

TRANSIT COOPERATIVE RESEARCH PROGRAM

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International Transit Studies Program
Report on the Fall 2008 Mission

BALANCING INFRASTRUCTURE REINVESTMENT WITH SYSTEM EXPANSION

This TCRP digest summarizes the mission performed from October 17 to November 1, 2008, under TCRP Project J-03, "International Transit Studies Program." This digest includes transportation information on the organizations and facilities visited. It was prepared by the Eno Transportation Foundation and is based on reports filed by the mission participants.

INTERNATIONAL TRANSIT STUDIES PROGRAM

The International Transit Studies Program (ITSP) is a part of the Transit Cooperative Research Program (TCRP), authorized by the Intermodal Surface Transportation Efficiency Act of 1991 and reauthorized in 2005 by the Safe, Accountable, Flexible, Efficient Transportation Equity Act. TCRP is managed by the Transportation Research Board (TRB) of the National Academies, and is funded annually by a grant from the Federal Transit Administration (FTA). ITSP was managed by the Eno Transportation Foundation under contract to the National Academies.

ITSP assists in the professional development of transit managers, planners, and others charged with public transportation responsibilities. ITSP carries out its mandate by offering transportation professionals practical insight into global public transportation operations. The program affords the opportunity for them to visit and study exemplary transit operations outside the United States.

Two ITSP study missions are conducted each year, usually in the spring and fall,

and are composed of up to 14 participants, including a senior official designated as the group spokesperson. Transit organizations across the nation are contacted directly and asked to nominate candidates for participation in the program. Nominees are screened by committee, and the TCRP Project J-03 Oversight Panel endorses all selections. Members are appointed to the study team based on their depth of knowledge and experience in transit operations, as well as for their demonstrated advancement potential to executive levels of the public transportation industry. Travel expenses for ITSP participants are underwritten by TCRP Project J-03 funding.

Each mission abroad focuses on a theme that encompasses a topic of concern in public transportation. Cities are selected according to their ability to demonstrate leading-edge strategies and approaches to public transportation issues and challenges, as reflected in the study mission's overarching theme.

The members of each study team are fully briefed prior to departure. The intensive, professionally challenging, two-week mission has three objectives: to afford

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team members the opportunity to expand their network of domestic and international public transportation peers, to provide a forum for discussion of global initiatives and lessons learned in public transportation, and to facilitate idea-sharing and the possible import of strategies for application to America's transportation communities.

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ABOUT THIS DIGEST

The following digest is an overview of a study mission that investigated how public transport agencies in Australia are balancing the need to increase capacity and expand service while maintaining and upgrading their existing infrastructure (bus, tram, rail, and ferry). Team members met with public transport officials, government planners, and transit advocates in Sydney, Melbourne, Adelaide, Perth, and Brisbane. The digest is based on individual reports prepared by the mission team members, and it reflects the observations of the team members, who are responsible for the facts and accuracy of the data presented. The digest does not necessarily reflect the views of TCRP, TRB, the National Academies, American Public Transportation Association (APTA), FTA, or Harrington-Hughes & Associates.

A list of the study team members is included in Appendix A. A list of the public transport agencies and organizations with whom the team met is included in Appendix B.

INTRODUCTION

Much like transit services in the United States, Australian public transport services are experiencing unprecedented ridership growth. Services are becoming overcrowded, and there is increasing public demand for more and better service. Each of the five cities visited is dealing with the increased demand in different ways, including significant improvements to existing infrastructure, enhanced customer service, and service expansion.

To understand the importance of public transport in Australia, it is important to know a bit about Australia's geography and demographics. Australia

consists of six states, two major territories (Northern Territory and Australian Capital Territory), and other minor territories. The capital cities in the six states are

- Sydney, New South Wales;
- Melbourne, Victoria;
- Adelaide, South Australia;
- Perth, Western Australia;
- Brisbane, Queensland; and
- Hobart, Tasmania.

While Australia is almost as large in landmass as the contiguous United States (2.94 million sq mi compared with 3.2 million sq mi), it has a population of only 21 million, in contrast to the U.S. population of more than 300 million. Approximately 60% of Australia's population (12.7 million) is concentrated in and around the mainland state capitals of Sydney, Melbourne, Brisbane, Perth, and Adelaide. Consequently, these five cities have the greatest need for transit and have made the greatest investment in transit infrastructure of all the cities in the country.

The commonwealth of Australia is a federal parliamentary state, consisting of six federated states, each with its own constitution and parliament. Except for the powers reserved to the commonwealth in the constitution, the states retain a self-governing status with their own parliaments. The legislative powers of the state parliaments cannot be changed or altered except by altering the constitution, and the constitution can only be altered by the Australian people voting in a referendum.

State governments have the primary role of implementing transit service in their cities. Because most of the population in each state is city based (in some cases, up to 80% of the population lives in the capital city metropolitan area), the majority of the transit infrastructure is located within the urbanized areas of the capital cities.

The five states visited have an environmental impact analysis process for their major capital development projects that includes preparing environmental impact statements. These statements are implemented at the state level, during the project-planning phase, and include public involvement and outreach activities.

Public transport in Australia is a responsibility of state government. The Australian federal government does not play much of a role in planning or funding

state transit programs. Federal funds are allocated to the state general funds, and the states then determine how to budget those funds. State transit programs must compete with all other state programs for funding, including other transport department agencies, such as highway programs.

The definition of public transport within Australia includes traditional mass transit modes, such as heavy and light rail, bus, and ferry, but also in some cases freight, taxi service, and hired (rental) cars. In most of the cities visited, home-to-school transport services were also provided by the public transport system.

One important federal regulation that applies to state transport programs is the Disability Discrimination Act of 1992 (DDA). Similar to the Americans with Disabilities Act, the DDA requires equitable delivery of services and access for those with a disability. The Disability Standards for Accessible Public Transport establish minimum accessibility requirements to be met by providers and operators of public transport systems, infrastructure, and premises. The standards, which went into effect October 23, 2002, take into account the range of disability covered by the DDA and apply to most public transport programs. To avoid creating an undue burden for operators and providers, the standards allow for incremental compliance with the relevant requirements over 30 years, with milestones at the fifth, tenth, fifteenth, twentieth, and thirtieth years. All the agencies with whom the study team met were successfully meeting the applicable DDA milestones.

Much like in the United States, Australians seem to have a “love affair” with the automobile. Yet Australians also seem to have a broader and stronger commitment to increasing the use of public transport in their cities as part of an effort to increase transport capacity and improve the environment.

The study team spent 2 to 3 days in each city, where they met with state government officials and public and private transit operators. There were many similarities between the approaches to delivering public transport in each city. Each of the cities has experienced changes in governance of public transport over time. In more recent years, the state governments have adopted the privatization practices that are in use in European countries.

Some of the cities appeared to have adapted very quickly to market changes, while others have struggled to find the most appropriate governance and

investment strategies to develop the public transport system for the future.

The Australian cities are somewhere between European cities and U.S. cities in terms of form and development. The cities all have a fairly dense urban core with surrounding centers of development.

Consistent themes throughout the mission included high demand for bus and rail service, strategies to mitigate peak-hour demand, the need to upgrade aging fleets and infrastructure, system expansion, privatization, integrated land use and transit planning, greenhouse gas emissions, insufficient transport financing, and the need for a new funding model.

PRE-MISSION BRIEFING

An element of the team’s pre-mission briefing in San Francisco included a dinner and conversation with Leslie Rogers, FTA Region 9 Administrator. Rogers provided a perspective on the challenges associated with balancing infrastructure reinvestment and system expansion. He especially recognized the emergence in recent years of renewed demand for transit services in our most urbanized areas, made particularly acute with the rising cost of fuel. He also discussed climate change and the key role assigned to public transport in achieving greenhouse gas emission goals. Coupled with this rising demand is the very real need for additional investment in maintaining and replacing our aging transport infrastructure.

As a representative of FTA, Rogers was most acutely aware of the need for federal funding assistance in successfully meeting the demands of system expansion and infrastructure investment. He advised that the current funding model is inadequate. He was hopeful that this study mission to Australia would provide fresh insight into federal/local transport funding issues, and he encouraged the team members to become engaged as stakeholders in the new authorization process and help craft solutions that will allow us to best meet the transport challenges before us.

ROLE OF THE STATE GOVERNMENTS

The role and organization of the transit management and delivery in each state result in many different structures and approaches to providing passenger services. The more centralized the operation of the bus, rail, and ferry services, the more unified

the marketing programs and customer information services. The existence of a common ticketing system provides the customer with a seamless approach to using transit for trip making.

Contracting of transit services and regular competitiveness in securing the contracts is common to each state. This approach requires a high level of attention to performance and accountability of the operators. The provision of service is accomplished in each state with a variety of modes and with widely differing equipment. The team members found all rolling stock to be extremely clean, well kept, and, though not visually apparent, well maintained. The age of many of the train and tram cars and buses was well beyond the typical useful life of transit vehicles in the United States. There was a general culture of using and making the best and most of what they currently have.

