CHAPTER 7—TRANSPORTATION MANAGEMENT/ INTELLIGENT TRANSPORTATION SYSTEMS

Introduction

Transportation Management is an integral part of managing the existing transportation system to enhance the capacity of the existing system and reduce transportation demand on the system. Transportation Management includes Transportation System Management (TSM) and Transportation Demand Management (TDM) measures or programs. TSM/TDM programs are designed to improve operation of area streets and make transit, bicycling and pedestrian circulation safer and more efficient without costly development of new infrastructure. TSM/TDM programs address both supply and demand issues. While TDM measures focus more on demand issues by providing information and incentives to influence human behavior, TSM measures focus on managing supply rather than on traffic demand. Intelligent Transportation Systems (ITS) are the use of technology to fulfill TSM objectives.

Transportation System Management

TSM measures are technologies, policies and operational techniques that maximize efficiency of the transportation system. They include capital improvements and operation, maintenance, regulatory and service programs that can enhance the capacity of the existing transportation system by achieving maximum efficiency and productivity. TSM programs may include traffic control upgrades and traffic engineering improvements having relatively low cost such as signal timing optimization, signal progression and coordination, addition of left-turn and right-turn bays, channelization and lane assignment, traffic signal controller upgrades, installation of LED traffic signal lights, signal interconnection and communication with central computers, providing transit signal priority, improvement and upgrades of Traffic Management Centers, and installation of ITS technologies. TSM can also include the relatively expensive programs such as providing reversible traffic lanes, intersection widening, high-occupancy vehicle (HOV) lanes on freeways and major arterials and ramp metering. TSM improvements may reduce travel times, delays and stops while also improving average travel speeds or they may enable greater system throughput will maintaining existing travel times and speeds. Since the travel patterns of the community are dynamic and change over time, it is important to continuously monitor, adjust and revise TSM measures to optimize their effectiveness.

Transportation Demand Management

TDM measures are intended to reduce peak-hour auto travel by influencing mode choice and the time of, or need to, travel. These measures can help alleviate traffic congestion, reduce lost worker productivity and improve the air quality in the region. TDM measures may provide incentives for using alternatives to single occupancy vehicle travel such as carpooling and vanpooling, public and private transit, bicycling and walking. TDM strategies can also include financial or time-of-travel incentives and parking management programs. In its broadest sense, TDM measures can include land use strategies such as Transit Oriented Development (TOD) which are focused on creating attractive physical environments that reduce the need for and reliance on automobiles as the dominant mode of transportation.

TSM/TDM strategies are very important as they may allow us to maximize and optimize the useful capacity of our existing physical facilities. In some cases, we may be able to avoid, defer or reduce street and highway widenings or new facilities in response to congestion at significant savings. TSM/TDM strategies are also very useful in meeting the air quality standards established for our region.

TSM/ITS Strategies

Signal Coordination

Signal coordination and optimization programs that increase the flow of traffic through a group of signaled intersections are essential to minimizing system delay and reducing congestion in the region.

High Occupancy Vehicle (HOV) Lanes

Priority treatment is offered to buses, vanpools and cars carrying two or more people on freeways and arterials where a lane is provided for the exclusive use of HOV vehicles. HOV lanes reduce congestion and are usually constructed on congested roadways where the construction of additional traffic lanes may not be possible.

Ramp-Metering

Ramp-metering can reduce congestion on freeway corridors by allowing only one car at a time to enter the freeway from a vehicle queue. HOV lanes may be used in conjunction with ramp-metering. Priority treatment is provided to the HOV, which can enter the freeway with minimal delay through the use of a ramp meter bypass lane.

Signal Priority and/or Queue-Jump for Buses

Transit signal priority and/or queue jumping allow transit vehicles to move through signalized intersections with less delay. Reduced delay time stimulates ridership thus increasing the efficiency of the total transportation system.

Investment in Public Transportation

Investment in public transportation is a long-range planning process and a major financial investment. Planning studies should include goals and objectives, a survey of travel patterns, identification of the existing needs and problems, forecast of future ridership, alternative routes and financial analysis. The RTC is the public transportation provider for Washoe County and, under that capacity, it is continually striving to provide the most efficient transit services to the citizens to alleviate traffic congestion on the transportation system and to help reduce fuel consumption and improve air quality in the region.

Dedicated Busways

Busways may be used exclusively for buses when volumes exceed 40 or more buses in the peak-hour. For lower volumes, carpool drivers may share busways. Busway stations normally require a loading/unloading lane separate from the through-lane in each travel direction.

Bus Shelters and Support Services

The addition of bus shelters and benches increases the safety and comfort of passengers by providing seating while protecting them from the elements. Bus shelters are desirable where service headways exceed a few minutes. Shelter walls also provide space for posting maps, schedules and advertising. At bus and rail stations, some transit operators are also now implementing technology improvements that can provide real-time arrival and departure scheduling information for transit riders.

Reducing Pedestrian, Bicycle and Automobile Conflicts

Bike lanes that are separated from automobiles and are differentiated by color, texture or material provide an extra level of safety and security. If the public is confident that safety and security are provided, bicycle use is likely to increase.

Incident Management

Used on freeways and major arterials, measures include the pre-positioning of incident response personnel and equipment and/or use of advanced technology to detect and verify traffic incidents. These measures improve response time and allow for quicker implementation of traffic management to restore traffic flow.

Real-Time Travel Information

Real-time travel information on roadway conditions can be provided to the traveling public via the telephone, radio, kiosks, changeable message signs or the Internet.

Intelligent Transportation Systems

Intelligent transportation systems (ITS) include technologies for collecting, processing, dissemination or acting on information in real-time to improve the operation, safety and/or convenience of the transportation system. It encompasses a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure and in vehicles themselves, these technologies relieve congestion, improve safety and enhance productivity. ITS refers to electronic and communications systems that can be used for collecting, processing, disseminating or acting on information in real-time to improve the operation, safety or convenience of the transportation system. This definition encompasses a broad range of systems and technologies and has created many new opportunities for transportation professionals to respond proactively to increasing demand for effective transportation services. Many of these new opportunities are predicated upon effective coordination between organizations, at both the institutional and technical level.

