Section 2.7.

2.2 Summary of Best Practice Integration of LRT with Other Modes

The ability of people to safely and conveniently access transport services is critical to the provision of public transport services. Walking and cycling play a critical role in allowing users to safely and conveniently access wider public transportation infrastructure.

Providing convenient and secure access to the LRT is important to meeting ridership goals and serving customer needs. The following conditions may limit the ability of people to access the LRT corridor (Station and Site Access and Planning Manual (2008)):

- Pedestrian paths are indirect and fragmented
- High vehicle traffic volumes and traffic conflicts exist in and around the station
- Pick-up/drop-off space is inconvenient, or limited
- Short-term and long term parking is full or unavailable
- Bike parking is full or unavailable

Best practice transport integration guidance uses an access hierarchy that helps inform the design and provision of public transport infrastructure.

The access hierarchy is listed below with the pedestrian being the design unit with the highest priority. (Station and Site Access and Planning Manual (2008)):

- Pedestrian
  - For the safety of all transit customers, the pedestrian should be provided the highest priority in site and access planning. It is generally recognised that providing a safe and convenient walking environment that includes clear, continuous, and integrated pedestrian paths to the station will encourage

better ridership. Providing access to persons with disabilities should be planned for all modes of access. Accessible design benefits a range of users and optimises conditions for pedestrians.

- Bicycle
  - Bicycles are given priority over all motorised vehicular access. In the transit area, bicycles have the right-of-way over buses and automobiles. Bicycles do not have the right-of-way over pedestrians and the co-mingling of two may need to be managed.
- Kiss & Ride
  - Because a Kiss & Ride facility requires proximity to a station entrance for optimum function, it is afforded a higher access than Park & Ride. Kiss & Ride areas include facilities for passenger drop-offs and pick-ups by automobile which may include a kerbside lane or short term parking. Depending on demand, a taxi rank may also be appropriate.
- Park & Ride
  - Park & Ride is generally used as all-day commuter parking. While an important part of transport infrastructure, it ranks below all other modes of access in the station access hierarchy due to its relative inefficiency and potential to conflict with other accessibility modes.

These access modes are discussed in more detail in the following sections.

2.3 Pedestrian Network

In considering the integration of LRT with wider cycling and pedestrian networks it is useful to consider two different scales. First, the wider accessibility measures typically described as walking and cycling catchments and networks, and second, the site-specific conditions sometimes referred to as the 'first and last 100 metres'.

2.3.1 Walking network

At the higher-level scale, this report examines the accessibility of neighbourhoods to the LRT corridor. Accessibility by walking is provided by the street network and associated footpaths, paths and trails.

Each stop/station is evaluated for its ability to serve existing neighbourhoods (residential population) and for employees in mixed-use or commercial areas. The scenarios considered in this report identify the points along the corridor that serve the widest population of users, using both a 500 and 750 metre distance.

The distance was calculated by following the pedestrians paths, footpaths and the street network. Future land use scenarios were evaluated using a simulated street network. At this scale there are a few general observations worth noting about the walking network and its relation to integration with the LRT.

2.3.2 Street Connectivity/Urban Form

Canberra's urban form presents challenges to pedestrian movement. A strong measure of the "walkability" of an urban area is often associated with metrics related to block size or intersection density. The uniquely large block sizes in Canberra limit walkability and accessibility by forcing longer walking and cycling trips.