Also observed in each state was attention to “active transport,” which consists of walking and bicycling. Station planning, pedestrian access, trail connections, and bicycle amenities were often apparent in site visits, literature, and websites.

New South Wales

The following government agencies are involved in the delivery of public transit services for New South Wales:

- Independent Transport Safety and Reliability Regulator,
- Ministry of Transport,
- Office of Transport Safety Investigations,
- Public Transport Ticketing Corporation,
- Rail Corporation New South Wales,
- Rail Infrastructure Corporation,
- State Transit Authority of New South Wales,
- Sydney Ferries Corporation,
- Transport Infrastructure Development Corporation, and
- World Youth Day Co-ordination Authority.

CityRail and CountryLink are two independent services operating under Rail Corporation New South Wales (RailCorp), the government agency responsible for all passenger rail services in New South Wales. CityRail is the passenger rail service that covers the greater Sydney region. It is the sister company to CountryLink, the passenger rail service that covers country and long-distance services in New South Wales. RailCorp, not CityRail, is re-

sponsible for developing and maintaining railway infrastructure such as tracks and overhead wiring.

The State Transit Authority of New South Wales is the government-owned authority responsible for the operation of Sydney Buses and Newcastle Buses & Ferries.

Sydney Ferries has been a government agency since 1951 and provides service to 39 destinations, spans approximately 37 km, and transports more than 14 million people across Sydney Harbor and the Parramatta River each year. Sydney Ferries’ fleet consists of 28 vessels (all of which are wheelchair accessible), which travel 1.3 million km per year.

The Transport Infrastructure Development Corporation is a state-owned corporation that develops and delivers major transport infrastructure projects for the Minister of Transport.

Victoria

The Public Transport Division, established in 1998 as the Office of the Director of Public Transport, is the Victorian government agency responsible for public transport services. It is a division of the Department of Transport and has assumed the planning and performance management functions from the former Public Transport Corporation.

The Public Transport Division’s role is, however, very different from that of the Public Transport Corporation. Contracted transport operators are responsible for the delivery of public transport services. The Public Transport Division has a contract management role, and the division works closely with public transport operators, local government, and other state government agencies to ensure that Victoria has an efficient, reliable, and integrated transport system that meets the needs of everyone in the community. The Public Transport Division also has a leadership role in developing and improving all parts of the state’s bus, train, tram, and taxi networks. The Public Transport Division also coordinates Victoria’s ticketing systems and fare structures and is investigating means for improving the metropolitan ticketing system.

The Public Transport Division’s responsibilities include the following:

- Contract and lease arrangements for train, tram, bus services, and infrastructure;
- Regulation of taxi industry;
- Regulation of public transport safety;

- Accessible transport services and facilities; and
- Management of large and complex transport infrastructure projects crucial to state development.

The Minister for Public Transport oversees Victoria's extensive public transport system and the implementation of the *Victorian Transport Plan*, which is an AUD \$38 billion investment to deliver more trains and trams, more train tracks and stations, less congested roadways, and more transport choice (the plan is available at <http://www4.transport.vic.gov.au/vtp/index.html>).

South Australia

The Department for Transport, Energy, and Infrastructure (DTEI) has diverse responsibilities in relation to transport system and services, energy policy and regulation, and infrastructure planning for South Australia. DTEI activities contribute significantly to South Australia's Go Zones. The provision of public transport is divided among several departments.

The Public Transport Division oversees the creation and maintenance of an integrated network of land passenger transport throughout South Australia. TransAdelaide operates train and tram services throughout metropolitan Adelaide under contract to the Public Transport Division, including the vintage 1929 trams that run to Glenelg.

Adelaide Metro is the public face of the transport system and provides information and marketing for the following:

- TransAdelaide, which is the government agency that provides the Adelaide Metro train and tram services;
- Torrens Transit, which provides Adelaide Metro bus services to the Outer North East, North West, North South, Eastern, and Western suburbs;
- SouthLink, which provides Adelaide Metro bus services to the Outer North and Outer South suburbs; and
- Transitplus, which provides Adelaide Metro bus services to the Hills and some regional services.

The companies providing Adelaide Metro passenger services are contracted to provide these services for 5 years with an option to extend for another 5 years subject to satisfactory performance and agree-

ment on price. The contracts include performance benchmarks that set acceptable standards for on-time running, customer satisfaction and passenger security, fare compliance, management of infrastructure, maintaining quality assurance status, and service review and improvements.

In addition, the Transport Services Division works to create integrated and safe transport facilities focusing on the delivery of projects, maintenance, and management of state-controlled transport infrastructure.

The Transport Planning Division leads the development of transport options providing policy, planning, and investment advice to the government to achieve its strategic objectives.

Western Australia

As part of the state government's Department of Planning and Infrastructure, the Public Transport Authority (PTA) was established in 2003 and is responsible for the following transport services:

- Rail, bus, and ferry services in the metropolitan area (Transperth);
- Public transport services in regional centers;
- Coach and rail passenger services to regional areas (TransWA); and
- School buses.

In addition, the PTA is responsible for designing and building transport infrastructure. The PTA's vision is to increase the use of public transport through the provision of customer-focused, safe, and cost-effective passenger transport services. The approach taken by Western Australia is very cohesive and consolidated.

Queensland

Queensland Transport, a department of the Queensland government, has three main roles:

- Transport leadership, including policy and planning;
- System stewardship—managing access to, and use of, the transport system; and
- Service delivery—coordinating and integrating transport-related services and infrastructure.

Departmental divisions and agencies manage and deliver strategies and actions to ensure there is a coordinated, consultative, and integrated approach

to addressing Queensland's transport challenges. The department consists of the following divisions:

- Corporate;
- Information Management;
- Integrated Transport Planning;
- Land Transport and Safety;
- Passenger Transport;
- Rail, Ports, and Freight;
- Services; and
- Trade.

The TransLink Transit Authority is an initiative of the Queensland government to meet the public transport needs of the region. The TransLink Transit Authority is working to improve and expand public transport across the TransLink network in Queensland and handles public transport scheduling, customer needs, and complaints for all modes.

KEY FINDINGS

The five Australian cities visited are working on land use and infrastructure development strategies that will cause the cities to become even more dense and compact. The state governments are investing in public transport capacity as part of their densification and economic development plan. To that end, several key principles seem to be followed by all of the cities that were visited:

- *Maximize the capacity and utility of the existing system first.* The states are holding transit accountable to maximize the capacity of the existing services (reform) before agreeing to add new capacity.
- *Strategically invest in expansion.* A business case must be made prior to adding new capacity to show that the new capacity investment is needed and will show positive measurable results. When additional capacity is being planned, the states are working in their planning efforts to encourage concentrated land use patterns.
- *Use proven technologies.* Transit is not necessarily investing in cutting-edge technologies; rather, investments are being made in proven technologies that have a positive benefit-to-cost ratio.
- *Adopt sound business management practices.* Before considering significant investment, state governments are evaluating the business prac-

tices and customer focus of existing services. Existing transit services must be performing well.

- *Political climate must be right.* A paradigm shift has occurred in Australia in that government is now beginning to make significant investments in transit by policies to improve the environment, provide mobility options, and improve the economic vitality of the cities.
- *Financing must be available.* Australian governments have been making decisions to invest in transport, but this is made easier because they have been running budget surpluses. This is a major difference from the United States, where most cities and states are currently struggling to balance their budgets.

LESSONS LEARNED

Australia is focusing much of its energy on getting the institutional framework and governance structure correct. The structure and relationship between the master planning and funding agency and government/private contractors that operate public transport has an effect on all aspects of decision-making—service delivery, performance measures, reinvestment, expansion, fare policy, and marketing.

In that vein, there are several take-away messages for consideration in developing future policies for public transit.

Make a Strong and Continuous Commitment at the State or Federal Level

Public transit in the United States suffers because of the tin-cup nature by which many agencies go about finding revenues for operations. There is a fairly strong perception (among nontransit professionals) that public transport should make a profit or at least break even. Furthermore, the prohibition against using federal funds and the dearth of state funds for operations mean that many agencies in the United States rely on sources with boom-and-bust cycles—leading to less service or increased fares for the passenger in lean local revenue years. Because of the relative convenience and low expense of auto travel, this creates an environment where people abandon public transit when service levels decline or, in some cases, when fares increase.

By comparison, there seems to be a decoupling of revenue from cost in managing public transport in

Australia. This is made possible because of a strong state commitment to ongoing public transport service. Because the revenue is provided directly from the state treasury, there is diversification of revenue sources that provides more insulation from peaks and valleys.