Under the guidance of the U.S. Department of Transportation (USDOT), ITS has evolved into service categories that are useful for categorizing the northern Nevada transportation system overview. These services are:

- Traffic Management
- Automated Vehicle Location
- Maintenance and Construction Operations
- Traveler Information
- Commercial Vehicle Operations
- Emergency/Incident Management
- Archived Data Management

Traffic Management

Traffic Management includes roadway traffic detectors, other surveillance equipment, the supporting field equipment and wire line communications to transmit the collected data back to a Traffic Management System. The derived data can be used locally, such as when traffic detectors are connected directly to a signal control system or remotely e.g., when a CCTV system sends data back to the Traffic Management System. The data generated enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations and collect census data for traffic strategy development and long range planning.

Most vehicle detection is provided through the use of inductive loop detectors, but failures are common because of the climatic conditions in northern Nevada and the frequency of road construction and widening because of growth. Although winter temperatures are not extremely low, because of the high-desert environment, there is a large range of temperatures between daytime and nighttime. This variability takes a toll on pavements and the imbedded wires of vehicle detectors

At some high-speed approaches to isolated traffic signals, advance signal warning flashers are in place. These systems detect vehicles well outside the dilemma zone and provide a flashing warning signal in advance of the yellow clearance interval. The flashing warning is continued for a number of seconds after the onset of green to give warning of a standing queue. This dynamic warning helps avoid rear-end crashes on the high-speed approaches.

Automated Vehicle Location

Automated Vehicle Location (AVL) provides a system to track transit vehicles' real-time schedule adherence and updates the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle, e.g., through a Global Positioning System (GPS) and relayed to the infrastructure, or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management System is used for relaying vehicle position and control measures. Fixed-route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management System processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider Subsystem via a wire line link.

Maintenance and Construction Operations

Maintenance and construction operations track the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. These activities can include ensuring the correct roads are being plowed and work

activity is being performed at the correct locations. Maintenance and construction operations automate vehicle maintenance scheduling and manage both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles for scheduling vehicle maintenance.

Traveler Information

Traveler Information involves the collection of traffic conditions, advisories, general public transportation, toll and parking information, incident information, air quality and weather information, and the near real-time dissemination of this information over a wide area through existing infrastructures and user equipment, e.g., FM subcarrier, cellular data broadcast. Traveler Information involves digital broadcast services and relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

Commercial Vehicle Operations

Commercial Vehicle Operations (CVO) keep track of vehicle location, itineraries and fuel usage at Fleet and Freight Management Systems using a cell-based or satellite data link and the pre-existing wireless infrastructure. The vehicle has a processor to interface to its sensor, e.g., fuel gauge, and to the cellular data link. A Fleet and Freight Management System can provide the vehicle with dispatch instructions and can process and respond to requests for assistance and general information from the vehicle via the cellular data link. CVO also provides the Fleet Manager with connectivity to intermodal transportation providers using the existing wire line infrastructure.

Emergency/Incident Management

Emergency Management provides the computer-aided dispatch systems, emergency vehicle equipment and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Systems supports emergency notification and coordinated response between agencies. Existing wide-area wireless communications would be utilized between the Emergency Management System and an emergency vehicle to enable an incident command system to be established and supported at the emergency location. The Emergency Management System would include hardware and software for tracking the emergency vehicles. Public safety, traffic management and many other allied agencies may each participate in the coordinated response managed by this package.

Archived Data Management

Archived Data Management provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy and data management common to all ITS archives and provides general query and report access to archive data users.

Transportation Demand Management Strategies

Incentives for Non Single-Occupant Vehicle (SOV) Travel

The single-occupant vehicle (SOV) is, in many instances, the least efficient mode for moving passengers in the surface transportation system. On a per passenger mile basis, SOVs typically take up the most room on the highways, generate the largest amount of pollutants and cost more than other alternatives. A variety of financial incentives currently exist today to travelers to move out of SOVs and travel by more efficient means. At a very basic level, there is an incentive for carpooling and ride sharing by the savings realized in fuel and vehicle maintenance costs. Further along the spectrum are federal and state tax incentives for individuals using transit, which when coupled with time-savings when transit is moving in dedicated right-of-way, can be very powerful in certain markets. Finally, employers and/or transit providers may offer still further incentives by offering subsidies or steep discounts to transit users.

Transportation Management Associations (TMA)

TMAs consist of several local business organizations that act in partnership with local governments to solve transportation problems. TMAs provide ridesharing and transit services to their employees, but are also involved in transportation planning, financing and implementation.

Limits on Parking Supply

Parking supply is the number and location of all parking spaces in the study area. Parking supply is a fixed number while parking demand can vary. A limited parking supply would consist of less than 100% of the parking demand at peak-hour, thus creating a shortage of supply to accommodate parking demand.

Alternate Work Schedules

In general, trip congestion occurs during peak periods. Alternative work schedules allow travel demand to be spread out throughout the day. Alternative work schedules include three types of programs: 1) staggered hours, 2) flextime and 3) compressed work week.

Telecommuting and Teleconferencing

Telecommuting allows an employee to perform work at a remote worksite; i.e., home, regional worksite or satellite center, by using telecommunications technology. Teleconferencing allows a meeting to be held at multiple locations and linked by audio, video or data equipment.

Transit-Oriented Development (TOD)/Planned Unit Development (PUD)

TODs are a planning approach that aims to create new communities around transport hubs. TODs promote using both urban land and infrastructure efficiently to maximize community benefit by clustering well-designed, mixed-use development including residential, commercial, employment and community activities, around public transport nodes, improving residents' access to them. Precincts where TOD principles are applied are called transit-oriented communities. The pedestrian-oriented design of TODs encourages residents and workers to drive their cars less and ride mass transit more.

Regional benefits of TODs can include:

- the protection of open space and scenic amenity through the containment of urban sprawl
- more efficient use of land and infrastructure
- reduced congestion pressures through increased public transport usage
- air quality benefits due to a reduced reliance on cars
- the provision of a variety of housing options
- more equitable access to community facilities and employment

Local benefits of TODs can include:

- an increased sense of community
- safer, more vibrant urban centers
- improved access to work, shopping and recreational facilities
- an increased variety of services and facilities located closer to where people live and work
- reduced reliance on private vehicles
- higher quality pedestrian and cycling environment
- improved connectivity with neighboring precincts

A number of strategies can be used for promoting TODs:

1. Implementing TOD principles through detailed planning for regional activity centers.

2. Increasing residential densities and the mix of uses in high capacity rail and busway stations to create transit-oriented communities.

