Overview of TDM

MODULE GOALS
1. Define TDM.
2. Understand the reasons why TDM is important in meeting community needs.
3. Relate the importance of TDM to federal initiatives.
4. Summarize the relationship between congestion management systems and TDM.

ASSUMPTIONS
1. Participants deal with TDM issues on a regular basis.
2. TDM has received new emphasis because of ISTEA, CAAA, and the public's understanding that we can no longer build our way out of congestion.

MODULE INFORMATION

TDM is defined as

TDM can be classified into three categories:
1. 
2. 
3. 

Five Reasons Why TDM Has Grown In Importance:
1. Growth in vehicle miles traveled
2. Energy usage of the SOV
3. Transportation project funding shortfalls
4. Urban density trends
5. Air pollution caused by vehicle emissions
Growth in Vehicle Miles Traveled

KEY INDICATORS 1983-1992

Energy Usage of the SOV

ENERGY INTENSITY OF U.S. TRANSPORT MODES
Btu PER PASSENGER Km

Transportation Project Funding Shortfalls

Average State Transportation Funding Needs
(In Billions of Dollars)
Urban Density Trends

**U.S. URBAN DENSITY TRENDS**

- 1973: 2,500
- 1984: 2,000
- 2000: 1,500

Urban Density (persons/square mile)

Air Pollution Caused By Vehicle Emissions

**POLLUTION EMITTED FROM TYPICAL COMMUTES**

THOUSANDS OF GRAMS PER 100 PASSENGERS

- Hydrocarbons
- Carbon Monoxides
- Nitrogen Oxides

Source: Alan Pisarski, *Commuting in America*

Transportation provisions of the Clean Air Act Amendments of 1990 are:

1.

2.

3.

4.

5.
TRENDS IN VEHICLE EMISSIONS
(Actual Hydrocarbon Emissions)


The 10 Commandments of ISTEA
1. Thou shalt implement intermodalism
2. Thou shalt be flexible
3. Thou shalt be more efficient
4. Thou shalt support the National Highway System
5. Thou shalt enhance the environment
6. Thou shalt promote safety
7. Thou shalt innovate
8. Thou shalt promote creative investment
9. Thou shalt take seriously plans and the planning process
10. Thou shalt create new partnerships

1. Employer may pay up to $60/month for rideshare expenses
2. Reduce American oil vulnerability
   - Alternative fuels and electric vehicles
   - Telecommuting study authorized
A Congestion Management System is defined as:

Seven key CMS elements:
1. 
2. 
3. 
4. 
5. 
6. 
7. 

What geographic areas must CMS cover?
1. Must cover entire state.
2. Areas where traffic congestion is or will be occurring
3. All corridors and facilities that are or will be congested
4. Entire metro planning area in non-attainment TMAs
5. Sufficient size to show effects of policy on system performance

CMS measurement systems must:
1. 
2. 
3. 

Managing Our Way Through Congestion
Good performance measures should be:
1. Clearly understood
2. Sensitive to modes
3. Sensitive to time
4. Not too difficult or costly to collect
5. Forecasted into future
6. Sensitive to the impact of congestion mitigation strategies

Possible performance measures:
1.
2.
3.

A performance monitoring plan:
1. Documents measures, collection, and analytical procedures
2. Identifies agency responsibilities
3. Identifies count measurement frequency
4. Fosters coordination and complementary use of resources

Congestion management strategy plans:
1.
2.
3.
4.
5.
6.
Classes of congestion management strategies:
1. 
2. 
3. 

**Evaluating Effectiveness**

**Primary Measures**
1. Change in vehicle occupancy for targeted corridors
2. Change in mode split and average vehicle ridership (AVR) at work sites
3. Change in distribution in volumes (work schedules)

**Techniques**
1. Workplace surveys
2. Vehicle occupancy counts on specific facilities
3. Volume counts documenting peak spreading

**Factors Impacting Effectiveness**
1. Employer size
2. Transit service levels
3. Income levels
4. Management style of ETC
Managing Our Way Through Congestion

TDM Effectiveness

### COMPARISON OF TOP INDIVIDUAL TDM PROGRAMS

<table>
<thead>
<tr>
<th>Employer (Location)</th>
<th>% Reduction in Vehicle Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travelers (Hartford, CT)</td>
<td>20%</td>
</tr>
<tr>
<td>Hartford Steam Boiler (Hartford, CT)</td>
<td>15%</td>
</tr>
<tr>
<td>3M Company (St. Paul, MN)</td>
<td>10%</td>
</tr>
<tr>
<td>US West (Bellevue, WA)</td>
<td>10%</td>
</tr>
<tr>
<td>CH2M Hill (Bellevue, WA)</td>
<td>10%</td>
</tr>
<tr>
<td>Pacific Bell (Contra Costa City, CA)</td>
<td>10%</td>
</tr>
<tr>
<td>AT&amp;T (Pleasanton, CA)</td>
<td>10%</td>
</tr>
<tr>
<td>UCLA (Los Angeles, CA)</td>
<td>10%</td>
</tr>
<tr>
<td>ARCO (Los Angeles, CA)</td>
<td>10%</td>
</tr>
<tr>
<td>State Farm (Orange County, CA)</td>
<td>10%</td>
</tr>
<tr>
<td>NRC (Montgomery County, MD)</td>
<td>10%</td>
</tr>
</tbody>
</table>


### SUMMARY OF TDM PROGRAM RESULTS AT SUBAREA LEVEL

<table>
<thead>
<tr>
<th>Subarea (Setting)</th>
<th>% Reduction in Vehicle Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downtown Bellevue (Suburban Activity Center)</td>
<td>20%</td>
</tr>
<tr>
<td>Bishop Ranch (Suburban Business Park)</td>
<td>15%</td>
</tr>
<tr>
<td>Minneapolis Free Parking (CBD)</td>
<td>10%</td>
</tr>
<tr>
<td>I-394 Interim HOV Lane (Radial Corridor)</td>
<td>10%</td>
</tr>
<tr>
<td>Hacienda Business Park (Suburban Business Park)</td>
<td>10%</td>
</tr>
<tr>
<td>Downtown Hartford (CBD)</td>
<td>10%</td>
</tr>
</tbody>
</table>

What is TDM?

TDM is defined as a set of specific strategies that foster increased efficiency of the transportation systems and resources by influencing employee travel behavior by mode, time frequency, trip length, cost or route.

The goals of TDM are to reduce traffic congestion, improve air quality, reduce dependence on fossil fuels, enhance employee mobility, reduce commuter expenditures and expand access to labor.

TDM is a process aimed at relieving congestion.

TDM actions can be classified into three categories:

1. Actions that reduce the number or length of trips.
2. Actions that shift trips to more efficient modes;
3. Actions that shift trips to off-peak hours or uncongested routes.

Key CMS elements:

1. Area of application
2. Transportation System Definition
3. Performance Measures
4. Performance Monitoring Plan
5. Identification and Evaluation of Strategies
6. Implementation and Management
7. Monitoring of Strategy Effectiveness

Possible Performance Measures:

1. Measure the extent of congestion
2. Evaluate strategy effectiveness
3. Established cooperatively
Classes of congestion management plans:

1. Demand Management
   - Transportation Demand Management
   - HOV Strategies
   - Transit operational improvements
   - Non-motorized and non-traditional modes
   - Congestion pricing
   - Growth management

2. Operational Management
   - Traffic operational improvements
   - Access management
   - Incident management
   - IVHS

3. Capital intensive improvements
   - Lane additions
   - Transit capital improvements
TSM AND TDM: TOOLS FOR ALLEVIATING CONGESTION

MODULE GOALS

- To provide a description of the relationship between TSM and TDM.
- To understand the street hierarchy system.
- To provide a basic understanding of transportation capacity improvements.

ASSUMPTIONS

- Participants need an overview of common TSMs strategies.
- Participants will not be involved in new road construction.
- Congestion mitigation requires a multi-strategy approach.

Dealing With Congestion

Congestion Problem

- Expand Capacity
  - Modify Roadways
  - Build Roadways
- Manage Demand
  - Provide Transit
  - Improve Alternatives
  - Provide Incentives
The Road Hierarchy

The functional highway system in urban areas consists of four types of roads:
1. Principal arterials
2. Minor arterials
3. Collectors
4. Local Streets

**Figure I-5.** Relationship of functionally classified systems in service traffic mobility and land access.

Principal arterials include:
- Interstates (I-95, I-275)
- Expressways (Crosstown Expressway, Florida Turnpike)
- Other principal arterials (Dale Mabry, Biscayne Boulevard)

Minor arterials:
- Examples (Westshore Boulevard, Commercial Boulevard)

Collectors
- Examples (Cypress and Swann)

Local Streets

**TSM STRATEGIES**

**Freeway Incident Detection and Management Systems**

A freeway incident detection and management system consists of one or some combination of:
- roving tow or service vehicles, motorist aid call boxes, citizen band radios and cellular phones, incident teams, detection loops in mainline lanes to monitor volume, ramp metering devices, motorist information systems, traffic diversion, and alternate route identification.
The surveillance system itself normally consists of highway and ramp loop detectors, changeable message signs, closed circuit television surveillance on particular trouble spots, a communications system, and some type of central computer control. Pertinent driver information is provided through the changeable message sign system and radio traffic reports to alert drivers to congested conditions and allow diversion to alternate routes if necessary.

Through the use of freeway incident detection and management system, incident duration can be reduced by an average of 10 minutes. Current costs per mile for an average system are about $1 million to design and construct and at least 10 percent of the construction costs or $100,000 per year for maintenance.

Low cost techniques that are growing in use in incident management schemes are Citizen Band radio and cellular telephones. Both use direct communication from the motorist on the road. The cellular technology is just being tapped. For example, it is possible to advertise a phone number that motorists can use to call in traffic information.

As freeways become more congested, incident detection and management systems will become even more important. The process from conceptual planning to completed system in an urban area can take 10 years.

A solid planning effort is needed initially to obtain the input and cooperation of all the public agencies at the federal, state and local levels. In most cases, the state highway agency or state department of transportation (DOT) will have the responsibility and funds to implement these actions.

Integrated Freeway and Arterial Network Surveillance and Control

Additional improvements are possible by combining arterial control and surveillance with adjoining freeway control and surveillance activities. An integrated freeway and arterial network surveillance system consists of the major elements already discussed in the previous section, but applied to the arterial system as well.

This activity of sophisticated integrated solutions is in its infancy. The technology is available. The barrier to further efforts is largely institutional. Quite simply, the major constraint is human and interagency communications.

A more systematic approach to urban traffic management and catalytic efforts can ultimately result in many more savings in
motorist delay. Applied marketing techniques early in the planning and project development process can also establish backing of the public and elected officials for these traffic management strategies.

**Motorist Information Systems**

Such systems consist of one or more of the following: changeable message signs, highway advisory radio, and/or in-vehicle navigation and information systems.

The beneficial features of changeable message signs:
- Early warning reduced the speeds of vehicles approaching a queue, resulting in fewer secondary accidents and associated delay. Decelerations were less severe into congested spots.
- Signing increased diversion at off-ramps that were greater than \( \frac{1}{2} \) mile upstream from incidents.
- Signing for lane blockages induced lane changing away from that lane.

Highway advisory radio involves the broadcast of pertinent driving and travel related information to motorists. This technique is used at the approaches to airport parking facilities, near construction sites on freeways, and in mobile units by incident management teams. The transmitters have a range of approximately 2 miles in each direction.

Motorist information systems are relatively inexpensive when compared to other system elements and offers a unique opportunity for providing better and more timely information to motorists.

A substantial amount of time is needed to plan and implement a motorist information system. Its implementation requires the design and construction of the system, using the steps required for a typical highway construction project. However, the nature of this system is such that experts in the areas of electronics and information systems must be involved in addition to highway and traffic engineers.

**Ramp Metering**

Using a modified traffic signal placed at the end of a ramp, ramp metering allows traffic to enter the highway traffic either at pre-timed intervals or at times determined by traffic volume on the ramp or on the highway. Although additional delays are incurred by the ramp traffic, mainline capacities are protected and the overall operational efficiency, usually measured in terms of travel time or speed, is improved. High occupancy vehicle bypass lanes on the
metered ramps have been used to provide incentives for carpools, vanpools and buses.