First, there seems to be an acknowledgement that auto subsidies exist and that public transport could not be expected to directly compete and make a profit. Second, individual agencies or private providers are generally guaranteed payments based on agreed-to cost for service and therefore are not subject to revenue risk. In Melbourne, where fare revenue is part of the payment structure, a mechanism exists for all private operators to receive a fixed percentage of overall transit revenue rather than keep the revenue collected solely by their specific services. This approach eliminates competition between the various modes of transport and promotes network cooperation. Third, in the many examples where there is an independent fare-setting body, that entity appears reluctant to raise fares; the professionals with whom the team met cited the societal benefits (improved air quality and reduced congestion) of keeping people on public transport as the reason for this reluctance. All of these approaches favor the customer by promoting more stable service levels and fares, as well as seamless service across modes.

Manage the Network at a Regional or State Level

In most cities visited, there is a move afoot to consolidate network planning, ticketing, and marketing under one organization. The goal was simple—make the system work for the customer. While it is common for Australia to have many independent service providers, the route network and timetable planning is mostly done at a regional level. In Perth, the network approach is most advanced because all service providers and planning functions report to one CEO; this has allowed Perth to accomplish an expedited roll-out of a smart card, a quick provision of real-time schedule information for bus stops and web-based applications, and well-timed transfers between buses and rail.

While managing transit at a network level similar to passenger travel patterns seems so logical, the existence of many autonomous transit boards with locally controlled funding has created a situation where route planning is done within a service area—

even if that service area overlaps with the area of another transit provider.

Refocus Efforts on Improved Frequency and Reliability

One Australian counterpart reiterated the importance of on-time performance, squeezing more out of the existing system, keeping buses for 16 to 18 years, and untangling the network. There seems to be more of a focus on system reliability and frequency than on new capital assets or expansion of the existing system. The explanation could be that most of the cities visited are fortunate to have a fairly extensive public transport network; but it could also be the result of an institutional structure and financing framework that is very dissimilar to that of the United States.

There are policies and underlying system structures that serve as incentives toward overcapitalizing public transport systems in the United States, including the following:

- Allocation of resources—capital money is more available; dollars for operating existing services are limited. Most efforts toward improving frequency and reliability come with an ongoing operating price tag. Many funding sources in the United States are geared specifically to capital projects, creating an incentive to either extend the existing infrastructure (with an accompanying request for taxpayer funding for the associated new operating cost) or replace rolling stock more frequently than might otherwise be optimal.
- Established replacement cycle—the FTA replacement cycle of 12 years for buses likely creates a maximum life of 12 years for buses.
- Decentralized funding—with limited transit funding being distributed to many independent agencies, there is less opportunity to focus funding where ridership is greatest and to enhance frequency and reliability.

Hold Operators Accountable Based on Key Performance Indicators

To fairly address many of the concepts above, there needs to be a renewed interest in key performance indicators and a mechanism for holding operators accountable for performance. The Australian model seems to de-emphasize the revenue-generation aspect of public transport and replace

that with a stronger focus on key performance indicators and cost control.

One way to mimic the Australian model would be to have contracts with the public and private providers that spell out both the expected service levels and key performance indicators, as well as the associated penalties should the indicators not be met. For this to be meaningful, however, the amount of the revenue would have to be large enough to be significant to an operator. To really mimic the Australian model, more private contracts should be in place, allowing the ultimate penalty for nonperformance to be putting the contract out for bid.

SYDNEY

Sydney, with a population of more than 4 million, is the largest city in Australia, and it is expected to grow to 5.3 million by 2031. Most of this growth is expected to occur in the established suburbs, with approximately 30% to 40% of new growth areas in the southwest and northwest portions of the city (approximately 290,000 new homes). Currently, 13% of the jobs are located in the central business district (CBD). Although the CBD will continue to be a heavily concentrated business district, the Metropolitan Strategy of Sydney is based on increasing the number of jobs in its regional cities, major centers, and specialized centers.

This growth and a rise in employment will increase the demands on Sydney's road and rail network. Sydney's traffic congestion is at its worst during peak hours, but congestion is spreading throughout the day. According to the Transport Data Center 2006 Household Travel Survey, there are 11.5 million average weekday trips taken via car (driver and passenger) in Sydney. In contrast, there are 820,000 average daily trips via train; 580,000 average daily trips via public bus; and 3,000,000 average daily trips via walking only. See Figure 1.

Public transport in Sydney has mirrored the American experience, with heavy investments in rail in the 1850s to 1930s when 70% of the population lived in urban communities and the remaining 30% lived in suburbs. The urban sprawl in the 1950s led to a car-based culture, which in some cases resulted in the removal of the transit/rail infrastructure in which the governments had significantly invested.

Public transport in Sydney includes heavy rail, light rail, monorail, bus, ferry, freight, taxi, and hire cars. Rail is the predominant public transport mode



Figure 1 Jim Glasson, Director General of the New South Wales Ministry of Transport, described how rail will underpin the transport system of the future in the CBD.

in Sydney, supplemented by publicly and privately operated bus services. Although the city recently experienced a 12% to 18% increase in ridership across both modes, the sustainability of the increase is still being evaluated. The state treasury funds 75% of public transport, while the other 25% comes from the farebox. There is no direct funding from the federal government. This funding structure promotes the system operating more from a cost basis than a revenue basis. The current budget allocates AUD \$1 billion per year for capital expenses, and it provides AUD \$500 million for major period maintenance and AUD \$500 million to add to the asset base.

From the 1940s until the 1990s, there was a marginalized transport plan, with most of the investments being spent on road infrastructure rather than on public transport. The 1990s brought more integrated transport planning, which involved all of the major agencies sharing information. Sydney's buses are competing with cars for limited road space, which is unsustainable on arterials and throughout the city. The city is gradually finding better ways of moving buses, but a metro is the answer that Sydney has focused on for the CBD in the belief that rail must provide for the major movement of people throughout the city.

The four key areas of focus for the future of public transport in New South Wales are driverless metros, an investment in rail and metro, finding al-

ternatives to at-grade buses, and exploring options for street signaling systems.

Rail Operations and Planning in Sydney

In the mid-1990s, the New South Wales government made the decision to privatize the rail system into four different components: infrastructure, maintenance, operations, and freight network. An evaluation found that there was an underinvestment in maintenance and other operational areas that did not support the privatization and segmentation of the rail system; it was thus decided that the infrastructure, maintenance, and operations components would be pulled back together and operated under the Ministry of Transport.

Passenger rail is operated by Rail Corporation New South Wales (RailCorp), which is a state-owned corporation organized into two business lines: CityRail, which provides metropolitan passenger rail service, and CountyLink, which provides long-distance service at an annual operating budget of \$1.2 billion. RailCorp owns and maintains the metropolitan rail network and provides access to freight operators in the metropolitan area of Sydney.

In 2006–2007, there were 281.5 million total journeys on CityRail. On a typical weekday (Tuesday through Thursday not during school holidays) there are 945,000 journeys, while on a typical weekend CityRail carries 500,000 individual customers. Two-thirds of the weekday rail travel occurs in the peak periods of 6:00 a.m. to 9:30 a.m. and 3:00 p.m. to 6:30 p.m., a large portion of which is traveling in and out of stations within the CBD. RailCorp officials attribute the high ridership numbers within the CBD to the increasing employment within that region and anticipate that there is more to come.

An independent survey, internal customer satisfaction surveys, focus group research, and discussions with RailCorp staff about customer complaints allowed RailCorp to identify more than 30 initiatives to address customers' concerns. These issues included reliability, crowding, handling of delays and train announcements, security, cleanliness, ticketing, and complaints handling. The two areas of greatest dissatisfaction among their customers were the lack of clear and informative announcements and crowding/standing during the peak travel hours. Staff at RailCorp has more specifically defined the issue to be addressed as the number of commuters

standing more than 20 min on specific lines, heavy crowding on other lines, and crowding during peak times on others.

RailCorp says the crowding on trains in the CBD is caused by passengers arriving faster than they depart, the station and platform being too small for the catchment area, not enough trains, trains taking too long to load/unload passengers, the lack of passenger organization, and service unreliability. In some cases, 1 min of dwell time was built into the schedule while trains were on a 3-min headway. These conditions, combined with a 92% on-time performance target, provide much opportunity for improvement.

One of the main causes for the overcrowding is that the system is running out of capacity. Within the CBD, CityRail is currently running at 96 trains per hour during the peak, which is 83% of capacity. With the anticipated growth, 100% capacity will be reached by 2017.

Solutions for addressing overcrowding, specifically within the CBD, have been categorized into three stages within the product development department: tactical solutions (from now to 12 months), squeezing the asset (from 1 to 4 years), and increasing capacity (5 years or more).