3. Concentrating higher density in green areas designed around existing or future public transport nodes.

4. Preparing master plans for activity centers and transit oriented communities.

5. Providing incentives, research, education and other services to support TODs.

6. Preparing guidelines for transit oriented development to assist best practice design.

Transportation System Management (TSM) Policies

TSM measures are technologies, policies and operational techniques that maximize efficiency of the transportation system.

1. Provide signal coordination where needed to optimize the traffic flow and minimize overall system delay.

2. Periodically review the use of high occupancy vehicle (HOV) lanes as a congestion relief measure.

3. Provide ramp metering where feasible and warranted.

4. Where feasible, use transit signal priority (TSP) and/or curb extensions for buses to improve efficiency.

5. Implement rights-of-way primarily dedicated to transit use in the bus rapid transit (BRT) and primary transit network (PTN) corridors, where feasible and cost effective.

6. Construct sidewalks and bike lanes in accordance with the RTP bicycle and pedestrian element whenever roads are constructed, reconstructed or rehabilitated where appropriate.

7. Use incident management techniques to increase safety and improve traffic flow.

8. Continue to explore ways to provide real-time travel information and implement systems to provide this information where feasible and cost effective.

9. Traffic signals shall only be installed where warranted by the standards of the Manual of Uniform Traffic Control Devices (MUTCD) and where they are consistent with the Access Management Standards.

10. Utilize comprehensive roadway guide signage to promote the effective, efficient and safe use of arterials and freeways.

Intelligent Transportation System (ITS) Policies

ITS includes technologies for collecting, processing, disseminating or acting on information in real-time to improve the operation, safety and/or convenience of the transportation system.

1. Continue and expand where feasible the use of advisory radio, variable message signs and roadway weather information to alert motorists to changing traffic conditions.

2. Employ the use of adaptive and special event traffic control to minimize traffic congestion.

3. Implement traffic flow monitoring and incident detection devices as funds allow.

4. Investigate the development of a traffic management center to monitor the transportation system and allow adaptive responses to maintain optimal traffic flows during peak periods, construction detours, transient incidents, accidents and emergencies, etc.

5. Promote the following strategies/technologies to improve transit operations:

   - Traffic signal priority
   - Automatic vehicle location
   - Real-time bus information
   - Automatic passenger counters
   - Demand responsive transit
   - Electronic fare collection
   - Flexible bus stop signage
   - Onboard automated announcements
   - Automated train detection

6. ITS investments should be consistent with the Regional ITS Architecture.

Transportation Demand Management (TDM) Policies

TDM measures are intended to reduce peak-hour auto travel by influencing mode choice and the time of, or need to, travel.

1. Encourage the use of transit financial incentives to increase ridership.

2. Continue to provide passenger amenities such as bus shelters and support services.

3. Continue to implement the region wide ridesharing program in the county.

4. Consider the formation of Transportation Management Associations (TMA) in high employment areas in the county.

5. Investigate the feasibility of third party vanpooling programs and implement where cost effective.

6. Encourage employer-based ridesharing programs.

7. Encourage alternative work schedules for employees as a means to reduce peak-hour vehicle trips.

8. Encourage the use of telecommuting and teleconferencing as a means to reduce vehicle trips.

9. Encourage transit-oriented development (TOD) and/or planned unit development (PUD) with standards and features to promote the use of alternative modes of travel.

10. Seek funding to allow investment in public transit at levels consistent with fulfillment of the RTP.

11. Encourage biking and walking to work to reduce system demand in the peak hours. Promote education for motorists, pedestrians and bicyclists to teach them to safely coexist.

Current Conditions TSM/ITS

Signal Coordination

The RTC, in cooperation with the local agencies, has undertaken a region-wide traffic signal coordination and optimization program to improve signal operations at the selected signalized intersections in the region. Congestion Mitigation/Air Quality

(CMAQ) funds, state funds and local funds are used to undertake this upgrade. In 2005-2006, RTC implemented coordinated signal timing plans at one-third of the intersections in the region and will continue to upgrade the remaining signals on a yearly basis.

Short-term future objectives for signal coordination include a two-phase project. Phase 1 includes a new traffic signal system that will be accessed at all five entities/agencies in a multi-user, multi-tasking manner. Also, a complete area-wide upgrade of most intersection controllers and conflict monitors is recommended as an integral part of the upgrade. Phase 2 will upgrade the traffic signal system communications with the signalized intersections.

Ramp-Metering

The Nevada Department of Transportation (NDOT) is working on a ramp-metering plan to install ramp meters in Washoe County to manage the flow of traffic into the most congested links of the freeway.

Signal Priority and/or Queue-Jump for Buses

The RTC is undertaking a region-wide program to implement transit signal priority system and a queue-jump program to enhance the operations of the transit system along the most congested and heavily travelled arterials and local roads.

Bus Shelters and Support Services

The RTC is upgrading the old bus shelters to accommodate more passengers and to make them safer. RTC is also installing new bus shelters along the transit routes where passenger demand has increased.

Intelligent Transportation Systems

Traffic Management

In the Reno-Sparks urban area, there are three agencies that operate advanced traffic signal systems and all three use the same manufacturer's hardware and software. There are approximately 390 traffic signals in the Truckee Meadows, of which almost 65% are connected to a central system.

Reduced speed limits at school zones are activated by a central pager system in the City of Sparks. A central server maintains schedules for each school zone and a pager signal is sent out to activate and turn off the flashers at appropriate times. Washoe

County has also implemented several pager activated school zone speed limit reduction systems. Status information on school zone activation is also maintained. The City of Reno uses variable signal timing in one school zone. The speed limit is reduced from 45 mph to 15 mph while the school zone is active so vehicle gap settings are increased to prevent the green from terminating early due to slower-moving vehicles.

Automated Vehicle Location

The RTC operates the public transit system in Washoe County, both fixed-route (RTC RIDE) and demand-responsive (RTC ACCESS). The RTC is nearing the end of a multi-year project to provide ITS features on its fleet. The additional capabilities include:

- Automatic vehicle location (AVL)
- Real-time bus arrival information
- Automatic passenger counters
- Electronic fare collection
- Onboard automated stop announcements
- Onboard diagnostics to monitor equipment status and maintenance needs
- Transit signal priority

Traveler Information

Traveler Information is disseminated through a variety of methods in northern Nevada. In the northern Nevada region, the media include highway advisory radio, dynamic and changeable message signs, a public website and interactive telephone services.