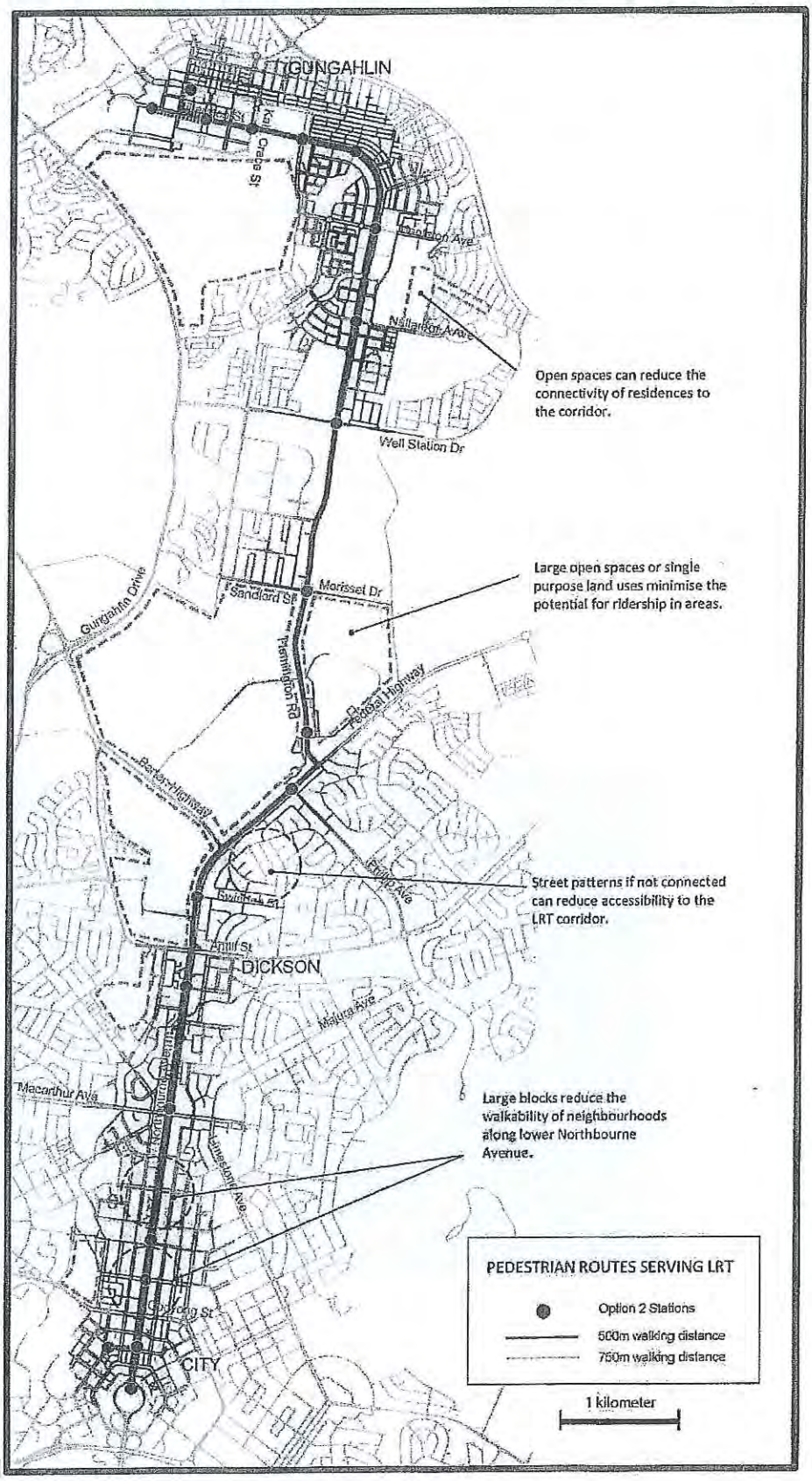

Figure 1 Pedestrian network serving the LRT corridor

2.3.3 Boulevard, Intersections

The width of Northbourne Avenue provides a barrier to pedestrian movement. Measuring 60m from footpath to footpath, there is significant proportion of a theoretical walking catchment that is spent on the road width itself. The central median alignment of the LRT helps to minimise this condition.

Related to the large blocks, there are large distances between formal crossing points along the corridor. This condition limits pedestrian movement across the corridor.

2.3.4 Vacant Land, Low Intensity Uses

In many places along the LRT corridor, there is adjacent land use which minimises the utility of the LRT corridor. Large parks, reserves, golf courses and showgrounds have no residences, few employees, and diffuse (or infrequent) trip generators making them inferior land use catchments for ridership purposes. These large, single land uses also separate people from their daily activities reducing the viability of walking to destinations including transit stops. These conditions are revealed through the GIS analysis.