Tactical Solutions

One step in RailCorp's tactical solution to CBD crowding is to reduce the number of incidents that cause delays. A second step is to sweep the platforms by changing the timetables in order to spread peak loads over a longer time period and over more trains. Other steps include improving platform management practices to maintain dwell times, increasing the off-peak fare differential, and introducing a new line that will move passengers from the most-crowded platform in the evening peak. The tactical solutions are currently under way and are anticipated to take 12 months for completion.

The Everyday Service Essentials Program solution for CBD crowding targets the seven areas that RailCorp's customers have asked they "get right, everyday." There is also a focus within RailCorp's Everyday program that addresses the overcrowding by "getting the most with what we currently have available." The campaign is based on the following tenets: "Everyday our customers use our service. Everyday our customers expect a consistent, reliable, positive experience using our service. CityRail needs to meet

this expectation.” RailCorp says, “It made sense to call our commitment to improving the customer experience the Everyday Service Essentials Program. It’s exactly what we are aiming to achieve—good, reliable, consistent service for our customers every single day.”

The specific tactics identified in the Everyday program include

- Optimizing timetables;
- Educating passengers about less-crowded trains/times;
- Changing fare structures to encourage off-peak travel (this includes changes to off-peak fare restrictions and off-peak fare trial);
- Alterations and refurbishments to rolling stock, including the pilot testing and potential introduction of improved handholds and vestibule layouts to increase comfort for standing passengers and improve access to and egress from trains; and
- Improved on-time running, particularly during peak periods, through the introduction of improved dwell management practices.

A July 2008 customer survey found that the majority of customers felt that the crowding problem was getting worse. These customers also felt that they had no choice but to travel by train, and they assessed the problem as being the result of insufficient trains and capacity, inadequate infrastructure, too many customers, and an increasing number of customers. Customers said they do not think that CityRail is doing all it can to deal with the peak-period crowds at city stations, but understood that there were no quick fixes.

The Everyday program also identifies the longer-term solution as including a review of operational plans to address demand, capacity, and high growth contingency options.

Squeezing the Asset

The squeezing the asset solution is planned to launch on the heels of the tactical solution and proceed for 1 to 4 years. This solution involves standardizing the stopping patterns to effectively sweep the platforms, increasing the number of eight-car train sets, and introducing additional services and lines.

Increasing Capacity

Beyond the 5 years of the tactical and squeezing the asset stages is increasing the capacity of the fleet and infrastructure. This includes more work toward

sweeping the platforms and increased sectorization and stopping patterns. RailCorp is also investing in multi-door rolling stock and a modern train-control system. To increase capacity, they will also look at adding an additional line into the CBD and another high ridership line, as well as adding stations with platform screen doors. RailCorp officials described this plan as equivalent to running five small train systems within one city. The investment needed to create the system and increase the capacity to 400,000 passengers per hour is estimated at AUD \$14 billion to \$15 billion.

New South Wales Bus System

The majority of bus service in New South Wales is managed by State Transit, which is a statutory body established under the Transport Administration Act of 1998. The service is provided by four operating contracts within the three-business unit of State Transit (Sydney Buses, Newcastle Buses & Ferries, and Western Sydney Buses). In 2007–2008, State Transit carried 206.34 million passengers.

State Transit’s bus fleet consists of more than 2,000 buses, 58% of which are air conditioned, 50% are low floor, 45% are wheelchair accessible, 23% are powered by compressed natural gas, and 5% are high-capacity articulated buses. The Sydney Bus system maintains a 50% farebox recovery ratio. The 2007–2008 financial review indicates revenues of \$571.9 million, expenditures of \$569.4 million, and a \$2.5 million profit. Sydney Buses operates 300 regular routes and 708 school routes, while Newcastle Buses & Ferries operates 29 regular routes and 149 school routes.

Sydney Buses is currently working on improvements to their work and management practices. These improvements include the following:

- Improve driver utilization,
- Reduce dead running time (deadhead),
- Reduce collisions and safety incidents,
- Reduce turnover and absenteeism,
- Reduce overhead,
- Reduce maintenance costs, and
- Reduce fuel consumption.

Plans are also underway to improve their operating systems through implementation or increased use of:

- Dedicated bus lanes,
- Queue jumps,

- Traffic signal priority,
- Pre-paid tickets,
- Reductions in fare/ticket transaction time,
- A cashless system, and
- Multi-door loading.

To improve boarding speeds and reliability, Sydney Buses has introduced 28 pre-pay-only routes. These routes have experienced an 8-sec decrease in boarding time per passenger. Customers are able to purchase pre-paid tickets at nearly 700 independent ticket resellers across metropolitan Sydney, including news agents. There are also four transit shops in key high-traffic areas within the city.

The average bus within the Sydney Buses fleet is 13 years old, but there are some buses within the fleet that are 26 years old. According to the State Transit Authority of New South Wales, the older vehicles are not necessarily more costly to maintain, but more of the maintenance work involves the coach's air conditioning system and wheelchair lifts. Sydney Buses currently maintains a 10% spare ratio, but they are working toward reducing it to 7%. Plans are under way to increase the use of high-capacity buses, and they are exploring increasing capacity by reducing the seating on selected routes to allow for more standees (with the average trip length being 6 to 7 km, this is an alternative they feel is worth exploring).

There is also a focus on improving and increasing service delivery through

- Connecting transport modes (i.e., trains, ferries),
- Creating direct routes,
- Providing service to multiple land use areas,
- Generating off-peak demand, and
- Providing safe and convenient bus stops.

These service planning endeavors are coupled with a focus on service delivery, which centers on providing improved customer information, more reliable schedules, more courteous staff, and an improved response to incidents. Sydney Buses has more than 8,500 bus stops and more than 200 printed timetable booklets. The Transport Infoline and website provide customers with information on the buses, trains, and ferries.

The Ministry of Transport offered the perspective that the increasing competition between buses and cars on Sydney's arterials is unsustainable and that they must gradually find better ways of moving buses throughout Sydney. The bus lane on the Sydney Har-

bour Bridge carries 45% more people in the morning peak than all other southbound traffic lanes combined. There are several traffic lanes dedicated to buses within the city. These lanes, indicated by red pavement, may also have specialized traffic signals ("B-Lights") that give buses priority. Local authorities enforce the bus-only usage of the lanes, and many of the lanes are outfitted with cameras to catch violators.

Sydney Ferries

Sydney Ferries provides services to 14 million passengers per year and has a \$140 million operating budget. Approximately 50% of Sydney Ferries' passengers are commuters, and 50% are visitors. The fleet's size, age, and state of repair presents challenges to providing daily service. Sydney Ferries owns 31 vessels and charters an additional vessel, bringing the total fleet to 32. Current service demand requires the use of 24 vessels; optimally, Sydney Ferries should have a fleet of 40. The average age of the fleet is 18 years, and some vessels are 30 years old. There are seven separate classes of vessels within the fleet, and maintaining the many different ferries is a challenge for the 85 staff members charged with keeping the fleet available to run 550 services per day during a 20-hr period of operation.

Investment in Sydney Ferries' infrastructure is the responsibility of the state treasury. Sydney Ferries is required to submit asset management plans that project out 10 years. Funding is allocated as deemed appropriate by the treasury and the Ministry of Transport, with cabinet approval. There seems to be some discretion involved in the funding, based on stakeholder interest. The infrastructure needs within Sydney Ferries include fleet replacement, shipyard improvements, office improvements, information technology infrastructure, and wharf improvements.

MELBOURNE

Melbourne is currently the second largest city in Australia, but it is expected to become the largest city within Australia by 2028. Melbourne is a low-density city with a land size comparable to that of London but with only 3.2 million people. Approximately 200,000 persons live within the CBD. How this lovely city, with its public art and high-rise buildings, can coexist with large amounts of road infrastructure is the center of much debate. See Figure 2.



Figure 2 Melbourne's extensive transport network includes rail, bus, and tram services, as well as a highway system that connects the suburbs to the city.

According to the Victoria Department of Transport, public transport has only a 10% share of Melbourne's travel market. Road congestion costs Victoria's economy \$3 billion a year, and each year cars produce 13 million tons of carbon emissions throughout the state. The department says that public transport services have failed to keep pace with urban sprawl and that 15% of Melbournians have no local public transport service.

Melbourne has an extensive public transport network including rail, bus, and tram. About 50% of the revenue for the various systems comes from the farebox; the remainder comes from government subsidies. The Victoria Department of Transport reports that within Melbourne there were more than 201 million yearly passenger train journeys along 15 lines, 158 million tram journeys along 28 routes, and 91 million bus journeys along 308 routes. In addition, there were 28.8 million school bus journeys along 1,585 routes within regional Victoria.

The public transport system was established in the 1930s when the city was first developed, with no significant expansion to the system since. The bus network that serves the surrounding metropolitan area has also had no major expansion since it was created. The tram network, which serves much of the congested areas, competes with cars and trucks on congested surface streets. See Figure 3. There is an extensive rail network, and focus is currently being given to "untangling" the network to make it as efficient as possible. The region has a smart card ticketing system but has had to simplify the fare structures



Figure 3 The tram network in Melbourne competes with cars, trucks, and bicycles on congested surface streets.

in order to make the smart card system work effectively. As in Sydney, operation of the transport system is contracted to various private companies.