A survey made for the Federal Highway Administration of seven ramp metering systems in the United States and Canada revealed that average highway speeds increased by 29 percent after installing ramp metering. An additional benefit from ramp metering is a decrease in the accident rate. Reductions from 20 to 58 percent have been achieved through improved merging operations. Traffic-responsive metering often produces results that are generally 5 to 10 percent greater than those of pre-timed metering.

A substantial amount of time is needed to plan and implement a ramp metering system. Its implementation requires the design and construction of the system, using the steps required for a typical highway construction project.

Individual ramps selected for this technique must be in locations where arterials feeding the ramps will not become severely congested as a consequence of such action. Motorists may choose to by-pass those ramps where metering has been installed to avoid delays. If a large number of people do so, this diversion could result in the creation of congestion on arterials that might not otherwise have a problem.

Providing Additional Lanes Without Widening the Freeway

In some cases, low cost geometric modifications can be made to increase highway capacity on a temporary basis. These modifications include:

- using one or more shoulders as travel lanes and
- reducing lane widths to provide additional lanes within the existing pavement.

Significant increases in capacity are possible. Such reductions have been achieved with either no increase in accident rates or even some reductions. Although such treatments should be considered temporary, in the 27 cities with populations over 1 million, almost 32 percent of the urban freeway mileage could experience reduced congestion through such low-cost measures. Costs will normally vary depending on the individual circumstances and the condition of the existing freeway, but in general costs per mile will be $1.3 million for construction and engineering, and $12,000 per year for maintenance.

These actions require careful preplanning and design, in order to avoid any potential safety problems. The state would plan and design these improvements as a typical highway project, and enter
into a construction contract or lane striping contract in the usual manner. Since the use of breakdown lanes is not consistent with federal design criteria, if the highway facility is on the federal-aid system then federal approval will also be required. When this action is being considered, it typically generates opposition from traffic enforcement agencies and the public. Their concerns are safety related and the response to these concerns should consider:

1. Advanced information and education required to describe the program.
2. Additional warning signs that alert drivers to the conditions.
3. The construction of intermittent break-down lanes that can be used temporarily to store disabled vehicles.
4. Strict enforcement of the modified traffic conditions.

Super Street Arterials

Super street arterials are wide, multi-laned arterials with limited access provided from intersecting streets. To the degree possible, major intersecting streets are grade separated, in order to minimize the need for traffic signals.

This approach is beneficial for those suburban highway systems that are based upon arterial networks that will not accommodate freeway facilities. Converting a typical suburban arterial with signalized intersections to a super street could increase capacity by as much as 50 to 70 percent, while at the same time significantly reducing delays when at-grade intersections are replaced with grade separations. The cost per mile could be approximated by using data for typical freeway widening or reconstruction projects, or by using the amount of $5 million per mile.

The design, construction and operation of a super street arterial will be undertaken by the agency having the administrative jurisdiction for the arterial in question. This would be one or a combination of a state, county or city organization.

The design and construction of such a facility will be expensive and time consuming, as it is treated in the same way that any large highway construction project will be. There are several important constraints including land acquisition, opposition from abutting land owners, access to existing and future land parcels, and environmental problems.
Traffic Signal Improvements

Traffic signal improvements generally provide the greatest payoffs for reducing congestion on surface streets. There are a number of relatively basic improvements that can and should be made to improve traffic flow on arterials. They include:

- Equipment update- An inventory should be made to determine if new, more modern equipment can replace them.
- Timing Plan Improvements- Update the traffic signal timing to correspond to current traffic flows. Appropriate re-timing of signals has been very successful in improving traffic flows.
- Interconnected Signals- Interconnected pre-timed signals, traffic actuated signals, interconnected actively managed timing plans, and master controls.
- Traffic Signal Removal- Many intersections can be better controlled by two-way stop control. For those situations, where peak traffic flows necessitate continued signalized control, but off-peak traffic does not, conversion of control from full to flashing operation can provide significant reductions in delay and congestion during the off-peak times.
- Traffic Signal Maintenance-
  - Preventive maintenance
  - Response maintenance
  - Design modification

Although the methods available to upgrade traffic signals are relatively straightforward, this action is often overlooked by public officials as an effective way to improve traffic flow. In fact, there are cases where public officials may react to public pressure for installing new traffic signals faster than they will to improving existing signals.

Computerized Signal Systems

Computerized traffic signal systems usually involve three elements. These include:

- coordinating groups of signals by using either interconnection or highly accurate time-based coordinators,
- systematically optimizing the signal timing parameters of pre-timed signals or the interval settings of traffic actuated signals, and
Managing Our Way Through Congestion

Interconnecting previously uncoordinated signals, pre-timed signals, and providing newly optimized timing plans and a central master control system has resulted in a 25% reduction in travel time.

Several factors have impeded more widespread and skillful application of efficient traffic signal system management techniques:

- Traffic signal system management often is limited to the most rudimentary installation and maintenance functions, with little or no effort or skill focused on optimizing system operation.

- Total staff and budget is usually insufficient to keep up with routine installation and traffic control device maintenance, with no time left over for aggressive operational management improvement functions.

- Budget constraints at the local level still inhibit continuing strong management of the traffic control system once developed.

Major traffic control system improvements, such as computer-based signal systems, would be implemented most cost-effectively by a multi-jurisdictional team. However, most urban areas either have not tried or have not been able to work out a coordinated area-wide approach to the problem.

Some states are not oriented to urban area traffic operations as they might be, and stress high-capital road-building as problem solutions at the expense of adequate funding for traffic control system improvements.

Traffic Channelization

Channelization involves the use of raised medians or "islands" at intersections to guide and protect traffic.

The costs associated with planning and implementing this technique are modest, and vary depending upon complexity and the number installed. The benefits are substantial, because of the separation of traffic and the enhancement of the safety of operation.

A modest planning effort is required to identify arterial locations for installations. Then a routine design and construction process is implemented, using appropriate design standards.
Intersection Improvements

Intersection traffic control devices can be used to improve the flow of vehicles and the safe passage of pedestrians. These devices include stop signs, yield signs, turning lanes, traffic islands, channelization, and improved design.

The costs associated with planning and implementing this technique are modest, and vary depending upon complexity and the number installed. The benefits are substantial, because of the separation of traffic and the enhancement of the safety of operation.

Turn Lanes

The free flow of vehicles on arterial highways depends upon minimizing the number of conflicts with the main flow of traffic. Turning vehicles can be a major source of such conflict. Traffic turn lanes can be provided if adequate roadway pavement space is available, by lane markings and other appropriate safety devices. If space and funding are available, traffic islands can be built in the middle of the roadway. Some cities still use a reserved middle lane for left turns on major arterials. Separate right turn lanes can be installed to make the through movement work more efficiently.

The costs of installing turning lanes will involve pavement markings, traffic signal modifications for right and left turn movements and possibly the cost to widen the pavement when it is possible to do so.

The benefits of such actions have been shown to be significant, as they greatly minimize the obstructions at intersections caused by turning vehicles.

Several basic actions are required:
- Identify critical intersections
- Obtain traffic count data
- Plan the strategy for implementing turn lanes
- Undertake the engineering
- Obtain the funding required
- Build the improvement

Turn Prohibitions

Conflicts between turning vehicles and pedestrians and between turning vehicles and other vehicles approaching form the opposite direction can cause congestion delay and safety problems at intersections and driveway access points.
Turning movements should be prohibited only during those hours when study data indicate that a congestion or accident problem exists and when a suitable alternative route is available.

Data compiled in San Francisco indicated that accidents at four intersections with turn restrictions were reduced by 38% to 52%. The prohibition of turning movements at driveways between intersections is frequently accomplished by a median divider. An alternative to turn restrictions is the designation of a separate lane for storage of vehicles waiting to make left turns. This traffic control technique can take the form of “continuous two-way left-turn lanes” which can be used by motorists proceeding in either direction.

A modest planning effort is required to identify arterial locations for installations. A routine design and construction process is then implemented, using appropriate design standards. Turn prohibition studies should consider:

- The amount of congestion and delay caused by turning movements.
- The number of collisions involving vehicles making the turning movement.
- The availability of suitable alternative travel paths if turns are restricted.
- The possible impact of traffic diversion on congestion and accidents at intersections that would be required to accommodate the traffic diverted by the turning restriction.
- Possible adverse environmental impacts caused by rerouted traffic.
- The feasibility of alternative solutions, such as provision of separate storage lanes for the turning movements and, at signalized intersections, the use of special turn-movement phasing.

One Way Streets

Although most streets and highways and designed for use by two-way traffic, high volumes of traffic and vehicle conflicts often lead to consideration of one-way traffic regulations.

One way streets provide increased capacity, as they:

- Reduce intersection delays caused by vehicle turning-movement conflicts and pedestrian-vehicle conflicts.
Redistribute traffic to relieve congestion on adjacent streets. They also result in more cost-effective operation, as they:

- Provide additional capacity to satisfy traffic requirements for a substantial period of time without large capital expenditures.
- Facilitate the loading and unloading of commercial vehicles with minimal impact on traffic flows.
- Save sidewalks, trees and other valuable frontage assets that could otherwise be lost because of the widening of existing two-way streets.

As a general rule, two-way streets should be made one-way only when:

- It can be shown that a specific traffic problem will be alleviated and the overall efficiency of the transportation system will be improved.
- One-way operation is more desirable and cost-effective than alternative solutions.
- Parallel streets of suitable capacity, preferably not more than a block apart, are available or can be constructed.
- Such streets provide adequate traffic service to the area traversed and carry traffic through and beyond the congested area.

**Reversible Traffic Lanes**

With the reversible lane system, one or more lanes are designated for movement one-way during part of the day and in the opposite direction during another part of the day.

The purpose of the reversible lane system is to provide an extra lane or lanes for use by the dominant direction of flow. Two increasingly used methods are to reverse the flow of an entire street during peak-hour periods or to make a two-way street operate one-way during that period.

A reversible-lane system is one of the most efficient methods of increasing rush-period capacity of existing streets. With minimal capital costs, it takes advantage of unused capacity in the direction of lighter traffic flow by making one or more of those lanes available to the heavier traffic flow.
Managing Our Way Through Congestion

There are several factors to be considered in determining whether reversible lanes are justified:

- Evidence of congestion.
- Time of congestion.
- Ratio of directional traffic volumes.
- Capacity at access points.
- Lack of alternative improvements.

The method of designating lanes to be reversed and the direction of low must be selected. Three general methods are used:

- special traffic signals suspended over each lane,
- permanent signs advertising motorist of the changes in traffic regulations and the hours they are in effect, and
- physical barriers, such as traffic cones, signs on portable pedestals, and movable divisional medians.

Improved Traffic Control Devices

Traffic control devised include traffic signs and markings. Traffic signs include regulatory signs, warning signs, and guide or informational signs. Traffic markings include all traffic lines, symbols, words, object markers, delineators, cones or other devices, except signs, that are applied upon or attached to the pavement or mounted at the side of the road to guide traffic or warn of an obstruction.

Miscellaneous traffic control devices are used to guide traffic in and around work areas, to alert traffic to hazards that are ahead, and to provide a means of identifying specific locations on streets and highways. They include: barricades, vertical panels, drums, barricade warning lights, rumble strips and milepost markers.

The costs associated with planning and implementing this technique are modest, and vary depending upon complexity and the number installed.

A modest planning effort is required to identify arterial locations for installations. Then a routine design and construction process is implemented, using appropriate design standards.

Goods Movement Management

One action to consider is the possibility of better managing the time and location of truck deliveries and pick-ups to minimize unneces-
An FHWA Handbook prepared to provide guidance on dealing with issues of urban goods movement recommended the following actions:

- Improvements of shipping/receiving points. On street loading and unloading can be facilitated by designing additional curb space for loading zones and enforcing time restrictions.

- Reducing operational and physical constraints.

- Changes in business operating practices.

- Changes in public policy. Land-use planning, zoning and industrial location policies and building regulation requiring off-street loading and unloading facilities may be used to separate freight-oriented from other activities.