Emergency/Incident Management

NDOT operates a freeway service patrol in the Reno-Sparks urban area on US 395 and I-80. The freeway service patrol gives free assistance to motorists whose vehicles are disabled on the freeway system. The patrol vans are equipped with spare auto parts, gasoline and diesel fuel, other motor fuels and water, first aid kits and oxygen for medical emergencies, miscellaneous road-service related items and are operated by drivers with specialized training. The patrols also clear debris from the roadway and communicate emergency situations to the Nevada Highway Patrol and/or NDOT. The hours of operation are Monday through Friday, 6 am—10 am and 3 pm—7 pm.

Archived Data Management

NDOT maintains collision records for the entire state. NDOT also maintains traffic volume information (Annual Average Daily Traffic—AADT) at a network of annual count locations and compiles the information into its annual traffic report.

Current Conditions TDM

Incentives for Non Single Occupant Vehicle (SOV) Travel

RTC SMART TRIPS Program. RTC offers a variety of trip reduction programs in the region including the RTC VANPOOL program and the RTC RIDESHARE (free carpool matching program). RTC SMART TRIPS operates vanpooling in the Truckee Meadows. Vanpools offer a comfortable, reasonably priced transportation alternative for groups of 7 to 15 people who share similar commute patterns. The RTC provides a substantial subsidy for each vanpool—up to $3.60 per person, per day, if all of the miles driven are within Washoe County. If some of the commute trip goes outside of Washoe County, the subsidy is prorated based on the ratio of the miles driven within Washoe County to the total miles traveled, to a maximum subsidy of $2.88 per person per day.

RTC SMART TRIPS, in partnership with Greenride, offers a free ride matching program for the Truckee Meadows. RTC RIDESHARE is a web-based service that uses advanced technology to make carpool matching easy, fast, convenient and accurate. Participants enter their traveling preferences and receive the best potential carpool matches back in a matter of seconds.

The RTC SMART TRIPS program assists businesses and citizens at large in using alternate modes of travel and adopting trip reduction strategies. The reduction in vehicle trips is a critical step toward maintaining and improving air quality in the Truckee Meadows and lessening traffic congestion. FY 2007 was marked by very positive growth of the program in the following areas:

- The number of business partners grew 22% from 18 to 22.
- The number of employees participating increased 16.0% from 1,034 to 1,201.
- The vanpool program increased 12.5%, from eight to nine vanpools.

RTC's Bus Pass Subsidy Program. RTC also offers a bus subsidy program to increase the transit ridership, which will help in reducing congestion and improving air quality standards in the region. This program has been effective in achieving its goals and the following is a summary of the Bus Pass Subsidy Program accomplishments.

- The number of business partners grew from 18 at the end of FY06 to 22 at the end of FY07, a 22% increase.

- The average number of employees participating in the program increased from 1,034 in FY06 to 1,201 in FY07, an increase of 16%.

- Seven of the business partners who have been in the program for at least a year had a participation rate of over 6% of their total number of employees, with a high of 8.89% at the Silver Legacy Resort Casino.

- The total net revenue from pass sales increased from $555,150 in FY06 to $651,220 in FY07, an increase of 17%.

- The total subsidy match from RTC increased from $130,158 in FY06 to $158,653 in FY07, a 22% increase.

RTC VANPOOL Program. A vanpool program is currently operating in the region that helps employees to vanpool to and from work. It helps in reducing the peak-hour traffic demand and congestion on our roadway system in the region. Vanpools have been successful in other communities in augmenting traditional transit services. A number of people who refuse to ride transit buses will join vanpools. A vanpool is like a carpool, only larger. Typically, 7 to 15 people share a van while commuting to and from work each day. One person volunteers to be the driver/coordinator of the van and usually rides free. The remaining passengers share a fee that covers the cost of the vanpool. For the commute to work, passengers may meet at a designated pick-up location or are picked up at home. Similarly, there may be one or several drop off points. The pattern is reversed for the return commute. To encourage participation in the program, RTC provides a subsidy per passenger trip roughly equivalent to the cost per passenger on RTC RIDE. Following is a summary of the vanpool program that is currently being operated in the Reno-Sparks metropolitan area.

- A total of 9 vanpools are currently operating in the region.

- 22,294 single-occupancy vehicle (SOV) trips were eliminated due to vanpool program in 2007 compared with 16,337 in 2006—an increase of 36%.

- 301,330 vehicle miles of travel (VMT) were eliminated as a result of the effective vanpool program within Washoe County in 2007 compared with 236,876 VMT eliminated in 2006—an increase of 27%.

- Overall VMT eliminated increased from 523,823 in FY06 to 807,685 in FY 07, an increase of 54%.

- Subsidies distributed to the vanpool participants decreased from $29,185.89 in FY06 to $13,613.30 in FY07, a decrease of 53%.

RTC RIDESHARE Program. An addition to the program this fiscal year is RTC RIDESHARE, a web-based rideshare matching service that uses modern mapping technology. This new program will enable people to find matches with ease, privacy and independence.

Guaranteed Ride Home Program. One of the most common concerns people have about ridesharing is the fear of being stranded at work without a way home. To provide an additional incentive to rideshare, a Guaranteed Ride Home (GRH) program has been implemented in conjunction with the RTC RIDESHARE program. The purpose of this demonstration program is to remove barriers to leaving personal vehicles at home. Survey results from around the nation show that offering GRH consistently promotes ridesharing, transit and other non-SOV commuting.

The RTC demonstration program is modeled after successful GRH programs across the country. To be eligible, participants must register for the GRH program on the RTC RIDESHARE website and have either carpooled or vanpooled to work on the day they need the ride home. The program is for unexpected/unscheduled trips home from work for personal or family illness, unexpected overtime or other emergencies. The commuter must call and pay for a taxi and is reimbursed for the full cost of the trip after submitting the online reimbursement form on the RTC SMART TRIPS website. The GRH benefit may be used up to four times per person per year. Nationwide experience with GRH programs indicate that they generally require minimal funding and staff time to operate.