In the CBD, trains that initiate in the suburbs run underground, as a metro. There is debate regarding whether trains (metros) or trams are the most efficient means of public transport in the central area. Funding for the transport system comes through the state and is based on state priorities.

The Victoria Department of Transport is responsible for all public transport functions and for developing policies and plans to improve transport services, provide essential transport infrastructure, ensure the security of critical infrastructure, and facilitate freight and logistics operations. The department purchases service from private providers to operate metropolitan buses, metropolitan trams and trains, and regional train service. The government owns the infrastructure and leases it to the private operators. All services are defined in a "partnership agreement," which includes a revenue-sharing agreement for the providers from fares set by the government. Taxi and hire (rental) cars are within the responsibility of the Director of Transport through the Victorian Taxi Directorate.

The bus system is instrumental to the overall transport system as it connects to the rail system. There are about 1,500 buses, and the fleet is about 7 or 8 years old on average. There is a significant SmartBus system, which complements Melbourne's radial train network by providing connections across town to schools, shopping, and other activity centers. Through a combination of priority on the road

and smart technology, the buses are highly reliable, and travelers are provided real-time travel information at high-use bus stops.

In the city's underground system, trains are experiencing capacity problems because the current technology does not allow for closer headways and efficient loading and unloading. The freight system and the passenger system run on different tracks; as a result, the Melbourne rail system is far less affected by freight operations than the Sydney rail system.

The rail system runs 331 three-car train sets with four different types of trains. As in Sydney, the trains are considered the workhorse of the public transport system carrying 340,000 passengers daily with annual expenses of \$646 million. Passenger counts have escalated 22.5% over the past couple of years while the focus has been on maximizing the existing infrastructure and simplifying the system to make it as efficient as possible. Only trains that operate in the loop are run in the underground, which is an infrastructure that is over 30 years old. There is a significant focus on customer service and on the needs of the customers. The challenge in Melbourne is trying to rely on the existing infrastructure merely by keeping it in a state of good repair and yet upgrade the service to meet growing demand. Currently, their focus is on keeping the infrastructure and equipment they have running in the best manner possible.

Victoria provides unified transport services coordinated through Metlink, which is the face of public transport in Melbourne and Victoria. Metlink is a private company formed of a partnership among the bus, tram, and train operators. It provides customers with a single source for information about bus, tram, and train services; handles fares and ticketing; answers customer inquiries; logs customer suggestions and feedback; and provides timetables. It is also responsible for tracking lost property, providing advice on new ticketing initiatives, gathering data, initiating research, collecting revenue, and managing a public transport think tank.

The other area of responsibility for the Ministry of Transport is the accreditation of operators and construction contractors through a safety arm of the organization. This group also develops risk management plans and conducts safety plan reviews of the operations contractors.

The Victoria Department of Transport is under pressure from the public for more trains and light rail lines. Every 2 to 3 years a short extension of the

heavy or light rail system is constructed, but the focus is on increasing capacity and quality of the existing system and upgrading bus service rather than expanding the system. The capital budget projects an investment of \$250 million within the next 5 years and \$650 million over 10 years.

Of the train and bus trips within Victoria, 70% provide service to the CBD. These trips have experienced a 9% increase in patronage since 2004. Tram patronage numbers have decreased over the past 2 years; these numbers are, however, based on number of tickets validated. Trams have been too crowded to conduct actual counts, which may have an impact on patronage numbers; the fact that these trams operate in mixed-traffic conditions provides little incentive to ride. Bus patronage remains flat. In contrast, regional train service experienced an increase in patronage of more than 20% in FY2006–2007, but saw a drop in FY2007–2008.

In response to the demand for increased service, the Victoria Department of Transport is taking several actions including

- Demand management (e.g., Earlybird/Travel Smart programs),
- Operational changes,
- Expanded/accelerated purchases of rolling stock, and
- Infrastructure expansion programs (AUD \$10 billion over the next decade).

There is a significant debate regarding investing in current infrastructure versus upgrading the current infrastructure. Melbourne has a strong transport advocacy group, the Public Transport Users Association, which was developed in the 1950s and 1960s when the transport system was run down and service was very poor. The advocacy group supports the position that investing in existing infrastructure through rehabilitation is more effective than adding new tunnels and track.

To respond to increasing demand, every couple of years a small portion of the tram network is extended to follow urban development trends.

The Department of Transport recently issued a tender for a company to run the SmartBus routes. This company will provide service every 15 min along four routes that feed or connect to major activity centers. These high-patronage routes provide “circumferential connections” around the city of Melbourne. Melbourne opted to take the SmartBus approach rather than the bus rapid transit

(BRT) approach; since implementation of the SmartBus routes, patronage has increased by more than 50% on the routes. System expansion will continue to focus on constructing short extensions to heavy or light rail, increasing capacity and quality of existing rail systems, and upgrading bus service.

The *Melbourne 2030 Land Use Plan* (available at http://www.dse.vic.gov.au/melbourne2030online/content/introduction/02_summary.html) provides an integrated transport and land use plan. There are several challenges presented in the report. The first is that two-thirds of Melbourne's tram system shares road space with private cars in the most congested parts of the city. The trams are slowing down and becoming less reliable. The solution presented is to provide on-road priority for the trams by using traffic signals and right-hand turns, as well as improving the tram stops.

Another challenge is that the patronage on Melbourne's train system has increased by 25% in the past 2 years, resulting in significant overcrowding. Increasing the peak-hour capacity on the suburban train system by adding extra track capacity, adding new vehicles, and adding car parks at stations is another challenge. To better serve the elderly and persons with disabilities, AUD \$250 million is being invested to improve accessibility at stations, bus stops, and tram stops, and to provide low-floor vehicles.

Melbourne Trams

The tram network is run by a private operator (Yarra Trams). In contrast to many cities in Europe and other areas where tram systems have been decommissioned, the Melbourne tram system exists as a highly functional public transport system. Trams are iconic of Melbourne; the tram system has been in place for more than 100 years and operates in mixed traffic throughout the city. It is considered to be the largest tram network in the world, consisting of 480 trams operated by 1,128 drivers on a 249-km double-track network. The system was privatized in 1999. The trams are considered very reliable and have strong support from the public. The state owns the assets, and the operations are contracted out to the private sector. There is a revenue-sharing agreement that supports the concept of growing both the number of passengers and farebox revenues.

The tram network is integral to the center of the city, but the trams are difficult to make accessible to persons with disabilities. The bus and rail systems are more easily adaptive to these needs.

In FY2006–2007, 155 million trips were taken along the 27 tram routes. The trams operate more than 20 hours per day and log more than 22.5 million kilometers each year.

The tram system is suffering from several years in which there was no investment in infrastructure. Responsibility for the infrastructure is now jointly shared by the state and the operator (Yarra Trams). The Victoria state government owns the trams, which range from modern low-floor vehicles made in 2002 to vehicles vintage 1955 with eight varied train types. The outdated infrastructure combined with the unusual combination of new, old, and historic vehicles presents challenges to running the system. Despite the aging fleet, there is a 92% availability of vehicles.

Approximately 80% of Melbourne's tram network shares road space with other vehicles, which directly correlates with the 900 accidents per year that occur on the system (approximately 3 per day). The crashes vary in severity from fender benders to serious collisions. Safety is a major priority, and measures are taken to review the 1,806 stops across the network, only 276 of which are modern platform stops. The average tram speed is 15.9 km/h overall and 11 km/h in the CBD.

Melbourne Trains

Connex provides the day-to-day train operations for Melbourne and maintains the train tracks according to standards set forth by the state of Victoria. Connex also provides the customer service functions; staffs, maintains and cleans the vehicles; develops new timetables; supports Metlink; and serves as the public face of the train system.

The state provides oversight of the contract and monitors the performance of the operator, as well as promulgates safety regulations, provides sustainable funding, conducts long-term planning, approves timetable changes, regulates fares and concession policy, and oversees the smart card ticketing system.

The Melbourne train network provides 201 million passenger trips per year, which equates to more than 340,000 customers per weekday. This service is delivered by 331 three-car electric units along 372 km of track and 211 stations within a 92% on-time performance threshold and delivering 98%

of trips. Ridership is expected to grow to more than 250 million riders by 2010 and it is estimated that the system capacity will be in crisis by 2015. Restrictions on the system already include the following:

- Need to increase service to deal with patronage growth;
- City Loop [station] has reached practical capacity;
- Additional services need to operate directly to Flinders Street station (i.e., without having to travel the City Loop);
- Conflict at the junctions approaching the City Loop;
- Cannot share access to the City Loop between groups; and
- Limited fleet size.