The Los Angeles Olympic experience showed that the removal of a significant portion of trucks through goods movement management during peak period traffic can effectively reduce overall congestion. During the peak hours in Los Angeles during the 1984 Olympics, peak period truck traffic was down about 6 percent overall, more than 15 percent below normal on some freeways. Additionally, the combination of free-flow and fewer trucks produced a 42 percent reduction in truck-related freeway accidents, 58 percent decrease region-wide.

Any of the above mentioned strategies will no doubt require some type of regulatory or legislative authority to make them effective. In addition, institutional strategies normally require a comprehensive set of both incentives and penalties to gain an acceptable level of compliance. In order to effectively develop a policy on urban goods movement, it would be helpful to carry out the following actions:

- Establish a forum among business, labor, trucking and the government sectors to facilitate the alteration of truck delivery schedules.

- Make changes to local and state government regulations (i.e., local noise abatement ordinances, parking restrictions, and restrictions on alcoholic beverage deliveries).

- Identify and make modifications to operations (i.e., work hours for both receivers and shippers).
Arterial Access Management

Access management elements often include one or more of the following:

- the physical restriction of left turns
- restricting curb cuts and direct access driveways,
- separating obvious conflict areas,
- eliminating parking
- locating intersections at no less than minimum intervals,
- construction of frontage roads to collect local business traffic and funnel it to nearby intersections.

Without an access management program along arterial highways, the normal chain of events involves a cyclical program that requires constant capital investment for roadway improvements and/or relocation. The number of conflict points among vehicles rises as a result of an increasing number of driveways, causing the capacity at a specific level of service to diminish.

The cost of allowing unplanned development to occur along arterials can be enormous, because the inevitable solution calls for more capital expenditure as the traffic conditions reach intolerable proportions.

Controlling or managing access along arterial highways is perhaps one of the most difficult tasks facing local officials and transportation engineers. This difficulty comes from a time-honored tradition and, in some cases, a legal right for landowners abutting a road to have access to their land. In addition, the process for land development decisions is often very different from that for transportation system planning.

Traffic Management During Reconstruction

Efforts at traffic management can be categorized into two areas: construction enhancement activities and traffic mitigation techniques. Construction enhancement activities involve efforts to speed the completion of the reconstruction project in order to minimize the time period of disruption. Traffic mitigation involves attempts at reducing or effectively managing the congestion resulting from reconstruction. This includes activities such as ridesharing promotions, special parking arrangements, alternative transit services, alternate route traffic flow improvements, intersection improvements, and retiming traffic signals.

The principal benefit of traffic management during reconstruction is the minimizing of traffic disruption. Successful implementation of traffic management strategies requires effective and thorough
planning and public education. Criteria that can be used to assess the potential effectiveness of individual strategies include:

- Does the strategy provide added opportunity for highway users to use alternative modes or routes?
- Can the strategy by implemented in time?
- Will the strategy be cost effective in terms of dollars spend per level of disruption reduction?
- Will the strategy contribute to permanent transportation improvements after the reconstruction project is finished?
- Can the strategy be terminated if found to be ineffective?
TDM IMPACTS ON BUSINESS

Module Goals

- To identify the benefits of TDM to employers.
- To provide information about the relative importance of transportation to corporate relocation decisions.
- To demonstrate how to estimate the cost of turnover and relate it to investment in TDM strategies.

Assumptions

- Employers are more receptive to TDM strategies when the benefits are described in terms of interest to a business.
- Workshop participants have little experience in estimating the potential impact of the program on issues of importance to businesses.

Benefits of TDM to Employers:

Businesses use transportation demand management strategies to:

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

Managing Our Way Through Congestion
Cost of TDM To Business

The cost of carrying out TDM programs has become a topic of considerable interest in recent years with federal, state or local mandates for corporate participation in trip reduction strategies. Trip reduction opponents claim that such mandates spend large sums of money on TDM programs with very little benefit. Research has found examples of employer TDM programs that show its cost-effectiveness for employers of all types, sizes, and locations but there is no definitive estimate of the cost-effectiveness of TDM. Furthermore, the data suggest a weak correlation between employer expenditures and reductions in employee commute trips.

Why can't we accurately predict the cost-effectiveness of TDM programs?

First, employers often lack the cost information. There are several reasons why employers may lack the data. Such data may not have a clear connection to the business's performance. The public reasons for TDM -- air quality, energy consumption or traffic congestion -- are not usually enough to motivate employers carry out TDM strategies. Employers with TDM cost data often expected to receive business performance benefits.

There are only three basic ways to show benefits to businesses.

- Increase revenues by raising prices.
- Increase revenues by boosting output.
- Decrease expenses to improve their profits.

Research conducted by FHWA have identified examples of employers who have reduced the number of vehicle trips by as much as 40 percent and saved themselves as much as $2.4 million. This study, *The Cost Effectiveness of Travel Demand Management Programs*, identified 22 case studies from various employers throughout the country (See Section III Table 3.4.1 in *Implementing Effective Travel Demand Management Measures*).

The report summarizes the results of private companies, a hospital, a university, and local governments. The smallest employer
had 130 employees and the largest reported 18,000 employees.

The project's goals were to:

- Determine the total cost of operating an employer-based trip reduction program.
- Distinguish between direct and indirect costs and savings.
- Determine the net cost per trip reduced.

Empirical data contained in that table show several types of successful TDM programs.

**What observations can you make about the employer TDM programs contained in the reference book?**

1. 

2. 

3. 

Another project investigated the financial impact of a regulation on businesses. A study by Ernst and Young for the South Coast Air Quality Management District (SCAQMD) attempted to quantify the employer's costs but not benefits. They prepared the study, *Regulation XV Cost Survey*, to estimate the annual compliance costs incurred by employers and the change in employee commute trips associated with those costs.

The accounting firm did not try to estimate the benefits associated with reduction in employee trips. Benefits such as decreased demand for parking, improved employee morale and productivity may offset some or all of the costs and show the cost-effectiveness of the program.

Ernst and Young sent the survey to each of the 5,763 regulated private and public sector sites in the SCAQMD's four county area. The response rate to the survey was 19 percent. The survey requested data about the employer type, location, and the number of employees at the site from 6 a.m. to 10 a.m. The firm asked
employers to split their costs into four areas:

- training of the Employee Transportation Coordinator,
- plan preparation and approval,
- plan implementation and maintenance, and
- other costs.

When the survey data was extrapolated to the regulated population, the following results were estimated:

<table>
<thead>
<tr>
<th>Regulation XV annual costs:</th>
<th>$162 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Reduction of vehicles:</td>
<td>53,910 vehicles</td>
</tr>
<tr>
<td>Daily trips eliminated each year:</td>
<td>13.75 million trips</td>
</tr>
<tr>
<td>Employees per reduced vehicle:</td>
<td>29</td>
</tr>
<tr>
<td>Average annual expenditure:</td>
<td>$105 per employee</td>
</tr>
</tbody>
</table>

By distributing the total costs among the regulated portion of the workforce, the cost per daily one-way trip reduced would be $5.66. Using the median costs would result in a cost of $4.75.

Can we trust these estimates? Usually, the costs are self-reported by employers and they may not fully account for their costs and benefits.

The SCAQMD directed Ernst & Young to re-survey some employers to determine why there was a wide variance in annual per employee costs among employers. They interviewed a sample of 20 employers who responded to Ernst & Young's first survey to clarify their responses. The sample included 10 companies of the 50 employers reporting the highest costs and 5 each from the middle and lower levels.

Ernst & Young found that 90 percent of the companies who reported the highest costs had overstated their costs. Over the entire sample, the total revised costs were about 50 percent less than the original estimates.

The costs associated for providing the program to employees other than those regulated (i.e., employees who arrive outside the regulated morning peak period of 6 AM to 10 AM) was one common data problem. Employers did not subtract these costs from the reported total to estimate the cost of complying with the
regulation. In addition, employers made errors in completing the form itself. This small sample may not represent the surveyed population. However, the full survey may provide a conservative estimate of the compliance costs.

A more recent study (results are yet to be published) was commissioned under the Transit Cooperative Research Program (TCRP) of the National Academy of Sciences. The purpose of the TCRP's Cost-Effectiveness of TDM study is to gather additional information on a national level. The study investigated the process by which employers develop and carry out TDM programs. The collection and use of data about the employer's costs and benefits was of particular interest to the TCRP panel of transportation professionals.

The study involved interviewing about 50 employers to get information on the development, evolution, and performance of their TDM programs. The research team found it difficult to obtain acceptable "before" conditions to calculate the change in vehicle trips and cost effectiveness. According to the research team, most employer interviews did not provide sufficient information to calculate cost effectiveness or to derive conclusions on performance for use in the employer guidance material. Most of these employers did not estimate the costs of the program. This finding may suggest that employers may have determined the data collection costs or program cost did not warrant baseline measurements.

Businesses may not choose the most cost-effective mix of TDM strategies for non-financial reasons. The literature finds that charging for parking can result in significant shifts in commuting behavior for little or no cost. However, employer concerns about employee morale or labor-management relations may prevent their adoption.

How come the cost-effectiveness ranges are so wide? Quantifying the costs is based upon self-reporting, the lack of accepted accounting practices, and the cooperation of employers. The TCRP study chose employers that team members thought were examples of effective TDM programs. They are not nor were sought to be a representative sample of employers. This project highlights the difficulty of extracting data that employers never set out to collect in the first place.
Even if the data is collected by the employer conditions over which the individual TDM program manager has no control may determine the cost effectiveness of employer TDM programs. These include:

- **Location**

  Some employer TDM programs historically have higher measures of efficiency levels than others as a nature of their market (e.g., employers located in downtowns and served by high occupancy vehicle lanes are ripe for carpool and vanpool formation). Therefore, vehicle trip reduction could be expected to be significantly higher for a downtown employer than an employer located in the suburbs.

- **Worksite characteristics**

  These characteristics include parking supply and demand, traffic congestion at its entrances and the type of transit service can determine the effectiveness of the program.

- **Support of Management and Commuters**

  The TDM program’s ability to change commute behavior also may depend the support of management and the help of commuters. A part-time employee transportation coordinator must balance the the commuting demands of employees, the requests for assistance from the regional TDM program, and the demands from managers to take care of his or her other job responsibilities. An employer vanpool program depends on the driver. The driver must contend with the operation and condition of the vehicle and the needs of up to 14 riders, as well as financial reporting systems.

- **Program Maturity**

  Furthermore, the time interval between the introduction of the program and overall effectiveness of the program depends upon many factors. This interval is not likely to be the same from employer to employer or even for a business of the same type.
Accounting Practices

Short-term improvements in efficiency also may be affected by factors such as accounting practices and other business decisions. For example, a survey of employer costs of carrying out Regulation XV in southern California found employers allocate costs of offering the program to their entire workforce even though only a portion of the workforce were subject to the regulation. It may have been a sound business decision but it certainly inflates the costs.

The Importance of Transportation in Site Selection

The functioning of the transportation system has a direct bearing on an area's economic development potential. The real estate adage of "location, location, location" is giving way to "access, access, access". Location alone is not sufficient. What is important is the access to the facility by customers, clients, suppliers, and employees. For example, advances in telecommunications have and will continue to make it less important where a business is located but how one can access the services and products of that business.

The reasons for relocating a business seem to focus on reducing costs as much as increasing market opportunities.

<table>
<thead>
<tr>
<th>COMPANY REASONS FOR GROUP MOVE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidation of operations</td>
<td>59.3%</td>
</tr>
<tr>
<td>Division or subsidiary reorganization and relocation</td>
<td>57.6%</td>
</tr>
<tr>
<td>Company wanted a lower-cost operating environment</td>
<td>27.1%</td>
</tr>
<tr>
<td>Corporate relocation</td>
<td>23.7%</td>
</tr>
<tr>
<td>Company wanted to attract qualified employees</td>
<td>23.7%</td>
</tr>
<tr>
<td>Closer proximity to markets</td>
<td>20.3%</td>
</tr>
<tr>
<td>Opening of a new sales territory</td>
<td>15.3%</td>
</tr>
<tr>
<td>Other</td>
<td>15.3%</td>
</tr>
<tr>
<td>Improve company image</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

Source: Runzheimer International

According to a survey of 150 personnel executives by Runzheimer International, the five most important criteria during the site selection phases of the corporate relocation process are
Managing Our Way
Through Congestion

high quality workers, low operating costs, quality of life, geographical locale, and proximity to markets.