Park-and-Ride Program. Park-and-ride locations are also available to the public where they can park their cars for free and either share a ride or take the transit to reach their destinations. There are many opportunities for expansion of RTC RIDE express services coupled with park-and-ride lot development. Public Transportation policies also indicate park-and-ride facilities in outlying areas will be developed and served by commuter express bus service, where warranted and feasible.

Figure 7-1 shows the current park and ride locations in the Reno-Sparks metropolitan area.

Alternate Work Schedules. The RTC offers alternate work schedules to its employees to help reduce the peak-hour congestion and delays on our roadway system. RTC also encourages other major employers in the region to offer alternate work schedules to help alleviate the congestion on our arterial and freeway system. In general, trip congestion occurs during peak periods. Alternative work schedules allow travel demand to be spread out throughout the day. Alternative work schedules include three types of programs: 1) staggered hours, 2) flextime and 3) compressed work week.

Transit-Oriented Development/Planned Unit Development. The RTC is working with other local agencies to pursue and implement Transit-Oriented Development (TOD) corridors in the region. The Truckee Meadows Regional Plan (TMRP) identifies TOD corridors. These corridors are shown on **Figure 7-2**. Both Reno and Sparks have developed TOD plans that identify policies and strategies on how to achieve the dwelling targets and other key urban development policies to encourage and implement transit-oriented developments.

Figure 7-1

PARK 'N RIDE LOCATIONS -- 2008

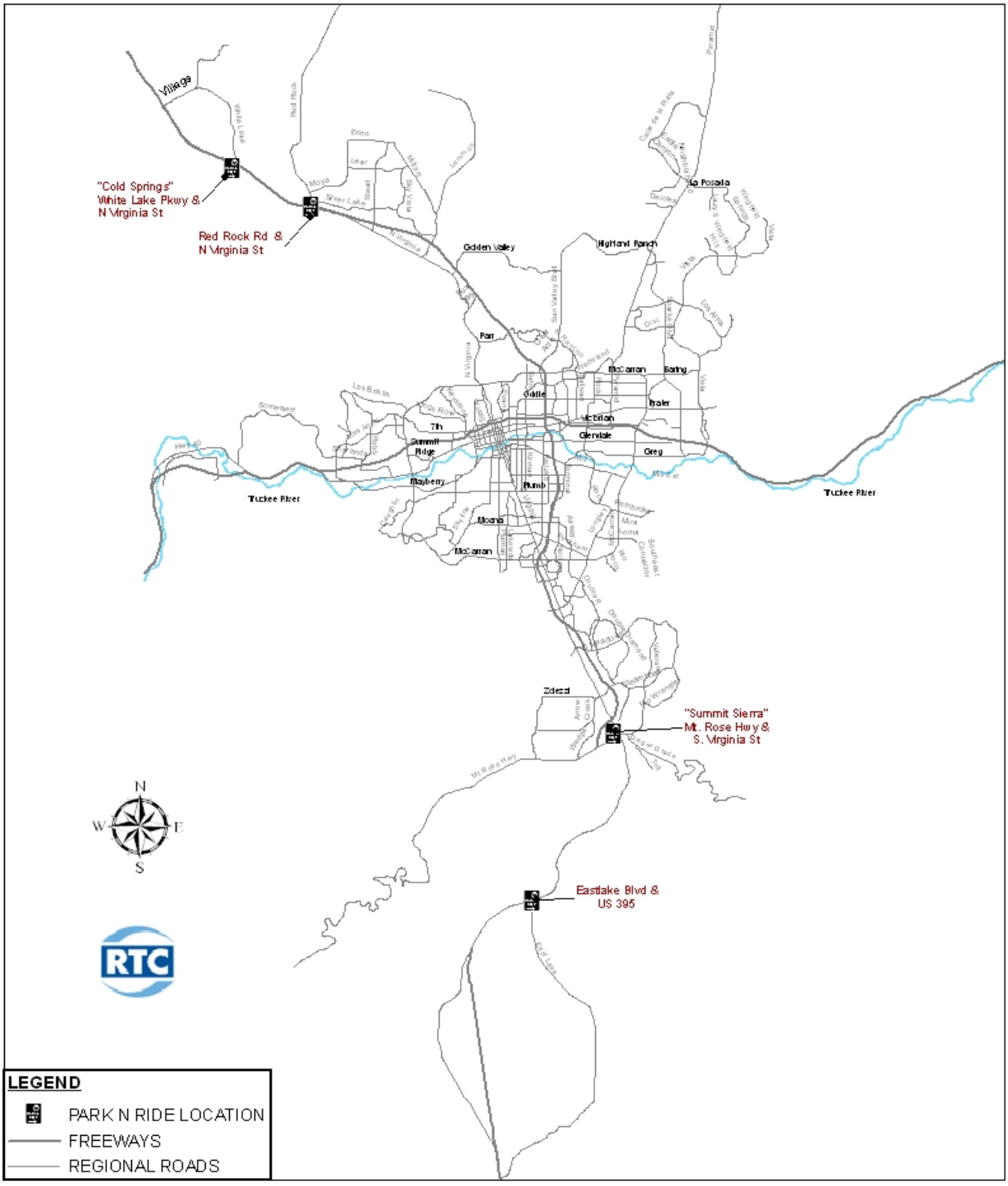
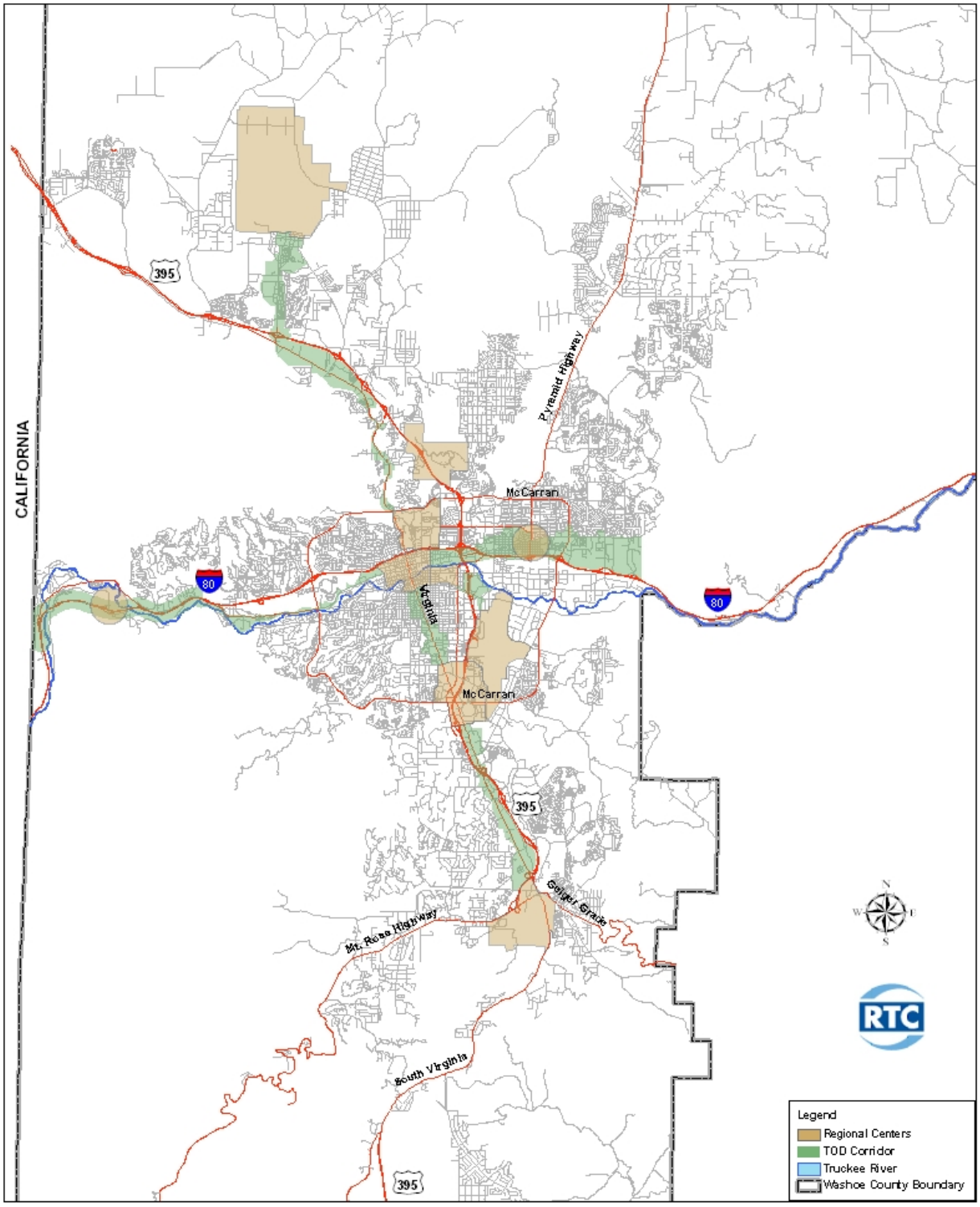