Connex officials anticipate adding 18 new trains in 2009 to replace some of the fleet, which ranges in age from 7 years to 30 years. To address the peak-usage capacity constraints, a network development partnership has been organized among key franchise managers and Connex representatives. The group has already made strides by planning the introduction of morning peak service utilizing the existing fleet by such tactics as increasing the capacity of the maintenance facilities, increasing maintenance staff, and improving the management of train faults.

Stage 2 of the plan will be based around an increase to the afternoon peak-hour service, the introduction of six-car interpeak running, and 105 additional and extended services per week along specific corridors. Stage 3 of the plan will continue to add key services during the peaks, as well as focus on rerouting trains to untangle the approaches to the CBD. Stage 4 will seek to improve interpeak frequencies, continue a focus on approaches to the CBD, and provide timetable initiatives to improve train running on identified corridors. A major endeavor in Stage 4 will be the preparation of the network to accommodate additional rolling stock. The additional 18 trains on the network will require revisions to the express running time on key corridors, standard stopping patterns, timetables, and new infrastructure.

ADELAIDE

Adelaide is the capital of South Australia and the fifth-largest city in Australia. A coastal city, it has a population of more than 1.1 million and a population density of approximately 3,350 people per square mile.

Historically, Adelaide was known as the “20-minute city,” because commuters could travel from metropolitan outskirts to the city proper in roughly 20 min. Today, however, roadways are increasingly inadequate to cope with Adelaide’s growing traffic.

The public transport system is managed by the State Department for Transport, Energy and Infrastructure, known as the Adelaide Metro. Adelaide Metro provides system-wide information and marketing.

The public transport system consists of a bus system operated by four contractors, commuter railways operated by a state governmental corporation, and the light rail system that connects the city center to the beach town of Glenelg.

TransAdelaide is a government agency that operates the train and tram services under a contract with the state.

The metropolitan region, as well as the CBD, does not experience significant vehicular traffic delays compared with the other four cities visited. This helps explain why Adelaide has one of the lowest uses of public transport. The public transport system accounts for only 7.2% of all weekday kilometers traveled; the goal is to increase that share to 10% by 2018, which would then account for approximately 25% of all trips to the CBD.

Adelaide’s long-term strategy is for heavy rail to act as the spine and buses to act as feeders. Currently 80% of the daily boardings are attributed to the bus system. Most of the remaining boardings occur on the 90-km commuter rail network.

Adelaide Metro has in place a 10-year forward-looking plan that had been fully funded only through the first 4 years. Recent governmental emphasis has now funded the plan through the full 10-year period as a result of existing infrastructure conditions, relentless media coverage, a strong CEO at the helm, a tenacious Minister of Transport, and rapidly escalating world oil prices. The plan also places a strong emphasis on multimodal coordination and collaboration on delivery of services.

The plan includes funding of almost AUD \$660 million for improvements to all three modes of the network over the next 4 years, as follows:

- AUD \$162 million for extension of the light rail,
- AUD \$293 million for partial electrification of commuter rail,

- AUD \$140 million for upgrade of commuter rail line and network, and
- AUD \$64 million for bus fleet expansion.

Current efforts in Adelaide are focused on providing better on-time performance and more effectively marketing the public transport system. The entire bus operation was recently contracted out to private firms; ridership surveys and focus groups have been undertaken to ascertain public opinion about the services being provided by the new operators. A colorful and unique branding of the system is under way, such as the Footy Express, which is service that carries 20% of football (soccer) fans to games. “Green” programs have also been implemented, with slogans such as “Your Ticket is Saving the Planet.” Go Zones, which are trunk-line bus corridors with frequent service patterns, are also being promoted.

The South Australian State Strategic Plan includes a goal of increasing the use of public transport to 10% of metropolitan weekday passenger vehicle kilometers traveled by 2018.

Adelaide’s current transport system consists of 810 buses traveling on 1,440 km of bus routes and 12 km of O-Bahn track; 99 railcars traveling on 120 km of train track; 16 trams traveling on 12.5 km of tram line, with 98 interchanges and stations; over 7,000 bus and tram stops; and over 650 metro ticket outlets. More than 66 million journeys (trips) are taken each year at a cost of AUD \$270 million per year. About 23% of the cost is recovered in fares.

The infrastructure plan outlines priorities that include the Outer Harbor export area, the North/South corridor, the regional freight network, and public transport. More than AUD \$2 billion will be invested over the next decade to revitalize the public transport network including converting trains from diesel to electric motors, upgrading bus fleets and increasing the number of buses from just over 800 to 1,100, extending the tram network, and upgrading interchanges on the world famous O-Bahn busway.

Area/Corridor planning will optimize services across modes to meet growing demand, examine the configuration of the rolling stock and fleet, develop infrastructure requirements such as stations, interchanges and park-and-ride lots, urban design, and transit oriented developments (TODs).

Of the AUD \$2 billion to be invested over the next 10 years there will be an AUD \$1.249 billion addition to the capital budget over the first 4 years of the strategic plan and an AUD \$173 million addition

to the operating budget over the first 4 years. Projects include extension of tram service from City West to Adelaide’s Entertainment Centre, beginning the electrification of the Noarlunga and Outer Harbor lines, expanding the bus fleet by 20 buses/year for the next 4 years, purchasing 50 new electric rail cars, concrete re-sleepering of the Gawler line, re-furbishing railcars, and replacing the existing magnetic fare collection system with a smart card-based system.

Trips on the Adelaide Metro system have grown by 10.9 million since 2000; last year, more than 66.17 million trips were made on the metro system. Rising fuel prices have had a major effect on transport patronage.

Every 2 years a customer satisfaction survey is conducted. The most important characteristics of the system, as identified by customers, are:

- Being on-time,
- Feeling safe on board,
- Feeling safe getting to the stop/station,
- Cleanliness, and
- Courteous staff.

Of the Metro’s customers, 57% are women and 42% are students (ages 15 to 24). Metro services are used at least 3 days a week by 66% of customers, and 90% use the Metro on weekdays.

The main factors that would encourage greater use of the system include

- More frequent service,
- Lower fares,
- More evening/weekend service,
- Reliability,
- Faster service,
- Improved security,
- Improved stop/station amenities, and
- Better cleanliness.

The best prospects for new or discretionary riders are women aged 25 to 44. Their main reasons for travel are for work (35%), social/recreational purposes (21%), shopping (13%), and personal business (13%).

Adelaide Metro says its marketing focuses on the basics, which consist of the following priorities identified by the customer:

- Get me where I want to go.
- Turn up when you say you will.
- Get me there when you say you will.

- Give me more choices and flexibility—I haven't got time to waste.
- Respect my personal space.
- Are you cheaper than my car?
- Are you quicker than my car?
- Am I safe with you?
- I care who I hang out with.

Adelaide Metro's marketing efforts target why and how customers use Metro. The marketing efforts point out the benefits of riding Metro, including ease of access, reliability, cost savings, comfort, and safety, and provide travelers with guidance on accessing and using the system, including "handy hints" for riding Metro.

Brand recognition is extremely high at 82% and services are well established. Adelaide Metro has a defined chain of information, and its staff and operations are customer-focused. Adelaide Metro's marketing strategy is that all activities will address one or more of the following strategies:

- Improve product alignment,
- Maintain customer focus,
- Manage expectations,
- Encourage migration out of peaks,
- Improve perceptions,
- Maintain credibility,
- Improve basic understanding of product,
- Improve awareness and understanding of benefits of transit,
- Target best prospects with relevant product and message, and
- Ensure smooth transition for service changes.

A Go Zone is not a route but a zone that promises a high frequency of service within that clearly defined zone, using a variety of different bus route numbers that will service all stops in that zone. Go Zones offer service at least every 15 min on weekdays. A Go Zone is clearly identified by bright red bus stops and information displays along the route containing timetable and route information.

Another promotion, After Midnight Saturday Bus Services, publicized revised night routes and services and resulted in a 40% increase in late-night patronage. Services were combined and rerouted as necessary to major destinations such as beaches, shopping malls, and entertainment areas while ensuring adequate service to many neighborhoods.

Heather Haselgrove, acting executive director of the Public Transport Division in the Department for

Transport, Energy and Infrastructure, stressed that "Public transport is not an end in itself—it is always tied to other activities and other objectives. It needs to reflect the lives of the people in the cities it serves." See Figure 4.

An additional objective of South Australia's strategic plan is to improve service for customers through innovative, responsive, and accessible service while controlling operating costs and maintaining a viable business that earns a reasonable profit. There are seven bus contract areas and a retained government rail service provider in South Australia.

The service contracts include length of contract, routes, timetables, customer information, standards, performance measures and penalties, common ticketing system and fares, termination of contract clauses, and price. The components include items such as special events, service requirements, approved vehicles, insurance, advertising, reporting, and audits.