**MOST IMPORTANT SITE SELECTION CRITERIA**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available high quality workers</td>
<td>67%</td>
</tr>
<tr>
<td>Low operating costs</td>
<td>59%</td>
</tr>
<tr>
<td>Quality of life</td>
<td>46%</td>
</tr>
<tr>
<td>Geographical locale</td>
<td>39%</td>
</tr>
<tr>
<td>Proximity to markets</td>
<td>38%</td>
</tr>
</tbody>
</table>

*Source: Runzheimer International*

As the following examples illustrate, transit and TDM strategies contribute to most of these criteria.

- **Carpooling and vanpooling** link long distance commuters with potential employers. Transit services from the downtown can link transit dependent populations in the city with jobs in the suburbs. Thus, these modes expand the pool of candidates from which to attract high quality workers.

- **Transit and TDM** can reduce operating costs by decreasing demand to build additional parking which can range from $2,000 per space for a surface lot to $20,000 per space for an underground garage.

- **Telecommuting programs** reduce office space requirements.

- **High occupancy vehicle lanes** can reduce commuting time for commuters and increase opportunities for residential choices.

List other examples how TDM strategies may address business concerns.

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________
List the top quality of life factors that affected site selection decisions

QUALITY OF LIFE FACTORS THAT AFFECTED SITE SELECTION DECISIONS

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuting Time</td>
<td>85%</td>
</tr>
<tr>
<td>Cost of Living</td>
<td>79%</td>
</tr>
<tr>
<td>Quality of School</td>
<td>67%</td>
</tr>
<tr>
<td>Climate</td>
<td>51%</td>
</tr>
<tr>
<td>Cultural Activities</td>
<td>38%</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
<td>29%</td>
</tr>
<tr>
<td>Community Activities</td>
<td>28%</td>
</tr>
<tr>
<td>Religious Diversity</td>
<td>10%</td>
</tr>
<tr>
<td>Religious Sports</td>
<td>9%</td>
</tr>
</tbody>
</table>

LOCAL INCENTIVES OFFERED TO TRANSFERRING COMPANIES THAT INFLUENCED THEIR RELOCATION DECISION

<table>
<thead>
<tr>
<th>Incentive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax abatements</td>
<td>34%</td>
</tr>
<tr>
<td>Free land</td>
<td>30%</td>
</tr>
<tr>
<td>Low interest loans</td>
<td>22%</td>
</tr>
<tr>
<td>Employee relocation assistance</td>
<td>13%</td>
</tr>
<tr>
<td>Financial Assistance</td>
<td>11%</td>
</tr>
<tr>
<td>Labor training</td>
<td>11%</td>
</tr>
<tr>
<td>Tax credits</td>
<td>4%</td>
</tr>
<tr>
<td>Waiver of permits</td>
<td>3%</td>
</tr>
</tbody>
</table>

What TDM strategies or services could be inducements to relocate to your area?
The Consequences of Employee Turnover and Absenteeism

Much of the literature suggests TDM strategies have positive impacts on employee productivity, turnover, morale, and absenteeism. Conspicuously absent from the literature, however, are attempts to identify and quantify the linkage between TDM strategies and these business concerns.

The purpose of this section is to identify the positive and negative consequences of employee turnover and absenteeism on the individual, work group, and organization. With an understanding of the consequences, TDM agencies will be better equipped to identify linkages between business problems and TDM strategies.

The need for good employees is one constant shared by all types of organizations. An organization’s success in improving performance depends increasingly on the skills and motivation of its work force. Businesses invest vast amounts of resources in the development of the work force through education, training, and creating opportunities for continuing growth. The loss of employees or “turnover” can increase these costs directly and indirectly.

Employee turnover is the rate of employee movement into and out of the organization over a given period. There are two types of movements: additions and separations. There also are two types of separations: voluntary (employee-initiated) and other (firing, death, retirement).

Voluntary separations can be further classified as avoidable or unavoidable separations. Unavoidable separations are those which the company has no control such as the job transfer of a spouse. Avoidable separations are those which the company could have prevented in some manner. Raising the pay of an employee who has another job offer or providing a transportation allowance for employees who work in a high cost area are examples of prevention techniques to address avoidable separations.

Regardless of the reason, the loss of an employee can have positive and negative consequences on the individual, work group, and organization. Potential moderating circumstances can affect the nature and extent of the consequence including the cost of turnover.
For example, some jobs, especially those with a high degree of customer-contact or those at the policy-setting level, can have a significant productivity and cost impacts throughout the organization. Other jobs such as those in the fast food service industry with predictable levels of turnover or limited customer contact can be replaced with less impact.

Positive and Negative Consequences of Turnover for the Individual

When changing a job, the individual may lose seniority and benefits such as free parking or flexible work hours. On the positive side, the individual may benefit economically, advance his or her career, or benefit by reducing their commute trip. They may change jobs to move closer to their current residence or seek other employment when a company relocates from one part of town to another.

The Rule of 45 says that most people won't travel more than 45 minutes to work or shop. Can we trust this rule? According to the 1991 American Housing Survey, about 90 percent of the population take less than 45 minutes to travel to work.

The key moderating variable for these outcomes is the difference between the jobs.

Positive and Negative Consequences of Turnover for the Work Group

Possible positive consequences arising from employee turnover on the work group could include increased effectiveness, new skills and abilities, and decreased conflict. Disruption of the work flow to cover for departing employee and inefficiencies related to the new hire can negatively impact the work group. Issues such as the difficulty of replacing the employee and characteristics of the replacement are moderating variables.

Positive and Negative Consequences of Turnover for the Organization

The consequences of turnover are ultimately borne by the organization. Increased effectiveness of the individual and work group translate into increased productivity and profits. At the same time,
### Consequences of Turnover for Individuals

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Positive</th>
<th>Negative</th>
<th>Potential moderating variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leavers</td>
<td>Increased earnings (2,4)</td>
<td>Loss of seniority (1)</td>
<td>1. Tenure</td>
</tr>
<tr>
<td></td>
<td>Career advancement (2,4)</td>
<td>Loss of network benefits (3)</td>
<td>2. Labor market</td>
</tr>
<tr>
<td></td>
<td>Improved individual performance (6)</td>
<td>Unrestrained moving costs (2,4)</td>
<td>3. Family status</td>
</tr>
<tr>
<td></td>
<td>Increased challenge (5)</td>
<td>Disruption of family (3,6)</td>
<td>4. Job skills/abilities</td>
</tr>
<tr>
<td></td>
<td>Network benefits (e.g., geographic location) (6)</td>
<td>Transition stress (3,6)</td>
<td>5. Social involvement in work</td>
</tr>
<tr>
<td></td>
<td>Increased family ties (3,6)</td>
<td>Loss of friendships (5)</td>
<td>6. Characteristics of old versus new job</td>
</tr>
<tr>
<td></td>
<td>New social relationships (5)</td>
<td>Decreased family ties (3,6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enhanced commitment to new job and organization (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stayers</td>
<td>Opportunities for promotion (8,9)</td>
<td>Increased workload (3,3,6,9)</td>
<td>1. Beliefs about why others leave</td>
</tr>
<tr>
<td></td>
<td>More positive job attitudes (1,4,7,9)</td>
<td>Decreased performance (3,3,6,9)</td>
<td>2. Social relationship to leavers</td>
</tr>
<tr>
<td></td>
<td>Increased performance (3,3)</td>
<td>Stress and uncertainty (6,9)</td>
<td>3. Task interdependence</td>
</tr>
<tr>
<td></td>
<td>Stimulatation at work (2,9)</td>
<td>Less positive job attitudes (1,4)</td>
<td>4. Status of leavers</td>
</tr>
<tr>
<td></td>
<td>Inclusion of research that results in better job (1,4,7)</td>
<td>Loss of friendships (2)</td>
<td>5. Performance of leavers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6. Job market conditions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7. Career development of leavers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8. Level of organization of leavers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9. Organization promotion policies</td>
</tr>
</tbody>
</table>

### Consequences of Absenteeism for Individuals

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Positive</th>
<th>Negative</th>
<th>Potential moderating variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absentees</td>
<td>Reduced stress and boredom (1-3)</td>
<td>Loss of earnings (1)</td>
<td>1. Absentee policies of organization</td>
</tr>
<tr>
<td></td>
<td>Reduced motivation toward the job (2)</td>
<td>Lowered performance evaluation (2,4,5)</td>
<td>2. Nature of the task</td>
</tr>
<tr>
<td></td>
<td>Ability to take care of nonwork responsibilities (1)</td>
<td>Renunciation of co-workers (2,4,5)</td>
<td>3. Employee norms about absence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Work committees while absent (2,4)</td>
<td>4. Timing of absence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Altered job attitudes or self perceptions (5)</td>
<td>5. Perceived reason for absence</td>
</tr>
<tr>
<td>Co-workers</td>
<td>Increased job variety (1,2)</td>
<td>Increased workload (1-4)</td>
<td>1. Nature of task</td>
</tr>
<tr>
<td></td>
<td>Skill development and training (1,2)</td>
<td>Renunciation toward absent co-worker (1-4)</td>
<td>2. Availability of replacements</td>
</tr>
<tr>
<td></td>
<td>Opportunities for overtime (1-4)</td>
<td></td>
<td>3. Timing of absence</td>
</tr>
<tr>
<td></td>
<td>Visibility to supervisor (1-4)</td>
<td></td>
<td>4. Production pressures</td>
</tr>
</tbody>
</table>

### Consequences for Turnover in Work Groups*

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Positive</th>
<th>Negative</th>
<th>Potential moderating variables</th>
</tr>
</thead>
</table>
| Work Group        | Increased effectiveness (3,7)  
New ideas and creativity (1,3,7)  
New performance standards (1,3,7)  
New skills and abilities (3,7)  
Reevaluation of group norms (3,7)  
Increased cohesiveness (3,7)  
Decreased conflict (5) | Disruption of work (1,3,5-7)  
Disruption of group process (3-4, 7)  
Decreased performance (1,3,5-7)  
Greater role specificity (4,5)  
Structured relationships and communication channels (4,5)  
Efforts to socialize new member (3,7)  
Increased conflict (7) | 1. Task interdependence  
2. Group cohesiveness  
3. Characteristics of恋人  
4. Size of group  
5. Predictability of turnover  
6. Difficulty of replacement  
7. Characteristics of replacement |

### Consequences of Absenteeism for Work Groups*

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Positive</th>
<th>Negative</th>
<th>Potential moderating variables</th>
</tr>
</thead>
</table>
| Work Group        | Increased motivation from absent member (2)  
Mutual support and greater cohesiveness (1,2,4) | Increased workload (2,4)  
Decreased group effectiveness (2,4)  
Inter-division conflict (e.g., subversive directed toward absent member) (1-4) | 1. Group norms about absenteeism  
2. Task interdependence and characteristics  
3. Group cohesiveness  
4. Availability of temporary replacements |

### Consequences of Turnover for Organizations

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Positive</th>
<th>Negative</th>
<th>Potential moderating variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Innovation and adoption (3,5)</td>
<td>Costs of turnover (1-5, 7)</td>
<td>1. Labor market conditions</td>
</tr>
<tr>
<td></td>
<td>Increased employee morale and mobility (3,5)</td>
<td>Selection and recruitment Training and development</td>
<td>2. Patterns of turnover</td>
</tr>
<tr>
<td></td>
<td>Increased motivation (1,3)</td>
<td>Administrative staff</td>
<td>3. Organization promotion policies</td>
</tr>
<tr>
<td></td>
<td>Increased effectiveness (1-4, 7)</td>
<td>Negative public relations (1)</td>
<td>4. Internal manpower pool</td>
</tr>
<tr>
<td></td>
<td>Reduction in entrenched conflict (7)</td>
<td>Operational disruption (1-4, 7)</td>
<td>5. Growth of organization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased effectiveness (1,2,7)</td>
<td>6. Job stress-role performance curve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structural changes</td>
<td>7. Characteristics of leavers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formalization (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Centralization (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased employee social involvement at work (2)</td>
<td></td>
</tr>
</tbody>
</table>

### Consequences of Absenteeism for Organizations

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Positive</th>
<th>Negative</th>
<th>Potential moderating variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased effectiveness (1-4)</td>
<td>Cost of absenteeism (1-4)</td>
<td>1. Patterns of absence and predictability</td>
</tr>
<tr>
<td></td>
<td>Training and development of work force (1-3)</td>
<td>Wages Fringe benefits Administrative staff</td>
<td>2. Technological interdependence of tasks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased absenteeism (1-4)</td>
<td>3. Capacity utilization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased overall effectiveness (1-4)</td>
<td>4. Absence policies</td>
</tr>
</tbody>
</table>

the social costs of turnover disrupt the organization's cohesiveness. If current labor market conditions make it a "buyers" market - they demand for jobs exceeds the supply then the duration and severity of the impact may not be severe. The same can be said for organizations with a strong program of advancement and a broad internal manpower pool.