2.3.5 First/Last 100m

There are many barriers to pedestrian movement to, across and along the LRT corridor.

In many places along the corridor, there is insufficient provision of pedestrian facilities. Footpath width and conditions are inconsistent and in places substandard. In some places, the lack of lighting and overgrown landscaping contributes to the perception of compromised safety.

Figure 2 Pedestrian paths and conditions along the corridor should be improved

There are many pedestrian accessways that are not formalised which force pedestrians to walk through scrub and dirt to reach the corridor. In many places, the path to the LRT corridor is through property with ownership status that is not clearly defined. There are private properties that block the natural pedestrian desire lines. In some instances, property owners have posted 'no trespassing' signs or gated off portions of their property to prevent passage.

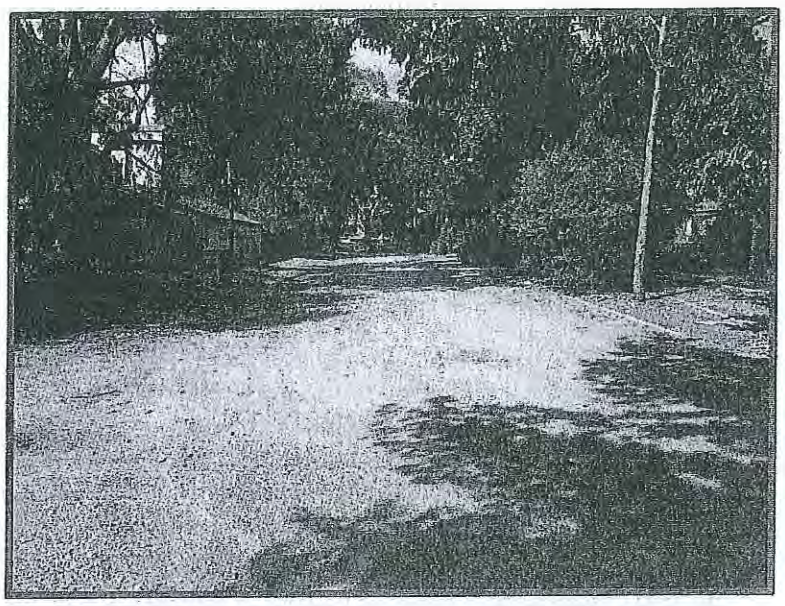

Figure 3 Pedestrian connections to the corridor should be improved

2.3.6 LRT Integration

The LRT location in the central median provides minimal interruptions to the existing pedestrian network. It is assumed that pedestrians will continue to use the formal crossings provided at signalised intersections and mid-block locations. The informal pedestrian crossings located mid-block are not at a standard to support high levels of pedestrian movement and to provide for users with more limited mobility.

It is expected that more pedestrians will use the median as a lateral access point since stops/stations located in the median will become destinations. Depending on the provision for pedestrians at signalised intersections, many pedestrians will find it easier to cross informally at mid-block locations to avoid long waits at the signals. Also, it is likely that riders alighting from the LRT will choose to cross in the most direct path to their destination, in a path that may not necessarily be safe.

Recommendations:

- Stops/stations should be located as close to signalised intersections as possible to provide the highest level of pedestrian safety and comfort, and designed for the most vulnerable users.
- Intersections should be designed with pedestrian and cycling safety and comfort given genuine consideration.
- Create a continuous pedestrian pathway network to access the stop/station area. Pedestrian walkways should not connect to the surrounding neighbourhood footpath system without passing through landscaped areas or carparks.
- Where stops/stations are sited midblock, signals and crosswalks should be provided.
- Where new stops/stations are introduced, signals and crosswalks should be provided.
- With the introduction of LRT, there will be increased demand to move laterally along the median.