Contract management is viewed as a partnering approach with performance measurements, continuous improvements, incentives, and penalties. Key performance indicators include: on-time performance, customer satisfaction, customer safety, fare evasion, bus maintenance and presentation (cleanliness), quality accreditation, community consultation, and service reviews.

According to the Public Transport Division, service is much better since they have contracted out the operations. There is more efficiency in driver as-



Figure 4 Heather Haselgrove, acting executive director of the Public Transport Division Department for Transport, Energy and Infrastructure, stressed that "Public transport is not an end in itself—it is always tied to other activities and other objectives. It needs to reflect the lives of the people in the cities it serves."

signments, deadheading, work rules, satellite depots, and adherence to key performance measurements.

TransAdelaide operates the rail network, which comprises four main rail lines that extend up to 40 km north and 30 km south of the city. The network also includes the tram line from the city to Glenelg. See Figure 5. Some of the initiatives that TransAdelaide is exploring to cope with capacity needs include:

- Establish an additional depot (currently there is only one);
- Review downtown loop;
- Track improvements (ties, inspection);
- Monitor delays;
- Standardize network patterns;
- Purchase new rolling stock;
- Encourage shoulder peak usage;
- Make station improvements;
- Take steps to reduce fare evasion;
- Work with police;
- Consider station closures; and
- Implement a smart card system to speed boarding.

The Adelaide bus system includes the distinctive Adelaide O-Bahn busway. The O-Bahn was introduced in March 1986 in the one main urban growth corridor that did not feature rail service; it was implemented in response to a growing demand for faster public transport services to the expanding northeastern suburbs and replaced an earlier plan for a tramway extension. The route is operated by Torrens Transit.



Figure 5 TransAdelaide operates a tram line from the city to the beach town of Glenelg.

The design is unique among public transport systems. Busways typically use dedicated bus lanes or separate carriageways, but the O-Bahn runs on a specially-built track, combining elements of both bus and rail systems. The track is 12 km (7.5 mi) long through a scenic, park-like setting. See Figure 6. Customers can either walk from their neighborhood to a busway station or drive and park in the lots provided. Interchanges allow buses to enter and exit the busway and to continue on suburban routes, avoiding the need for passengers to change. Buses travel at a maximum speed of 100 km/h (62 mph), and the busway is capable of carrying 18,000 passengers an hour from the CBD to Tea Tree Plaza in 15 min.

The mechanical track guidance technology used on the O-Bahn was conceived in Germany by Daimler-Benz and Ed. Züblin AG to enable buses to avoid traffic congestion. Horizontal guide wheels engage raised concrete edges on the track to automatically steer the bus. See Figure 7. The O-Bahn is based on a similar design in Essen, Germany. The bus stations are designed to allow buses to pull off the track and into passenger bays so buses are never stationary on the track itself, allowing free-flowing traffic.

Annual patronage on the routes using the O-Bahn increased by almost 70%, from 4.23 million in 1985–1986 to 7.13 million in 1995–1996. Passengers are at-



Figure 6 The O-Bahn runs on a specially-built track through a scenic, park-like setting.



Figure 7 Horizontal guide wheels engage raised concrete edges on the O-Bahn track to automatically steer the bus.

tracted to the O-Bahn by its high frequency, its speed and freedom from congestion, and its smooth ride. The guideway is quieter and safer than a normal busway, and maintenance costs are reduced due to the stability and durability of the track. The O-Bahn could be converted to fixed rail if the need and demand ever warranted it.

The study team had an opportunity to ride the system and found it to be truly a unique experience. The O-Bahn operates within a dedicated right-of-way on a specially constructed fixed guideway. Stations are strategically located near main vehicular roadways along with park-and-ride facilities.

Investing in the commuter rail system includes replacing all rail sleepers (ties) in order to increase operating speeds and replacing train seats and windows. There is also a plan to replace the existing “broad gauge” track with standard gauge in order to accommodate future shared use of heavy rail track by light rail vehicles. Consistent with the plan for shared-use track, plans are in place to electrify the commuter rail network.

All commuter rail expansions were completed in the 1980s and the extension of the tram/light rail system to the waterfront was recently completed. No specific plans for expansion were presented other than extending the reach of the light rail system onto the commuter rail network. Early planning efforts are underway that would advance 11 different sites for high-density TOD projects.

Consistent with a program to electrify the rail system, 15 dual-voltage trams that can operate on both direct current (DC) light rail lines and alternat-

ing current (AC) heavy rail lines are being ordered by TransAdelaide. This technology, used in France and Germany, will be a first for Australia. Bus operations have in place a program to add 20 additional vehicles per year to increase capacity.

PERTH

Western Australia accounts for about one-third of Australia’s land mass. Perth is home to 1.5 million of the state’s 2 million population. In 1960, the city’s population totaled 409,000; as the city grew, its infrastructure was designed and built around the automobile. Today Perth has a comprehensive road system with relatively low levels of congestion; yet congestion is getting worse, travel times are increasing, and land for additional road capacity is limited. Approximately 81% of all trips within Perth are by car.

Split by the Swan River and situated on a coastal plain, the city of Perth measures 20 km wide and 130 km long—and it is expanding. It has low urban density, high transport dependency with a good road network, and a high rate of automobile ownership. As a result, Perth faces the challenge of making public transport relevant and effective.

Transport in Western Australia is controlled by the Public Transport Authority of Western Australia (PTA). It has a common branded service (Transperth) covering integrated bus, rail, and ferry services, and it has a smart card system for fare collection.

Public transport is operated both by the PTA and by contract. The government retains ownership and control of the network and outsources the labor.

Transperth operations are divided among a train network operated by Transperth Train Operations, a bus network with three contract providers, the strategic corridors network, and a centrally controlled ferry service provided by one contractor.

The Perth train system is a great success story. As with other Australian cities, passenger and freight service runs on separate tracks. See Figure 8. Governmental priority and investment have helped in Perth’s rail success; however, the lack of preserved corridors for additional lines will present challenges in the future. New lines will require tunneling and property acquisition.

The state government invested \$1.66 billion in a new metrorail project that was completed in December 2007. Known as the Mandurah line, this was the largest infrastructure investment ever undertaken in Western Australia. The new line provides



Figure 8 Perth’s passenger rail system is completely segregated from freight rail, giving it the ultimate priority.

81.5 km of new route and infrastructure and includes 13 new suburban stations, two major underground stations, major tunneling works, 93 new rail cars and maintenance facilities, and 20 new bridges and structures. Ten months after the line was commissioned, patronage was at 96% of that predicted for the first year of operation.

The AUD \$1.66 billion project doubled the metropolitan rail network serving Perth. Its trains travel at speeds up to 150 km/h. Strategically placed high-volume stations and increased frequency of service have turned wait times into journey times. Twenty of the thirty-nine stations account for 63% of the boardings. Providing high-quality rolling stock also contributed to the use and reliability of the system.

The Transperth bus fleet consists of 98 articulated buses and 1,019 rigid buses. The average age of the fleet is 10.4 years. Today 65% of the fleet is accessible; Transperth’s goal is to have 100% of the fleet accessible by 2022. The bus replacement plan provides for 896 buses over 12 years, but does not include retiring the buses one for one.

There has been little focus on bus priority, and Transperth will have to facilitate the ability to meet increasing demands. A change in mindset is needed to reinforce the idea that public transport is the more efficient form of travel.

The PTA has developed a strategic corridors network that provides a strategic framework for the long-term implementation of a comprehensive, integrated mass transit network. The strategic

corridors network looks to identify critical transport and mobility corridors and then to find ways of combining the benefits of the existing rail network with increased priority for road-based public transport in those corridors. Transperth describes strategic corridors as those that have the following characteristics:

- Increasing traffic congestion and high levels of private vehicle travel,
- Already popular public transport corridors,
- Major arterial/regional roads, and
- Limited opportunities for additional vehicle capacity.

The SmartRider ticketing system was fully launched in April of 2007. This smart card-based integrated ticketing system provides access on all transport modes and replicates the former fare and discount structures. Because of the tag-on and tag-off requirement, the system can calculate and deduct the correct fare from the stored value on the card. Ten fare types can be processed, but the system does not accommodate period tickets, such as monthly passes. For the week commencing December 31, 2006, there were 14,313 SmartRider cards used and 83,449 tag ons; in comparison, for the week commencing October 8, 2008, there were 181,377 cards used and 1.5 million tag ons.

Transperth is the only system in the five Australian cities visited with a systemwide smart card. The government spent \$30 million on the smart card, which replaced antiquated systems that were no longer effective. The systemwide smart card is marketed through a third-party retailer. Both standard and discounted tickets are sold. Transperth also operates a fully integrated web-based data management system that incorporates Google Transit into system mapping and journey planning.