Why should companies worry about finding replacement workers? Problems associated with new employees can include:

- It isn't unusual to find 80 percent of the errors were made by new employees.
- Many employers think they miscalculated when they find turnover costs of $_______ per employee. They may not know the cost of employee turnover because it rarely shows up as a budget line item. The direct costs associated with employee turnover are only a portion of the total costs. Employers find the high costs of turnover are in the indirect costs.
- How come the cost of turnover is so high? While pay and benefits costs attract the most attention, the cost of turnover does not appear as a line item expense. One of the keys to positioning TDM strategies as potential solutions to business problems is to understand the components of turnover and provide a basis for employers to evaluate the potential impact of those strategies.
- The following lists parts of the high cost of turnover. The accompanying tables show that small impacts on reducing turnover can pay big dividends to employers. The challenge to the TDM program is to tailor its services to meet the specific needs of the employer and its workforce.
COST OF TURNOVER

1. Incoming employee inefficiency
2. Inefficiency of those closely associated with incoming employee
3. Departing employee inefficiency
4. Inefficiency of those closely associated with departing employee
5. Inefficiency of position being filled while vacant
6. Out-of-pocket processing costs
7. Human resources processing costs
8. Non-human resources employee processing costs
9. Relocating costs

Requiring employers to invest time and resources in TDM programs or activities can be compared to other investments. The following tables provide reference guides to help understand that TDM strategies that contribute to reduced employee turnover (e.g., transit subsidies) can have "bottom line" impacts on the business.

**EMPLOYEE TURNOVER AVOIDANCE REQUIRED**

**PER $100,000 INVESTMENT WITH 12 MONTHS PAYBACK**

(Number of Employees)

<table>
<thead>
<tr>
<th>COST OF TURNOVER TO SALARY RATIO</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>1.00</th>
<th>1.25</th>
<th>1.50</th>
<th>1.75</th>
<th>2.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANNUAL SALARY</td>
<td></td>
<td></td>
<td></td>
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<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
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</tr>
</tbody>
</table>

No. of employees = [($100,000 investment +$100,000 savings)/(salary * cost of turnover to salary ratio)]

**MAXIMUM INVESTMENT ALLOWED TO REDUCE COST OF TURNOVER WITH A 12 MONTH PAYBACK**

($ PER TURNOVER)

<table>
<thead>
<tr>
<th>COST OF TURNOVER</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
<th>40%</th>
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<tbody>
<tr>
<td>$10,000</td>
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</tr>
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<td>8,000</td>
<td>10,500</td>
<td>12,000</td>
<td>14,000</td>
<td>16,000</td>
</tr>
</tbody>
</table>

$ per turnover = (Cost of turnover *(1- turnover cost reduction target))

After estimating costs, employers can compare these costs to investment in strategies to reduce turnover. Using the above table, employers can estimate the reduction in turnover per $100,000 to recover the investment in one year. For example, if the average cost per turnover was $30,000, a transit subsidy program that paid $60 per month to 140 employees would show a breakeven point if it reduced turnover by seven employees who have an average salary of $30,000 per year.

Of course, there is no assurance that the TDM program such as a vanpool program or a transit subsidy will reduce turnover or absenteeism. Until more research is conducted on these linkages, the question remains whether TDM agencies can actually have a substantial impact on these organizational variables through changes in either employer policies or the incentives.

Any program of turnover and absenteeism control must begin with accurate data on employee separations and absences. Only with such information is management able to:

- Determine whether the rate of turnover or absenteeism is cause for concern, particularly by comparing data with national or industry averages.
- Identify major causes of employee separations or absences, with special emphasis on avoidable separations and absences.
- Carry out measures for reducing the rate of turnover and absenteeism.

Exit interviews with employees or internal surveys are methods used by companies to identifying the major causes of employee separations. Commuting related issues that employers may probe for or employees may offer will vary by site. Issues such as the price, availability or location of parking may be major concerns for a downtown employers. The unacceptable travel time or the quality and/or lack of transit service may be an issue for employers who move to a new location. These concerns may contribute to an employee's decision to leave.
SUMMARY OF EMPLOYERS' COST AND BENEFITS

The following checklist summarizes the key areas when evaluating the costs and benefits of TDM strategies on employers.

Effectiveness

- Change in output or deliverables
  - Quantity
  - Quality

- Change in employment costs
  - Salary and expenses
  - Support staff
  - Office space and overheads
  - Core team response
  - Health and energy

- Change in productivity
  - Time
  - Time lost to illness
  - Training costs

- Change in motivation
  - Hours worked
  - Recruitment
  - Retention

- Changes in Costs
  - Office space
  - Home/remote office costs
  - Reuse of existing space
  - Heat, light and power
  - Travel
  - Parking

- Value of Dispersed locations
  - Customer contact
  - Colleague contact

- Compliance
  - Regulatory
  - Clean Air Act
  - Zoning

- Changes in Image
  - Public image
  - Employee loyalty
Example: Benefits to Employers from Telecommuting

1. More hours worked per day. Less time is consumed by commuting and socializing at the water cooler.

2. More work done per hour. Less distractions from co-workers.

3. Ability to work at peak hours. Morning persons and night owls can accommodate their internal clocks.

4. Expanded coverage. Flexibility offers the opportunity to expand telephone coverage to customers and clients in different time zones with existing resources.

5. Less incidental absence. A poll by the Detroit News found the following percentages of people agreed that it was okay to stay home for the following reasons.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>60%</td>
</tr>
<tr>
<td>Sprained ankle</td>
<td>59%</td>
</tr>
<tr>
<td>Arthritis</td>
<td>28%</td>
</tr>
<tr>
<td>Stomach ache</td>
<td>18%</td>
</tr>
<tr>
<td>Visible bruises</td>
<td>12%</td>
</tr>
<tr>
<td>Sunburn</td>
<td>11%</td>
</tr>
<tr>
<td>Lack of sleep</td>
<td>9%</td>
</tr>
<tr>
<td>Hangover</td>
<td>8%</td>
</tr>
<tr>
<td>Headache</td>
<td>7%</td>
</tr>
<tr>
<td>&quot;Blah&quot; feeling</td>
<td>7%</td>
</tr>
<tr>
<td>Runny nose</td>
<td>3%</td>
</tr>
</tbody>
</table>
TDM IMPACTS ON BUSINESS

The Benefits of TDM

The benefits of TDM and transit to employers include:

- Decreases turnover and improves recruitment;
- Reduces employee stress and related productivity losses;
- Reduces the amount and cost of employer provided parking spaces that may be needed for other, more productive uses.
- Lowers absenteeism rates and minimize tardiness (e.g. transit is always available, operates on a fixed schedule)
- Provides a tax-free, employee benefit (e.g. employers can provide up to $60 per month to employees for transit or vanpooling)
- Decreases traffic congestion around employment site, with potentially positive impacts on corporate citizenship (e.g. traffic flows can be improved especially when employees switch to staggered work hours).
- Enhances employee productivity by decreasing the stress of commuting alone (e.g. telecommuting offers fewer distractions, continuous work time);
- Decreases absenteeism (e.g., telecommuting offers the ability of employees to work in through emergencies such as car trouble or a sick child);
- Increases employment opportunities for the disabled and others unable to meet traditional work hour requirements (e.g., compressed work weeks and telecommuting);
o Decreases overhead (e.g., shared office space and telecommuters can reduce space requirements or allow company to expand);

o Removes traffic from the road. (e.g. each bus can remove as many as 35 automobiles from the road;

o Reduces peak hour traffic — the major cause of urban road and highway congestion on company property.

o Improves air quality (e.g. one bus can reduce up to 600 lbs. of pollution)

o Decreases the demand for fossil fuels, particularly petroleum based ones which are largely imported and negatively affect the balance of payments and interest rates.

o Contributes to positive community growth patterns and related land-values through coordination of transit facilities as part of development strategies for community design and land use planning.

QUALITY OF LIFE FACTORS THAT AFFECTED SITE SELECTION DECISIONS

<table>
<thead>
<tr>
<th>Factor</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuting time</td>
<td>85</td>
</tr>
<tr>
<td>Cost-of-living</td>
<td>79</td>
</tr>
<tr>
<td>Quality of the public school system</td>
<td>67</td>
</tr>
<tr>
<td>Climate</td>
<td>51</td>
</tr>
<tr>
<td>Availability of cultural activities</td>
<td>38</td>
</tr>
<tr>
<td>Outdoor recreation</td>
<td>29</td>
</tr>
<tr>
<td>Community activities</td>
<td>28</td>
</tr>
<tr>
<td>Religious diversity</td>
<td>10</td>
</tr>
<tr>
<td>Spectator sports</td>
<td>9</td>
</tr>
</tbody>
</table>

Problems associated with new employees can include:

- lost or dissatisfied customers;
- mistakes made and the time and expenses to correct them;
- fraud;
- shortages; and,
- higher overhead costs.

Many employers think they miscalculated when they find turnover costs of $30,000 per employees.
ESTABLISHING THE BASELINE

MODULE GOALS

1. To understand the interrelationship between the traditional planning process and the Deming Quality Improvement Cycle.

2. To understand how to facilitate buy-in to the TDM plan through sound public involvement and such activities as charrettes and the nominal group technique.

3. To understand the data requirements to develop a TDM plan.

4. To be able to collect your own data set.

5. To be able to analyze a data set.

ASSUMPTIONS

1. Customer service is paramount.

2. A interrelated and structured process has a better chance to succeed.

3. Background materials can provide important insight into the problems and perceptions.

4. Getting buy-in to the plan and process makes implementation easier.

5. Let the data do it.

6. A good plan requires good data.

7. What you can’t find in other sources you can collect.

THE PDCA CYCLE

1. PLAN
2. DO
3. CHECK
4. ACT
1. Issue Formulation
   --Project Initiation Activities
   --Define key issues

2. Data Collection and Analysis
   --Existing conditions scan
   --Issue analysis

3. Goal Setting
   --Develop goals and objectives

4. Strategic Plan
   --Plan Development
   --Implementation Strategies

ISSUE FORMULATION

Project Initiation Activities

1. Define purpose

2. Background scan

3. Advisory committee

Define Key Issues

1. Establish buy-in
   --Define stakeholders
   --Solicit public input

2. Review of relevant legislation
   --Fulfill requirements

3. Refine purpose

4. Basic understanding of key issues

ESTABLISH BUY-IN

YE OLDE PUBLIC HEARING

* Established Official Record

* Unresolved Public Concerns

* Public Reactions To Decisions
  -can be adversarial
  -affected persons first opportunity
* Procedural Formalities
  -limiting comments
  -intimidated by others and microphone

* Highly Charged Meeting
  -become emotional or militant
  -rallying opposition
  -suspicions sway crowd
  -arguing match

DEALING WITH DIFFICULT SUBJECTS

"An effective public participation program must be instituted early in the project planning process to obtain meaningful input from interested parties. Project developers must prove to the public that their concerns and ideas will be given serious consideration."