Figure 7-2

TRANSIT-ORIENTED DEVELOPMENT CORRIDORS AND REGIONAL CENTERS



Future Conditions

In the future, increases in population and employment in Washoe County will lead to an increased demand for travel. The automobile will continue to accommodate the majority of this demand which, in turn, results in the level of service (LOS) deficiencies as discussed previously. These LOS deficiencies add to air quality and congestion problems.

TSM and TDM measures can be effective in reducing vehicle congestion and improving transportation access. The future travel conditions in Washoe County will require implementation of some of these measures to help relieve the transportation system of congestion without investing in large-scale capacity projects. In the past, TSM measures were applied to traffic control improvements at key intersections within the Cities of Reno and Sparks as a retrofit to the existing system. In the future, TSM technologies and features will be incorporated into all new construction so that TSM benefits can be realized from the outset. The use of TDM measures is currently in its infancy but will be increasingly employed in the future. Both types of measures will be needed in Washoe County to help counteract the effects of growth, increased travel demand and limited financial resources.

Future Conditions TSM

Traffic Management Center

Transportation agencies in the Truckee Meadows are using technology to help manage transportation operations. As these uses become more prevalent, opportunities arise to share resources and knowledge among all transportation agencies to solve common transportation problems efficiently. Stakeholders are now discussing a regional concept of transportation operations and the feasibility of coordinating operations activities through a traffic/transportation management center (TMC).

A TMC is the hub of a transportation management system. The center can be a physical building or a virtual center, linking various computer systems and Intelligent Transportation System (ITS) devices. It is a place where agencies can coordinate their responses to transportation situations and conditions and a focal point for communicating transportation-related information to the media and drivers. A common element of all TMCs is that all transportation operations data is routed through a central facility of some type.

The TMC links various elements of Intelligent Transportation Systems, such as traffic signal control, video feeds, electronic message signs, roadway weather stations, etc., enabling engineers and technicians to identify and react to traffic congestion and

incidents quickly based on real-time data. Because of these linkages, agencies are able to work cooperatively.