BRISBANE

The population of South East Queensland is expected to grow from 2.8 million to 4.3 million in the next 20 years. Approximately 70% of the job growth will take place in the Brisbane CBD/inner city, while large employment growth is projected in lower density areas. These combined factors will lead to a change in travel demands and increased public transport demand. South East Queensland has developed an integrated Regional Transport Plan to prepare for these transport demands, *Connecting SEQ 2031* (informa-

tion is available at http://www.transport.qld.gov.au/Home/Projects_and_initiatives/Plans/Integrated_transport_plans/Connecting_seq_2031). The plan incorporates the Queensland State Government priorities, the state transport coordination plan, the congestion management strategy, a draft strategic road network plan, and South East Queensland Freight Network Strategy.

The following transport planning drivers were identified in developing SEQ 2031:

- Average distance travelled is 7,400 km/y compared with 6,500 km/y in Sydney;
- Total private vehicle kilometers traveled has increased by over 80% in the past decade from 28.5 million km/day in 1992 to 52.4 million km/day in 2004;
- Average distance from home to work is increasing from 11.6 km in 1992 to 16.3 km in 2004;
- 43% of daily trips occur in peak periods, resulting in increased congestion;
- Public transport ridership has grown 10% per year (four times the rate of population growth) since 2004; and
- Public transport share of all travel has increased from 6.6% in 1992 to 7.1% in 2004.

The transport agency has developed key themes. The creation of transit development corridors linked with investment in quality public transport services and infrastructure is one of the key themes. A second theme is that the connected network of centers of employment provides an opportunity for high-frequency priority public transport and industrial centers with access to freight corridors. The development and infrastructure coordination/sequencing is defined as the “coordinated staging of supporting infrastructure with new communities developed in sequence for better outcomes with limited resources.” Within this theme the plan is that major new communities should be designed around and with transport infrastructure. Public transport experts in Brisbane have learned that given the constraints of funding, new public infrastructure should be developed close to the existing urban areas.

Queensland Transport provides public transport for several networks. Large regional cities of major importance, retirement destinations, and small urban centers have been identified and provide a framework to cater to the varied markets. The networks may have different markets such as commuters, tourists, elderly persons, disabled persons, youth, or the financially

disadvantaged. Qconnect is a strategy to improve transport in regional Queensland utilizing lower fares, zone-based fare structure, improved marketing, improved infrastructure, and better planning.

The three-point approach to the qconnect network plan includes improving existing service, expanding the network, and adding value. The minimum service levels identified by the plan are 30-min daytime frequency and a service span that spreads to nights, weekends, and public holidays. Adding service to new attractions and new developments will provide the plan with network expansion. There may be opportunities to add value to the system by increasing frequency on some lines to at least 15 min to attract segments of the market or choice riders.

Of the 11.4 million rides taken on the regional bus, urban rail, and ferry system, 38% were taken by adults, 22% by pensioners (retirees), 36% by children, and 4% by university students.

TransLink is Southeast Queensland’s transit authority responsible for the public transport system including integrated services, ticketing, and accessible customer information. It also oversees and coordinates the services provided by 17 different bus, train, and ferry operators in the region; develops new technologies to improve services and passenger information; and oversees resources to ensure that public transport infrastructure will meet the demands of the growing population.

TransLink’s network plan sets the vision of the organization as:

- The best public transport system in Australia,
- An operationally excellent organization,
- A trusted organization, and
- A place people want to be.

The network plan anticipates a 9% growth in patronage over 4 years. Toward this goal, the Queensland government plans to expend AUD \$36.3 million for additional service in 2007–2008. In 2004–2005, the annual cost of the changes in service was AUD \$4.3 million, and in 2005–2006 the cost was AUD \$10.4 million.

The rail network within Brisbane is a radial network. The plan is to squeeze as much capacity as possible out of the existing network until the infrastructure can be expanded with its aging rolling stock (the oldest train is 24 years old). The bus fleet is considerably newer and the plan is to add 140 vehicles per year. A new 20-km busway project is underway at a cost of \$4 billion.

The Queensland Department of Infrastructure and Planning has developed the *South East Queensland Infrastructure Plan and Program 2008–2026*, which includes sections on “Tackling Urban Congestion” and “Public Transport Initiatives” for South East Queensland (the report is available at <http://www.dip.qld.gov.au/regional-planning/south-east-queensland-infrastructure-plan-and-program.html>).

The plan details the many transport projects underway or in development for increasing passenger transport services. Queensland is very structured in its approach to transport infrastructure improvements and has committed funding to complete transport improvements and upgrades.

Queensland Transport identified certain conditions and drivers for purposes of its regional strategic planning. One of the key drivers is the expected increase in growth over the next 20 years. The population is expected to increase from 2.8 million to 4.3 million. Jobs in the Brisbane CBD are expected to grow by 70%, and large out-of-center employment growth is expected, which will create a need for new services.

The urban areas are rapidly expanding, and congestion and capacity are expected to increase for both freight and passenger services. In consideration of these core planning drivers and others, Queensland is planning to connect Southeast Queensland by linking transport with land development. The idea is to create transit development corridors. The team had the opportunity to visit one of the TODs that Queensland refers to as smart urban growth.

Along these same lines, Brisbane is also in the process of providing infrastructure improvements to its busway corridors. Several large projects are currently under construction to provide exclusive busway corridors so that the buses can move more effectively through the city.

Brisbane has a significant BRT system that incorporates major infrastructure investment in the CBD including tunnels, an underground bus terminal, and dedicated bus-only roadways and stations. See Figure 9.

The expected high level of growth over the next two decades, combined with factors such as the recent rise in public transport patronage and a focus on reduction of greenhouse gases, has led the Queensland government to increase both its investment in public transport and its long-term planning effort, which attempts to integrate land use planning, greenhouse gas reduction, and transport, freight, and roadway planning.



Figure 9 Brisbane has a sophisticated, extensive BRT system to serve the CBD.

The Inner City Rail Capacity Study (ICRCS) has begun to identify and assess options to address network capacity issues and support projected rail passenger and freight growth, since both services share tracks in some locations. Preliminary findings indicate that two new rail corridors within the CBD will be needed by 2026, with supporting rolling stock and maintenance facilities. In addition, infrastructure improvements outside of the CBD will be required to feed new corridors. Improvements include additional platforms, track, grade separation, and signaling upgrades.

To support passenger rail operations, 44 three-car units are on order and will be delivered in 2010. Plans for an additional 58 three-car units are in place. A bus purchase program has been in place for the past several years, with a delivery schedule of approximately 140 buses per year.

The results of the integrated planning studies all point to the need for constructing additional public transport infrastructure in both the near and long term. Currently, the city is constructing extensions to dedicated busways that connect to the CBD and plans to purchase additional buses to support the extensions.

In addition to new infrastructure to support passenger rail needs, studies indicate that a new light rail system should be constructed in the Gold Coast, which is now the sixth largest city in Australia. Light rail was compared to BRT and was determined to be the appropriate mode due to the need for higher capacity.

TransLink has issued a draft report on capacity enhancement alternatives called the “Rail Assessment of Capacity Alternatives Study.” The findings include purchase of additional rail cars for longer trains (12-car units), signaling modifications, platform and holding facilities to accommodate longer trains, and grade separation projects.

CONCLUSION

With funding for public transport provided at the state level in Australia, the priority for public transport varies from state to state. In the states where public transport has a high profile and thus the attention of the politicians, there seems to be a significant investment in the expansion and augmentation of the public transport infrastructure. This seems very apparent in Perth and Brisbane and to some extent Adelaide. In the states where public transport is not part of the political agenda, public transport investments seem to focus on maintaining the existing infrastructure and equipment and maximizing the life of existing assets, which is apparent in Sydney and Melbourne.

Our Australian colleagues in the transit industry are facing the same challenges we do: rising populations, traffic congestion, budget constraints, and the new imperative to be “green.” The Australians are addressing these challenges by combining some very simple solutions with cutting-edge technology. They are employing a balance that is effectively getting the best from each approach. For example, the Australians are comfortable keeping vehicles in service beyond what we would consider their useful life. It is a decidedly low-tech solution to maintaining fleet inventory and it appears to work. This tactic reduces or eliminates the need to retrain operators or retrofit maintenance facilities. And, from a rider perspective, the study team saw nothing that indicated significant user dissatisfaction with this decision.

On the other hand, our colleagues in Australia are pushing the envelope with their use of new technologies, such as video surveillance, smart cards,

and real-time schedule information on Blackberries/personal digital assistants.

There are no set formulas for addressing these challenges. Each challenge requires creative thinking, and every low- and high-tech solution should be considered.

APPENDIX A—STUDY MISSION TEAM MEMBERS

(Affiliations listed were current at the time of the study mission)

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APPENDIX C—ABBREVIATIONS

DDA	Disability Discrimination Act of 1992
DTEI	Department for Transport, Energy, and Infrastructure
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act



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