-Edison Electric Institute

FOLLOWING PROCEDURE

"Procedures, rather than actual decisions, appear to be the origin of most people's perception of political legitimacy."


PUBLIC PARTICIPATION

"Public involvement processes shall be proactive and provide complete information, timely public notice, full public access to key decisions, and opportunities for early and continuing involvement."

Federal Register, October, 1993, "Statewide and Metropolitan Planning Regulations."

FURTHER FEDERAL GUIDANCE

* Timely Information
  -agencies
  -individuals
  -groups

* Adequate Notice
  -public review and comment on TIP

* Review of Effectiveness
  -ensure full and open access
  -revise as necessary
* Public Comment On Public Input
  -review of methods and procedures

PRINCIPLES OF PUBLIC INVOLVEMENT

* Consensus is Unrealistic
  -strive for general consent
  -better than doing nothing

* Establish a Fair and Open Process
  -need to be heard
  -concerns are considered
  -fair hand=accept hardship
  -manages political pressure

* Start Early
  -begin with public input
  -allows early resolution of issues

* Build Trust
  -know decision makers and leaders
  -help participants understand opposition
  -strive for mutual solutions

PRINCIPLES OF PUBLIC INVOLVEMENT

* Establish Need
  -use data
  -establish the why and what
  -use before and after studies

* Use Visuals
  -use slides, charts, graphics
  -minimize explanation
  -before and after visuals

* Involve Stakeholders
  -debate and resolve public concerns
  -solicit stakeholder involvement
  -early refusals, no credibility late

* Know Your Audience
  -anticipate negativism
  -understand the opposition
  -ask for explanations
  -prepare for questions

* Tell the Truth
  -consistent and clear responses
  -avoid jargon and acronyms
- use everyday language
- don’t know is better than vague
- common understanding = common ground

* Practice Tolerance
  - keep cool under fire
  - personal acceptance of other side
  - people need to be valued and accepted
  - avoid posturing
  - don’t pretend to have all answers
  - ask for their solutions

* Be Responsive
  - be willing to modify
  - review all input

* People Can Differentiate
  - don’t assume ignorance
  - self-serving leads to failure
  - people don’t expect to win it all

* Avoid Hasty Concessions
  - always step back to consider
  - don’t appear to agree to changes
  - consequences can be awkward

* Achieve Clear Resolution
  - personal follow-up with affected
  - summarize recommendations
  - outline future opportunities
  - clearly resolve major issues

* Keep Thorough Records
  - document opportunities
  - establish process
  - put it all in writing

PUBLIC INVOLVEMENT TECHNIQUES

* Visioning
* Brainstorming
* Citizen Advisory Committees
* Transportation Fairs
* Focus Groups
* Collaborative Task Force
* Media Outreach
* Citizen Surveys
* Telephone Techniques
* Video Techniques
* Public Meetings/Hearings
* Charrettes
Charrette
1. A one-time public event (public forum) aimed at solving transportation related problems or issues.
2. Facilitates public involvement by providing private citizens with an opportunity to openly and freely discuss transportation issues and problems

A successful charrette
1. Ample time and space
2. Background materials
3. Materials
   - Large maps
   - Large newsprint pads and markers
   - Site photographs
   - Outline basic goals, rules, and time constraints
4. Adequate staffing
   - Competent leader
   - Individuals who have previous experience with the problem or issue
   - Individuals who are familiar with the derivation and use of the data
5. Good organization
   - An agreement on the process and timing
   - Finding an experienced leader
   - Setting up space for an informal discussion

Nominal Group Technique
1. Designed to discourage discussion until all issues are listed
2. Four step process
   - Silent idea generation
   - Round-robin reporting of ideas
   - Discussion for clarification
   - Ranking of problem/solution importance
3. Guided group discussion
4. All topics mentioned, many discussed
5. Input from all
6. Drawback: Not all topics get exhaustive treatment

How to use the Nominal Group Technique
1. Give all participants 3" X 5" index cards.
2. Ask them to respond to a question or problem statement.
3. Have each person share one of their responses. Go around the table as many times as necessary until all responses are recorded. Write all responses down on the poster boards.

4. No discussion is allowed until all responses have been shared.

5. After all points are listed, discussion by group to clarify or elaborate.

6. Using new 3" x 5" cards, each participant ranks the top five to ten issues listed on the master sheet.

7. Cards are collected and the results of the voting are tabulated.

8. Group discussion is then permitted on each one of the issues.

9. Again, each participant ranks the issues which then become the results of the group.

**KNOWING WHAT YOU NEED**

1. Data Needs
   --Current transportation conditions
   --Commuter travel patterns
   --Site/service area characteristics
   --Identification of congested areas

2. Collection Methods
   --Periodic employee transportation survey
   --Driveway counts/survey
   --Traffic Counts/surveys

**DATA CHOICES**

- Demand Volume
- Average Travel Speed
- Average Travel Time
- Volume/Capacity Ratio (v/c)
- Vehicle Miles Traveled (VMT)
- Person Miles Traveled
- Average Vehicle Occupancy (AVO)
- Average Queue Lengths
- Maximum Queue Lengths
- Vehicle Hours of Delay
- Level-of-service (LOS)
- Peak-Hour Factor (PHF)
- Roadway Congestion Index (RCI)
- Average Daily Traffic (ADT)
Managing Our Way Through Congestion

The TDM planner must determine:

- what data is to be collected
- locations for data collection
- the period for data collection (e.g., hourly, daily, weekly, monthly, etc.) such that effectiveness measures can be recorded and monitored. Appropriate selection of these data characteristics will minimize effort and produce meaningful, measurable results.

**Demand Volume:**
The number of vehicles or persons that desire to traverse a particular section of roadway or facility during a specified period of time. Can only be measured where available capacity does not constrain the demand.

**Average Travel Speed:**
Total distance divided by total time needed to traverse a given roadway segment or travel corridor, averaged for more than one vehicle-trip.

**Average Travel Time:**
Total time, including stopping, needed to traverse a given roadway segment or travel corridor averaged for more than one vehicle-trip.

**Volume/Capacity (v/c) Ratio:**
A measure of facility usage or congestion, where demand volume or flow is divided by the designed facility capacity. Capacity should be in terms of person-carrying capacity. A ratio of 1.0 signifies that measured volume equals capacity. Likewise, the greater a ratio is below 1.0, the more the facility is under-utilized.

**Vehicle-Miles Traveled (VMT):**
An estimated measure of travel activity from network or roadway segment studies.

**Level-of-Service (LOS):**
A letter designation (A through F) that describes a range of operating conditions on a particular transportation facility. LOS “A” describes a free-flowing condition where individual vehicles are not influenced by the presence of other vehicles in the traffic stream. LOS “F” describes breakdown operations which occur when traffic flow arriving at a point is greater than the facility's capacity to discharge flow and queues develop.
Level-of-service is a performance parameter and its measure of effectiveness varies depending on the type of facility and/or the type of flow. For example, for uninterrupted flow facilities (i.e., freeways and multi-lane highways), level-of-service is measured in terms of vehicle density, vehicle or person flow rates and average travel speed. For interrupted flow facilities (i.e., signalized intersections, arterials, transit and pedestrian facilities), level-of-service is measured in terms of average stopped delay, average travel speed, load factor (persons per vehicle seating capacity) and space (square feet per sidewalk pedestrian).

Peak-hour factor (PHF):
A factor that indicates the relationship between hourly volume and the maximum rate of flow within the peak-hour. For 15-minute periods of flow, the PHF is defined as the hourly volume divided by 4 times the maximum 15-minute rate of flow. The maximum value is 1.0, the minimum value is 0.25, and the typical range of values is between 0.70-0.98 (with lower values signifying a greater degree of variation in traffic flow during the peak-hour).

Roadway Congestion Index (RCI):
A relative measure of urban mobility levels, developed by the Texas Transportation Institute, intended to be areawide representations not site-specific locations of spot congestion. The RCI combines the daily vehicle-miles of travel per lane-mile (DVMT) for freeways and principal arterials in a ratio comparing the existing DVMT to calculated DVMT values identified with congested conditions.

An RCI value of 1.0 or greater indicates that congested conditions exist areawide. Assumed capacity for freeway sections is taken as 13,000 vehicles per lane per day, and 5,000 vehicles per lane per day for principal arterial roadways.

Average Daily Traffic (ADT):
Average 24-hour traffic volume at a given location for a period of at least two days but less than one year.

Average Weekday Traffic (AWT):
Average 24-hour traffic volume, occurring on weekdays only, for at least two days but less than one year. Depending on the type of land use activity being monitored, AWT may be more critical than ADT (e.g., office building during weekdays vs. shopping center on weekends).

Average Annual Daily Traffic (AADT):
Average 24-hour traffic volume at a given location over a full 365-day year, or the total number of vehicles passing a given location in a year divided by 365.
Average Annual Weekday Traffic (AAWT):
Average 24-hour traffic volume occurring on weekdays only over a full year, or the total number of vehicles passing a given location in a year for weekdays only divided by 260.

Average Vehicle Occupancy (AVO)

-Defined as: Number of Employees arriving in vehicles at worksite

AVO is typically measured for an area (i.e., Central Business District) or region of many work sites, whereas average passenger occupancy (APO) is measured for a single work site. The need to examine both or one should be stipulated. For purposes of this example discussion, AVO will be used.

Single-occupancy vehicle (SOV) users often do not regard the full costs of operation when making their travel decisions. They tend to consider the out-of-pocket costs only (parking, tolls, fuel, oil), and disregard the costs of vehicle ownership, depreciation, maintenance, insurance, taxes, and fees. Further, many times parking at the employment site is free or heavily subsidized, and would greatly offset the perceived cost advantage of driving if it had to be paid by the employee. The closer the AVO is to 1.0, the higher the percentage of single-occupant vehicles in the mode split (or the greater the potential for congestion and mobility problems). The goal of TDM is to determine the desirable AVO.

AVO measures are generally represented in four categories:

1.0-1.05 common for many new, low-density suburban growth areas

1.10 a little less auto dependency and maybe some use of carpooling, with little or no transit use. Determined to be the national average for commute trips.

1.15 common in established suburban corridors and activity centers, with some transit use.

1.30+ common for a radial corridor into a CBD, involving varying degrees of transit use.

During the peak-hour, the average vehicle occupancy for a carpool is 2.5, 12 for a vanpool, and 50 for a bus. These AVO's can vary substantially depending on the "incentives" (i.e., travel time savings, cost savings, availability of alternative modes, etc.) provided
to the user. The following examples, using the aforementioned vehicle occupancies, describe the levels of mode shift that would be needed for achieving desired average vehicle occupancies for a work site.

**Example A**: For a work site with 100 employees, if existing AVO = 1.05 and desired AVO = 1.3, then instead of 95 (100/1.05) vehicles entering the work site during the peak-hour, 19 fewer vehicles or 76 (100/1.3) vehicles would enter during the peak-hour.

The necessary carpool program to achieve the desired AVO would require 60 SOV's (60 employees) and 16 carpools (40 employees, 16 * 2.5), or a mode shift of 40% ((100-60)/100) to carpool.

**Example B**: For a work site with 500 employees, if the existing AVO = 1.05 and the desired AVO = 1.3, then instead of 476 (500/1.05) vehicles entering the work site during the peak-hour, 92 fewer vehicles or 384 (500/1.3) vehicles would enter during the peak-hour.

The necessary vanpool program to achieve the desired AVO would require 373 SOV's (373 employees) and about 11 vanpools (132 employees, 11 * 12), or a mode shift of 25.4% ((500-373)/500) vanpool.

**Example C**: For a work site with 2,000 employees, if the existing AVO = 1.05 and the desired AVO = 1.3, then instead of 1,905 (2,000/1.05) vehicles entering the work site during the peak-hour, 367 fewer vehicles or 1,538 (2,000/1.3) vehicles would enter during the peak-hour.

The necessary bus transit program to achieve the desired AVO would require about 1,528 SOV's (1,528 employees) and about 10 buses (500 employees, 10 * 50), or a mode shift of 23.6% (2,000-1,528)/2,000) to buses.