- Footpaths or shared trails with appropriate lighting should be considered in areas with high pedestrian demand.
- In areas adjacent to stops/stations existing public pedestrian connections from adjoining residential neighbourhoods should be formalised with hardscape materials and lighting.
- In areas adjacent to LRT stops/stations easements should be acquired through private property to increase the permeability of the large block structure.
- As development occurs along the corridor public pedestrian connections should be introduced to improve accessibility.
- A higher level of pedestrian amenity should be provided along the LRT corridor including wider footpaths, pedestrian-scale lighting and formal pedestrian connections.
- The intersections with stop/stations should be designed to support safe and convenient pedestrian movements. High speeds, uncontrolled left turns, and long signal timings should be reconsidered for pedestrian accessibility.
- Open spaces and parks adjacent to the corridor should have convenient pedestrian and cycling paths connecting residences to the LRTcorridor in particular close to stop/station areas.

2.4 Cycling Network

The ACT has an extensive network of on and off-road cycling routes. The LRT corridor along Northbourne Avenue, Flemington Road and Hibberson Street, is identified as a "Primary" route in the draft ACT Strategic Cycle Network Plan[1] (ASCNP). The Primary routes, "carry cyclists across the city centre, town centres and other major attractors in the most direct and efficient manner, catering for high volumes of cyclists."

The primary network from Gungahlin to City (Civic) consists of facilities, ranging from separated paths to on-street bike lanes. Cycling rates along the Northbourne Avenue corridor have increased by more than 350% over the past five years. (Transport for Canberra - A Case for implementing the North-East transport corridor in the Nation's Capital). Bicycle counts from March 2010 recorded 245 (200 city bound) cyclists during the morning peak period between 7:30 - 9:00 AM. (Northbourne Avenue Feasibility Study).

The corridor's relative popularity for cycling is likely attributed to the bike facilities and the direct, high speed nature of the route. Due to the scale and general design of the corridor, there are few conflicting vehicle turning movements and travel movement to and from the City is prioritised.

There are duplicative parallel streets that serve similar cycle network functions to the Northbourne Avenue corridor. These are identified in the ASCNP as "Tertiary Routes" and they tend to be more circuitous and may lack formal bike facilities.

Along the Northbourne Avenue section in particular, there are challenges to cycling including the lack of separation between high volumes and high speed traffic, conflicts with bus movements, and precarious intersections caused by the high speed environment and sweeping road geometry. While the corridor seems popular for cyclists, it likely serves a very narrow spectrum of the population, sometimes identified as the "Strong and Fearless" (Four Types of Cyclists, City of Portland Bureau of Transportation) or "Commuters (experienced)" (ASCNP).

[1] The ASCNP Feasibility Study is still in progress and discussions on hierarchy are ongoing