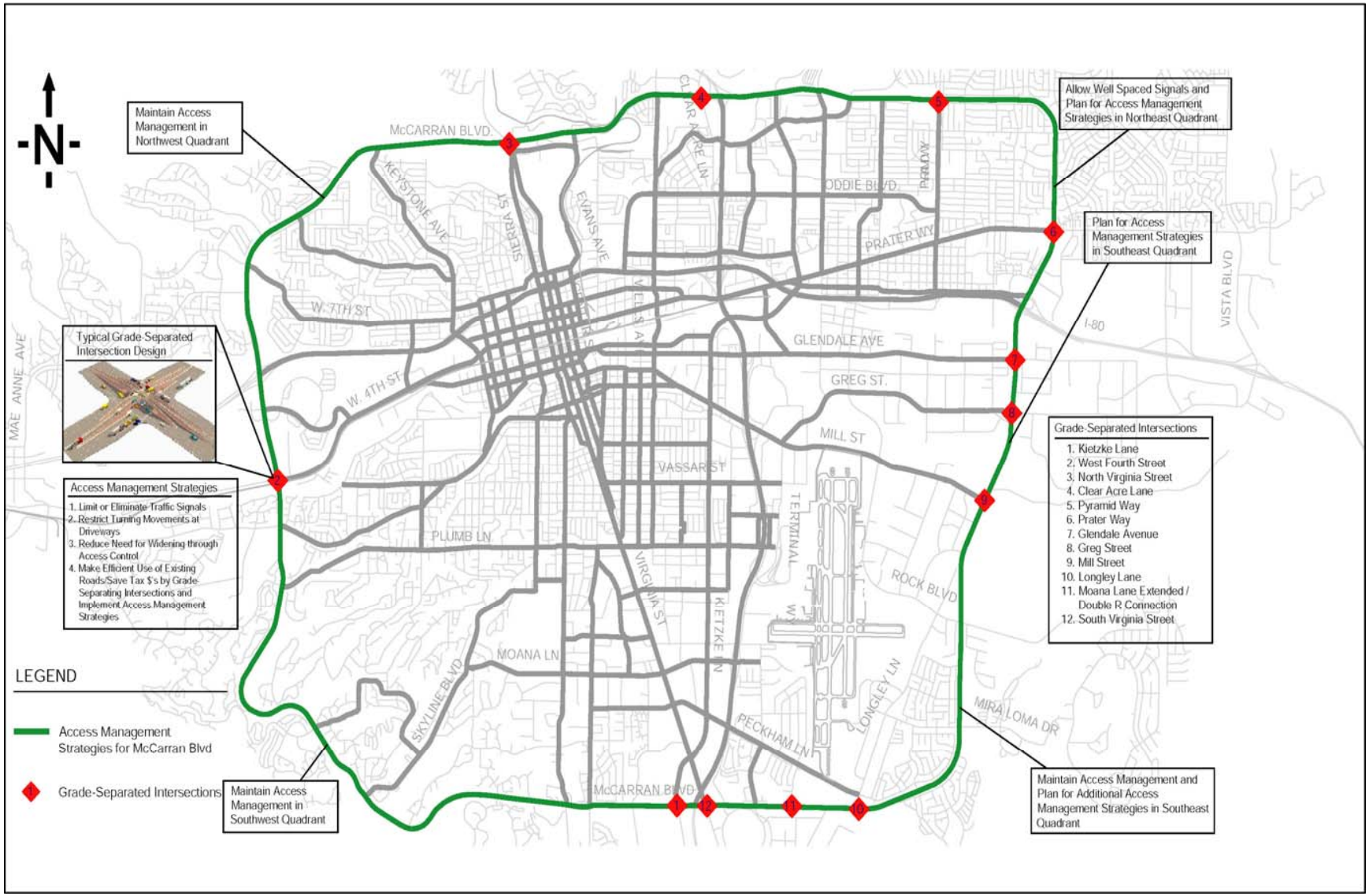
In the Truckee Meadows, the consensus philosophy is to create a cooperative center that will allow sharing of knowledge, experience, equipment and even personnel, but not to cede responsibility to a central transportation authority. The regional transportation agencies wish to leverage existing resources, not to create another level of government.

Grade Separated Intersections

While the numbers of lanes on major surface arterials may be adequate to handle the volume of vehicles using the roadway, significant congestion problems often occur at intersections. This is particularly the case where high-volume surface arterials cross "at-grade", that is, at surface intersections. There are only 60 seconds in a minute and when high-volumes of traffic cross at an at-grade intersection, signals often cannot provide enough green time to get everyone through without unreasonable amounts of delay, particularly during the peak periods of travel. These problems must be addressed if we are to get the most out of our investment in the existing road network. In some cases, additional turn and through lanes can be built at the intersection to increase the number of cars that can move through on a green light. However, this solution may have its limits when the impacts of additional surface lanes to development adjacent to an intersection are unacceptable to the community or prohibitively expensive. Even when there is ample vacant land, extremely wide intersections can be difficult for pedestrians to cross safely.

McCarran Boulevard offers some impressive examples of the problems that can occur when large surface arterials intersect one another at-grade. A significant TSM project in the region that will address this problem is the conversion of McCarran Boulevard to a controlled-access facility by installing raised medians, maintaining proper signal spacing, limiting driveways and constructing up to 12 grade-separated intersections (see **Figure 7-3**). These two-level interchanges would allow turn movements to take place on the upper level separate from through movements and can be designed to accommodate all types of vehicles including trucks.

Figure 7-3
McCarran Boulevard Access Management Strategies



Future Conditions ITS

All future ITS projects must be included in the Northern Nevada ITS Plan and the Regional Transportation Improvement Program (RTIP) to quality for federal funding. The Northern Nevada ITS plan includes a regional ITS architecture to comply with federal regulation. The plan also includes a prioritized list of projects that will facilitate regional coordination of the transportation system to more effectively and efficiently meet transportation needs in the rapidly growing northern Nevada region. These projects have been assigned a low, medium or high priority level based upon stakeholder input and technological capacities. These projects will be integrated into the RTIP. Engineering estimates are provided in the Plan to assist in determining funding needs.

The following is a description of ITS measures, including those that are to be implemented by RTC, which can be used to help manage the transportation system in Washoe County.

Ramp-Metering

Ramp-metering regulates vehicle entry onto a freeway system. By allowing only one car to enter the freeway at a time, conflicts related to merging vehicles can usually be reduced. Vehicles are typically released from a queue by sensor-controlled ramp signals. High-occupancy vehicle (HOV) lanes may be used in conjunction with ramp-metering. HOV lanes reserve a traveling lane for vehicles with a minimum number of passengers. HOV lanes encourage carpooling and transit use. By providing a meter bypass lane for HOV lane users, priority treatment and, therefore, HOV travel is encouraged. Ramp-metering has been successfully implemented in congested freeway corridors. For example, Seattle, Washington, and Minneapolis, Minnesota, report a decrease in travel time on certain high-volume freeway corridors by as much as 37%. However, the state of Minnesota has turned off all ramp meters per recent legislation. To be turned back on, the state must complete a study documenting the benefits of ramp meters (decrease in travel time, etc.).

Signal Coordination

Traffic control coordination aims at optimizing demand versus capacity within a roadway network. Automated traffic signals, which synchronize with other signals within a network, may be utilized. Computer applications using real-time information gathered from sensors and video cameras can also react to changing traffic conditions by adjusting signal timing patterns and cycle length. As a result, signal coordination can optimize individual intersection operation by decreasing travel times, vehicle stops and delays. It can also encourage uniform vehicle speeds and utilization of signalized arterial routes.