**VEHICLE MILES TRAVELED**

**Background**

One of the outputs of transportation network analysis is an estimate of the total vehicle-miles traveled (VMT) on the network during the period of interest. The estimate of VMT assumes that a vehicle counted on a network link travels the entire length of the link. This is considered to be a reasonable assumption because while some vehicles traveling only a portion of the link will be counted, others will not since they do not all cross the specific counting location. A 24-hour VMT estimate requires that the counts be taken and averaged over at least two, 24-hour periods. Further, peak-hour or
Daily VMT cannot be expanded to annual VMT without knowledge of seasonal variations that exist. Control counts are used to monitor and quantify daily and seasonal (or monthly) volume variation patterns. Such control counts may be taken at permanent-count stations or at control-count stations. Permanent-count stations are counted 24 hours each day, 365 days per year. Control counts are used to supplement the information obtained from permanent-count stations. Control counts are typically one-week counts taken during each month of the year for a continuous seven-day or five-day period using portable mechanical counters.

Count locations for permanent and control counts should be representative of the various roadway classes (i.e., principal arterial, minor arterial, major collector, minor collector, etc.) in the transportation network for estimates of network-level VMT. On the other hand, specific roadway VMT estimates should have counts taken at a location where traffic flows do not vary (e.g., mid-block, away from short segments of major "point loadings"). Generally, a coverage count should be taken on each two-mile segment of the roadway or network.

Annual VMT can be estimated using the average annual daily traffic (AADT) estimates computed for each coverage count. For example, for each coverage count:

\[ AVMT = \text{AADT} \times L \times 365 \]

where \( AVMT \) = annual vehicle-miles traveled,

\( \text{AADT} = 24\text{-hour count on a particular day} \times \text{daily variation factor} \times \text{monthly variation factor} \) (see sample tables below),

and \( L \) = length of the segment, in miles

**Volume/Capacity Ratio**

The volume/capacity (v/c) ratio is a measure of facility usage or congestion, where demand volume or flow is divided by the designed facility capacity. Capacity is typically noted in terms of passenger-car equivalents per hour per lane for roadway facilities, people per hour per lane for transit facilities, and people per minute per foot for pedestrian facilities. Volume is a point measure, or the rate at which vehicles (or people) pass a particular point.

The volume/capacity ratios are used to determine the facility level-of-service, or capacity efficiency. A ratio of 1.0 signifies that measured volume equals capacity, and that there is a need for improvement (i.e., spreading the demand volume). Likewise, the greater a ratio is below 1.0, the more the facility is under-utilized. The goal in TDM planning is to establish a standard for level-of-service, or tolerable v/c ratio. The evaluation process then becomes understanding what type and intensity of TDM measure is needed to adjust the v/c to the desired level-of-service.
STEP 1 - Calculate V/C Ratio

Example A: A single-lane HOV, buses only, able to accommodate level-of-service C. Estimated design person-carrying capacity during the peak-hour would be:

60 buses/hour x 45 passengers/bus = 2,700 passengers/hour

If peak-hour headways are actually 2 minutes (due to lack of adequate "return" route, number of buses available, etc.), and buses are only two-thirds filled, the volume would be:

30 buses/hour x (2/3 x 45 passengers/bus) = 900 passengers/hour, and the v/c ratio would be 0.33.

Example B: A 4-lane roadway with a design speed of 50 mph, able to accommodate the maximum LOS "D" volume. Estimated capacity during the peak-hour would be:

1,500 vehicles/hour/lane x 4 lanes = 6,000 vehicles/hour

If the peak-hour volumes are measured at 5,700 vehicles/hour, the v/c ratio would be 0.95.

Step 2 - Determine V/C Adjustment Requirements

Example A: The HOV facility is very under-utilized, and a significant adjustment (or increase in volume) is required. Since the facility is designed to accommodate LOS "C", and the desired v/c ratio is 0.85, an additional 1,400 passengers/hour need to be attracted to the facility.

Example B: The roadway facility is operating at 95% of its design capacity. Since the desired v/c ratio is 0.85, approximately 600 vehicles/hour need to be encouraged to select a high-occupancy mode of travel or encouraged to travel at another time of the day.

Step 3 - Determine Most Effective TDM Measure

Example A: The most effective TDM measure to select to remedy this under-utilized facility is one that would be most expected to increase HOV usage by 1,400 passengers/hour (or if AVO = 1.2, then 1,166 SOV's). Therefore, the selection of the most appropriate TDM measure can best be determined by the level of non-HOV traffic on the facility. For example, if the traffic volume is at least 32,000 vehicles/hour, then employer support of transit could apply (1,166/0.36 = 32,388). If the traffic volume is at least 15,000 vehicles/hour, then vanpooling could apply (1,166/0.075 = 15,546). The maximum level of employer support and employee participation is assumed for all cases.
Example B: The most effective TDM measure to select to remedy this over-utilized facility is one that would be most expected to reduce vehicle-trips by approximately 10.5% (600/5700). Assuming a CBD/Corridor environment and maximum level of employer support and employee participation, alternative work schedules and transit service improvements can be expected to reduce vehicle trips up to 9% (the most of any other TDM measure excluding SOV surcharges).

**ADDITIONAL NEEDS**

1. Transit Service  
   --Availability  
   --Routes

2. Peak-Period Volumes

3. Parking  
   --Location  
   --Types  
   --Costs

4. Employment Distribution  
   --Identify Activity Centers  
   --Target Areas

5. Major Employers  
   --Activities  
   --# of employees

6. Growth Trends

7. Non-Motorized Access

8. Residential Locations

9. Access Points
MEASURING PERFORMANCE

Module Goals

- To explore the need for evaluation and examine the results of several TDM performance evaluations.
- To demonstrate how to use the FHWA/FTA tools.
- To provide additional resources to facilitate participants' further understanding.

Assumptions

- Evaluation is good.
- Transportation professionals can improve TDM performance. We can learn from the successes and failures of others as well as ourselves.
- We recognize the importance of performing reasonable and defensible evaluations of TDM impacts to establish TDM's credibility.
- We share a common interest in, and commitment to, developing a broad-based coalition of public and private interests to advocate TDM implementation.

Goal Setting

Goals and objectives may be established throughout the planning process, but the primary goal setting effort should be focused after data collection and analysis for the following reasons.

1. 

2. 

3. 

The Use of Benchmarks in Goal Setting

Benchmarking information and data refer to processes and results that represent superior practices and performance. Benchmarks encourage TDM programs to set targets that stretch.

1. To encourage creativity and represent a clear challenge to "beat the best," rather than only gradually refining the existing approach.

2. To place the emphasis of program benchmarks on achieving superior program offerings and low costs of operation.

3. To help improve communication with other organizations interested in TDM by providing a common language for assessing performance.

4. To serve as a working tool for planning, training, and other uses.

Sources of comparisons and benchmarking data might include:
(1) information obtained from other TDM programs through the
direct sharing of information; (2) prior experience of the TDM program; and (3) published reports such as annual reports of TDM programs.

Selecting the right benchmarks is critical, and benchmarks should be reviewed periodically for appropriateness.

Using the above graph, the following characteristics of clear and effective benchmark data are presented (Data are for illustrative purposes only):

- the trend line report data for a key performance requirement for TDM programs
- both axes and units of measurement are clearly labeled
- results are presented over several years to indicate trends affecting the organization and its industry
- meaningful comparisons are clearly shown

What comments on the graphed results would be appropriate?

Identifying Goals

Successful TDM programs exhibit several core values and concepts. These values and concepts are the foundation for integrating performance requirements of the customer with that of the TDM program. The core values and concepts are:

1. Leadership
2. Customer driven quality
3. Management by fact
4. Design quality
5. Continuous improvement
6. Employee participation and development
7. Long-range outlook
8. Partnership development
9. Public responsibility
LEADERSHIP

This goal category examines how the TDM Board and other stakeholders become personally involved in visible activities such as:

- planning
- communications
- review of TDM program performance
- recognizing employees for quality achievement

CUSTOMER-DRIVEN QUALITY

The ultimate success of the TDM program will depend on how it focuses on and satisfies its "customer" needs. The goals set for this category should consider methods how to track customer satisfaction, monitor current trends, assess levels of satisfaction and measure retention.

TDM programs must have a constant sensitivity to changing commuter and employer requirements. This includes increasing awareness of developments in technology and rapid and flexible response to customer and market requirements.

Who are the "Customers"?

1. __________________________________________
2. __________________________________________
3. __________________________________________
4. __________________________________________
5. __________________________________________
6. __________________________________________
7. __________________________________________
MANAGEMENT BY FACT

Management by fact requires a framework of data, analysis, and measurement. Facts and data needed for quality improvement and quality assessment, include:

- customer profiles,
- product and service performance,
- operations,
- the market,
- competitive comparisons,
- suppliers,
- employee-related, and
- cost and financial.

Analysis refers to the process of extracting larger meaning from data to support evaluation and decision making at various levels of the TDM program. Such analysis may entail using data to reveal information—such as trends, projections, and cause and effect—that might not otherwise be evident.

Performance measures or indicators should be derived from program strategies and encompass all key activities and outputs. A system of measures or indicators tied to customer satisfaction and program performance provides a clear and objective basis for aligning activities with TDM goals and objectives.

DESIGN QUALITY AND PROBLEM PREVENTION

In general, costs of preventing problems at the design stage are much lower than costs of correcting problems that occur later. This requires paying attention to TDM program suppliers including:

- carpool and vanpool drivers,
- regional commuter assistance programs (CAP) and TMAs/TMOs,
- transit agencies,
- taxicab companies for guaranteed ride home programs,
and

- third-party vanpool providers for the provision of vans and maintenance support.

CONTINUOUS IMPROVEMENT

Achieving the highest levels of quality and competitiveness requires a well-defined and well-executed approach to continuous improvement. Opportunities for improvement have four major sources:

1. 
2. 
3. 
4. 

Improvements may be of several types:

- enhancing value to customers through new and improved products and services;
- reducing errors;
- improving responsiveness;
- improving productivity and effectiveness in the use of all resources; and
- improving the TDM program's leadership position in fulfilling its public responsibilities.

EMPLOYEE PARTICIPATION AND DEVELOPMENT

A TDM program's success in improving performance depends on the skills and motivation of its work force.

- Employee success depends on having meaningful opportunities to learn and practice new skills.
- TDM programs need to invest in development of the
work force through education, training, and creating opportunities for continuing growth.

**LONG-RANGE OUTLOOK**

Achieving quality and deeper market penetration requires a strong future orientation and willingness to make long-term commitments to all stakeholders—customers, employees, suppliers, the public, and the community.

Planning needs to determine or anticipate many types of changes including:

- customers' expectations of products and services,
- technological developments,
- changing customer segments,
- evolving regulatory requirements, and
- community/societal expectations.

Other major parts of the long-term commitment are:

- developing of employees,
- improving relationships with suppliers,
- fulfilling responsibilities to the taxpayer, and
- serving as a community role model.

**PARTNERSHIP DEVELOPMENT**

TDM programs should seek to build partnerships to better accomplish their overall goals. These partnerships blend a TDM program’s skills or leadership capabilities with complementary strengths and capabilities of partners, thereby enhancing overall capability, including speed and flexibility. These partnerships might involve:

- Employee Transportation Coordinators (ETC),
- local public transit providers, or
- business associations.
PUBLIC RESPONSIBILITY

A TDM program's objectives should stress responsibility and accountability to the public. This responsibility refers to basic expectations of the TDM program to:

- protect public health,
- enhance mobility for all, and
- conduct realistic, defensible evaluations of the public resources.

Inclusion of public responsibility as a core value means meeting all local, state, and federal laws and regulatory requirements. It also means treating these and related requirements as areas for continuous improvement beyond mere compliance.

APPLY IT!

What ideas presented in this session do you plan to put into action?

1. ______________________________________

2. ______________________________________

3. ______________________________________

4. ______________________________________
Why Evaluate?

There are many reasons for developing a system to monitor progress, as follows:

1. __________________________________________________________________________

2. __________________________________________________________________________

3. __________________________________________________________________________

4. __________________________________________________________________________

5. __________________________________________________________________________

6. __________________________________________________________________________

7. __________________________________________________________________________

8. __________________________________________________________________________

9. __________________________________________________________________________

10. __________________________________________________________________________

11. __________________________________________________________________________

12. __________________________________________________________________________

What Does Evaluation Do?