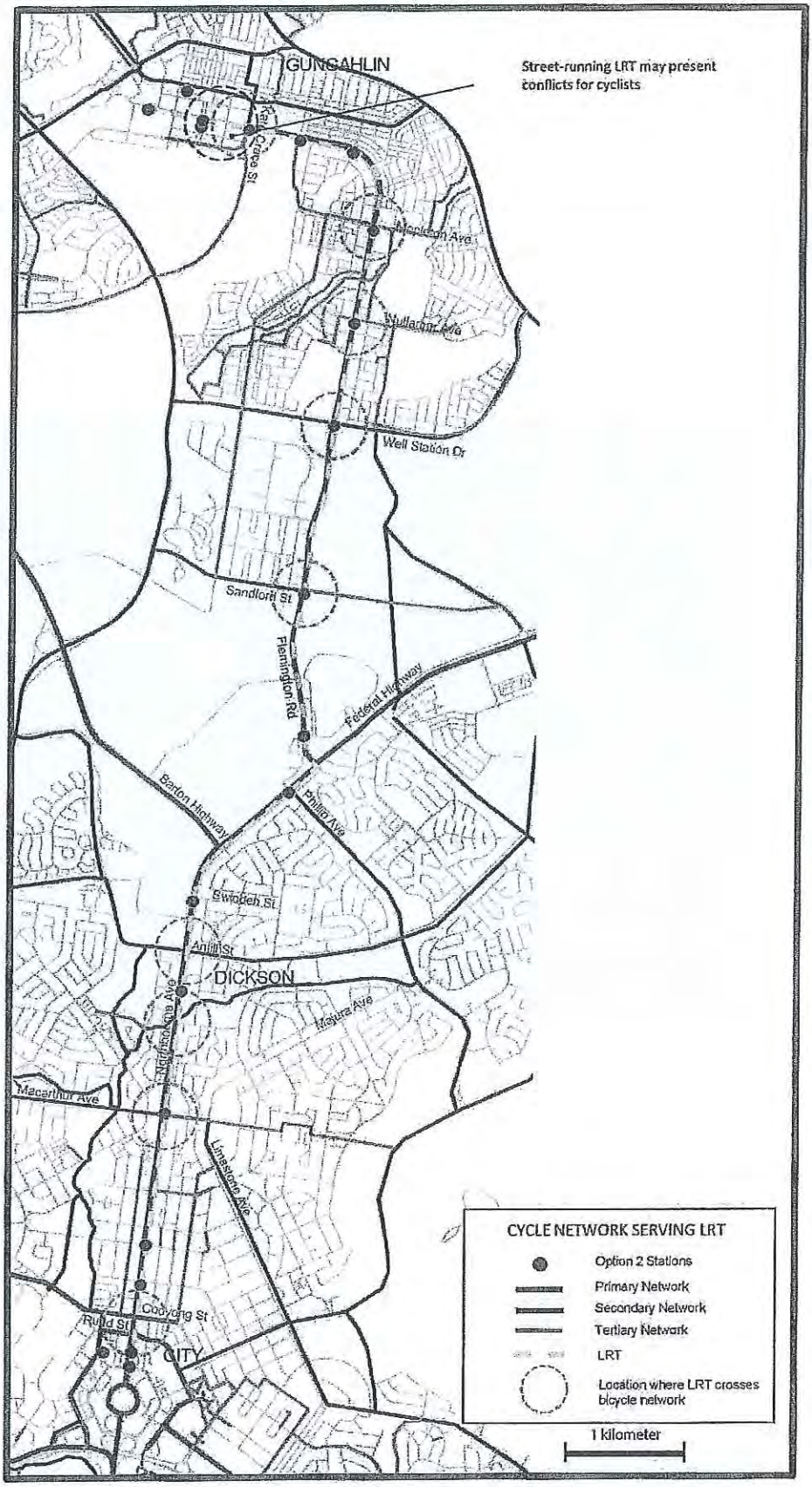

Figure 4 Cycle network relative to LRT Corridor

2.4.1 Central Median Alignment and Options discussion

The LRT's proposed central median alignment introduces opportunities for improved cycling conditions along Northbourne Avenue. Depending on the strategic network design of the LRT corridor, the following positive conditions may result with the introduction of the LRT:

- The volume of buses using the corridor will be relocated to the central median
- The number of bus stops along the corridor may be reduced or eliminated altogether
- Improved bicycle infrastructure may be implemented without the disturbance of the existing kerblines

These conditions are discussed on a case by case basis in 2.9.

Figure 5: Bus network redesigns have the potential to improve conditions for cycling along Northbourne Ave

2.4.2 LRT Integration

By integrating cycling and transit, there is potential to benefit both modes. Cycling provides the ability of people to travel greater distances to access public transport services. Effective integration between cycling and public transport relies on three components (*Transport Capacity and Quality of Service Manual*, TCRP):

- Bicycle connections to stops and stations
- Bicycle parking at stops and stations
- On-vehicle bicycle-carrying facilities

Cycling facilities to and along the corridor provide good connections to the LRT corridor. There are several Primary and Secondary routes[2] that feed into the corridor. Tertiary

[2] Based on the ongoing ASCNP Feasibility Study