Transit Signal Priority (TSP)

Traffic signal operation can be controlled to give priority to transit vehicles. Cycle length and green times may vary through the use of detector actuations, which respond to traffic demand. Buses occupying a bus lane may be given preference over the other traffic lanes. With the use of TSP, transit buses can operate more efficiently and schedules can be maintained, thus reducing delay time. A traffic signal prioritization system for buses has successfully been used, for example, in Portland, Oregon, where travel times have been cut 5 to 8%. This system provides extended green time for bus routes; however, this may increase delay for automobile traffic.

Emergency Vehicle Management

The focus of an emergency vehicle management system is to reduce the time it takes to respond to an incident. Emergency vehicle management (EVM) may consist of fleet management, route guidance and signal priority. Fleet management will assist in dispatching response units that have the potential to arrive at the incident scene in the least amount of time. Route guidance will provide emergency units with up-to-date route information. In addition, priority can be given to emergency vehicles by adjusting traffic signals along the emergency route.

Through the use of emergency vehicle management, emergency units can be efficiently dispatched and guided. A quicker response is critical in most emergency response situations. Technology has the ability to help personnel immediately identify the incident location and react accordingly. According to a crash study conducted on California highways, having one highway crash on a corridor increases the likelihood of an additional crash by six times. Quick removal of incidents to restore normal operations increases highway safety and system efficiency. Both Reno and Sparks currently have an EVM system in place.

Automatic Vehicle Location (AVL)

An AVL is a computerized system that tracks the current location of transit units and relays the information to a control center. Information is usually relayed via vehicle transponder tags or a global positioning system (GPS). An AVL system using GPS technology can add a greater level of efficiency to the transit system by knowing precise geographic locations. Schedule adherence can be easily monitored. AVL systems can also have tie-ins to other features such as passenger information systems, automated passenger counters or silent alarms. The FTA found that from 1992 to 1996, the use of AVL systems in the US increased by more than 100%.

An AVL system can increase overall dispatching and operating efficiency resulting in a more reliable service. Service disruptions can be responded to quickly and the overall safety and security of passengers are promoted. Maintenance costs can be reduced through accurate identification of mechanical problems. When AVL and computer-aided

dispatching were installed in both Baltimore, Maryland, and Portland, Oregon, travel times were reduced by as much as 18% and on-time performance has increased by 12% to 23%. This type of system is to be implemented by RTC for its RTC RIDE and RTC ACCESS transit services.

Real-Time Bus Information

Real-time transit information, including routes, schedule adherence and bus location, can be provided at strategically located sites. Flexible signs can also be installed in high traffic areas conveniently accessible to transit users. Real-time bus information works in conjunction with onboard automated announcements to provide the traveling public with accurate route information while using a transit service. By allowing the users to make decisions based on real-time information, route choices can be modified for travel requirements. The information is also important for people waiting for the bus and can be used to provide information at the bus stops using kiosks. The collection and dissemination of real-time information will be another component of RTC's ITS deployment program.

Flexible Bus Stop Signage

Real-time transit information, including routes, schedule adherence and bus location, can be provided at individual transit stops. Real-time data collected from the AVL system can be transmitted from the control center to the flexible message signs. Flexible bus stop signage allows the transit service user the opportunity to determine the optimum route and schedule based on immediate needs. By allowing the users to make decisions based on real-time information, the user is given the convenience to choose alternate routes appropriate for immediate travel requirements. Ridership may rise with increased confidence in schedule adherence as a result of flexible bus stop signage.

Onboard Automated Announcements

While traveling, transit users can be provided transit information such as arrival or departure time and location. Onboard message signs and voice announcements can precede each stop on a scheduled transit route. Real-time bus information works in conjunction with onboard automated announcements to provide the traveling public with accurate route information while using a transit service. This ITS measure will also be a part of RTC's ITS deployment program.

Automatic Passenger Counters

Data is collected on passenger boarding and alighting through the use of infrared beams, sensor mats or other sensor devices. Information regarding the time, location

and usage can be used for planning purposes as well as justifying a traffic signal prioritization option based on occupancy. Automatic passenger counters are effective in decreasing data collection costs as well as decreasing the time and effort required to process the collected data. An increased level in the type and range of data collected can improve service planning. The increased convenience and efficiency of traffic signal prioritization may encourage ridership.

Automated Train Detection

An automated train detection system can detect train arrival and direction and can be used to notify dispatchers to establish detour routing if necessary. An automated train detection system is particularly useful at busy intersections with at-grade railroad crossings. Trains normally travel at high speeds and can take up to a mile or more to stop. A busy intersection with an at-grade railroad crossing can be a safety concern, especially if a train is delayed for a sustained period of time. An automated system allows for a certain level of train arrival forecasting and can assist in the development of transit or emergency vehicle detour routing.

Collision Avoidance Technology

Systems can be installed in transit vehicles to provide the driver with additional warning features. In addition, video surveillance can allow drivers to view the rear of the vehicle. Active detectors installed on the front and side of the vehicle can warn the driver when another vehicle is in violation of programmed acceptable ranges. Collision avoidance technology can significantly increase the level of safety and travel comfort. Side warning devices can reduce lateral collision and lane departure crashes by 8%. Avoidance components that warn of drift, close vehicles and other travel hazards may reduce driver stress.

Future Conditions TDM

Establishment of Transportation Management Associations (TMAs)

TMAs consist of several local business organizations that act in partnership with local governments to solve transportation problems. TMAs provide ridesharing and transit services to their employees, but are also involved in transportation planning, financing and implementation.

Expansion of Employer-based Ridesharing and Vanpool Programs

These programs involve matching employees who make similar commutes, providing information about commute choices, operating supporting services (possibly including a

Guaranteed Ride Home Program) and may involve the use of an 8- to 15-passenger van provided by the company and driven by an employee. The employer may use a regional rideshare matching service or an in-house service.

Alternative Forms of Work

Consideration of alternative forms of work programs including compressed work weeks, flexible work hours, telecommuting and teleconferencing. In general, congestion occurs during peak periods. These alternative forms of work programs will be needed to alleviate congested peak periods of travel as growth occurs in the region.

Encouragement and Support of Less Auto-Dependent Land-Use

Land-use and zoning that promote mixed uses and higher density centered on the use of public transit and/or bicycle and pedestrian travel modes can improve the utilization of existing transportation infrastructure investments. Well planned TOD corridors and regional centers can offer attractive life style choices to traditional auto centric land uses.