A successful evaluation will use procedures that determine one or more of the following:

1. The extent to which the program has achieved its stated objectives (e.g., increases in average vehicle ridership).
2. The extent to which the accomplishment of the objectives can be attributed to the program (direct and indirect effects).

3. Degree of consistency of program implementation to plan (relationship of planned activities to actual activities).

4. The relationship of different tasks to the effectiveness of the program (productivity).

**Measures of Performance**

1. Measuring the extent to which the program has achieved its stated objectives (e.g., increases in AVR) will include methods to determine:
   - How many people were placed into a carpool per year or per 100 employees?
   - How many new vanpools were formed?
   - How many people were placed as riders into new and existing vanpools per year?
   - How many customers were served?
   - How many requests for assistance were filled?
   - How many transit passes were sold? What was the sales value?
   - What was the change in Average Vehicle Occupancy over the year?

2. Measuring the extent to which the accomplishment of the objectives can be attributed to the program (direct and indirect effects).
   - What is the estimated change in Vehicle Miles Traveled?
What is the estimated change in Vehicle Trips?

How has demand for parking been affected?

What reduction in pollutants is estimated?

How much money did our commuters save as a result of the program?

What were the above outcomes for commuters who were influenced to try an alternate mode as a result of marketing efforts, but not directly attributable to any specific program or service of the agency? (e.g., commuters who form a vanpool on their own).

Some research indicates the indirect effects of a program may equal or exceed the direct effects.

Evaluating the degree of consistency of program implementation to plan (relationship of planned to actual activities) may determine whether, for example, the number of matchlists produced were sufficient to form new carpools.

Which implementation tactics were the most effective?

Where all planned activities carried out on time and within budget?

Where the number of carpool formation meetings adequate?

Was customer response time within performance goal (e.g., requests received by 10:00 a.m. will be filled the same day for 95% of the employees)?

What level of staffing did it take to form and maintain a carpool?
4. The relationship of different tasks to the effectiveness of the program (productivity).

The CAP and taxpayers will want to see that the investment in the program is being used efficiently and effectively. Benefit/cost ratios or productivity matrices can be produced to provide this measure.

ON DEATH AND TDM EVALUATION
THE FIVE STAGES OF COPING WITH A POOR TDM EVALUATION

1. Denial and Isolation
   “No, not us, the data cannot be true!”

2. Anger, Rage, Envy and Resentment
   “Your survey is faulty.” “Why us? DOT spills more money than what we get!”

3. Bargaining
   “Okay, so your evaluation of our TDM program found that we didn’t change the behavior of thousands of commuters overnight. What about all the other things we do like provide traffic advisories, identify sites for bus shelters and encourage the provision of sidewalks? How about giving us credit for these activities?”

4. Depression
   “Our TDM program had so much potential.

5. Acceptance
   “I’m happy. We can only improve.”

Our apologies to Elisabeth Kubler-Ross, author of On Death and Dying
Methods of Evaluation

There are several different methods for collecting the data for evaluation purposes. Some of the most commonly used methods involve:

- Employee surveys
- Program participation documentation (e.g., registrations for preferential parking; applications for subsidies)
- Vehicle or average vehicle occupancy counts
- Time sheets/Activity logs

The evaluation method and data collection requirements depend on the measures of effectiveness being used.

Use of Surveys in Transportation Research

Surveys are often used in transportation research to determine how a group of people (commuters, residents in a certain part of town, etc.) travel now and how they might change their travel behavior if certain changes are implemented (new roads, transit routes, transit costs, etc.).

There are four major types of survey research. These are characterized in the table on the next page.
<table>
<thead>
<tr>
<th>TYPES OF SURVEYS</th>
<th>FOCUS GROUPS</th>
<th>WRITTEN/MAIL SURVEYS</th>
<th>TELEPHONE SURVEYS</th>
<th>PERSONAL INTERVIEWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>8-10 people discuss topics of interest to client; Led by professional moderator</td>
<td>Pre-designed survey mailed out to respondents</td>
<td>Pre-designed survey conducted by professional telephone interviewers</td>
<td>Survey administered by individual professional interviewer</td>
</tr>
<tr>
<td>Applicable Uses</td>
<td>Issue generation; In-depth discussion on complex survey results</td>
<td>General surveying of population; Medium-long surveys; Simpler survey formats</td>
<td>General surveying of population; Short-medium length surveys; Moderately complicated surveys</td>
<td>Interviews with key individuals; Long- Very long surveys; complicated survey formats</td>
</tr>
<tr>
<td>Costs</td>
<td>Low/Moderate</td>
<td>Moderate</td>
<td>Moderate/High</td>
<td>Very High</td>
</tr>
<tr>
<td>Usefulness for Projections/ Trend Analysis</td>
<td>Virtually None - not projectable at all</td>
<td>Only if adequate response rates (40% or more) are obtained</td>
<td>Good</td>
<td>Very Good if enough interviews are completed</td>
</tr>
<tr>
<td>Turnaround</td>
<td>Very fast</td>
<td>Slow</td>
<td>Fast/Moderate</td>
<td>Moderate/Slow</td>
</tr>
<tr>
<td>Strengths</td>
<td>Gets at issues beneath the surface; Low cost Fast Turnaround</td>
<td>Large sample sizes can be obtained; Longer surveys possible</td>
<td>Reasonably representative; fairly good turnaround</td>
<td>Allows more flexibility in interview format; in-depth probing</td>
</tr>
<tr>
<td>Weaknesses</td>
<td>Very dependent on having a good moderator; No projectability</td>
<td>Low Response rates/ Unrepresentative samples can occur; Slow turnaround</td>
<td>Higher costs; Surveys need to be kept fairly short and simple</td>
<td>Very high costs per completed survey; Slow turnaround</td>
</tr>
<tr>
<td>Typical single project cost</td>
<td>$5,000 - $10,000 (2 groups)</td>
<td>$10,000 - $15,000 (500 - 750 respondents)</td>
<td>$20,000 - $30,000 (500 - 750 respondents)</td>
<td>$50,000 - $75,000 (500 - 750 respondents); $15,000 - $20,000 (100 respondents)</td>
</tr>
</tbody>
</table>
SURVEY SAMPLING, ANALYSIS AND UNCERTAINTY LEVELS

Survey results always have an element of uncertainty, based on the fact that we haven't polled everyone to find out what they want. Clearly, because of expense and time constraints, it is not possible to survey everyone. Therefore, one key decision that must be made: How many people should be surveyed?

There are two key factors that will determine the answer to this question:

1. The budget that is allocated to surveying the population, and

2. The amount of uncertainty that you are willing to accept from the surveys.

The budget will generally give you an absolute maximum to the number of people you can survey. However, within that maximum, you may very well find that you don't need the amount of precision that will come out of doing all of the surveys that the budget allows.

Suppose, for instance, that you want to know approximately how many people will use a new tollway. You have a budget of $20,000 to survey the population. Now suppose you are quoted a rate of $5,000 overhead and $10 per interview completed. Should you go ahead and 1,500 interviews, as the budget allows?

You probably want an answer that is reliable within a range of 5 percentage points. In other words, if you get a result of 32.5% from the survey, you want to be able to say confidently that between 30% and 35% of the population will use the new tollway. This means that your amount of uncertainty is plus or minus 2.5 points around the 32.5% result. A mathematical formula is used to determine the uncertainty from survey results. For a proportion, as we are discussing here, that formula is:

\[
\text{amount of uncertainty around the result} = 1.96 \times (P(1-P)/N)^{0.5}
\]
where
- \( P \) is the proportion (in this case 32.5%)
- \( N \) is the sample size of the survey
- 1.96 is the standard multiplier used to achieve a 95% confidence level.

A "Confidence level" means that you are 95% sure that the "true" results will indeed fall within the uncertainty range. If you want to be 99% sure, that number changes to 2.576; if you want to be 90% sure, it falls to 1.645.

The "amount of uncertainty" is generally referred to as the Confidence Interval, and is associated with the confidence level. When you hear the term "a 95% confidence interval" used by statisticians, this is what they mean. When you see national polls on TV, this is the formula used to determine what the "plus or minus" amount of the result is, as in "25% of Americans actually believe results from national polls, with an error rate of + or - 3.5%".

Solving for \( N \), we get:

\[
N = \frac{P(1-P)}{(\text{amount of uncertainty}/1.96)^2}
\]

\[
N = \frac{(.325(1-.325))}{(0.025/1.96)^2}.
\]

\[
N = 1348, \text{ which is the sample size needed to achieve this result.}
\]

So, in fact, yes you should do just about all the surveys if you want an answer as precise as 2.5 percentage points around the result.

A lot of times you can't afford to do 1,500 surveys. You may only have a budget for 350 surveys. So, let's turn the problem around. Suppose you contract to have 350 surveys conducted, and you get 32.5% (or 65 people) saying that they would use the new tollway. What is the error rate associated with this result? The formula says that the error rate is 1.96*\((.325(1-.325))/350\)^.5, or 4.9%, so that you can say with 95% confidence that between 27.6% and 37.4% of the population will use the tollway.

Because of the way the formulas are set up, in order to double your precision (that is, to reduce the error rate by half), you
need to get four times as many interviews completed.

Now let's suppose that you aren't interested in a proportion, but rather in a mean result, such as Average Vehicle Occupancy. Let's say you surveyed 350 people, and got an Average Vehicle Occupancy of 1.12. Suppose the sample has a standard deviation of 0.35 (the standard deviation refers to how much the answers vary around the mean result. About 60% of the survey responses will fall within 1 standard deviation of the mean). How do you determine the error rate in this case?

The formula is actually very much the same as the proportion formula.

\[
\text{amount of uncertainty} = 1.96 S / (N)^{.5}
\]

where S, the standard deviation, replaces \(P(1-P)\) from the proportion formula. In this case, the result would be \(1.96 * 0.35 / (350)^{.5} = 0.037\). So we could say that the average AVO is between 1.083 and 1.157 at a 95% confidence level.

An interesting property of survey sampling is that the amount of precision has only to do with the size of the sample, not with the size of the population it is drawn from. If you sample 300 people, your results are just as accurate if the population is 10 million as they are if the population is 100,000. There is no need to survey 1%, or 5%, or 10% of the population. You only need to get a random sample of sufficient size to reduce the error to an acceptable level. (Note that this property becomes invalid if you survey a large proportion of the total population, say 50% to 70%. In those rare cases, your level of precision will actually be greater (and your error rate lower) than the sample size would indicate).

One of the most important ways in which surveys are used is to trend data from one survey to the next to see if there has been a change in behavior. Typically there will be a requirement that a statistically significant change be measured through a survey. "Statistically significant" means that the change in the survey results must not be due to the uncertainty arising from the sampling, but instead accurately reflect a change in the behavior of the population.
Trending and change detection requirements place serious constraints on the sample sizes you can use. If you expect a program to have an impact of a 5% increase, in, say, bus ridership, you need to conduct enough surveys so that if in fact a 5% change has occurred in the population, you can detect. If you only interview 100 people, the error from sampling will be so large that a 5% change in the behavior of the population may well be completely masked by uncertainty from the small sample size.

Suppose you want to know if the changes in the survey results (Using AVO again, say from an AVO of 1.06 to an AVO of 1.10) are significant (i.e. not due to error arising from the size of the sample). These formulas are very involved. A safe rule of thumb is to add the uncertainty levels from the two samples together, and if the change is larger than this sum, it is significant. This will overstate the size of change needed for a statistically significant result which should be fine - you will err on the side of caution.

If you are determined to know the exact numbers, the formula to determine this is:

Assume the second survey had a sample size of 500, AVO of 1.10, standard deviation of 0.35

Change needed from 1 survey to the next =

1.96 * std dev 1/(sample size 1)^0.5 +1.96* std dev 2/
(sample size 2)^0.5 =
1.96 * .35/(350)^.5+1.96*.35/(500)^.5=0.068

This represents how much change you need to see from one survey to the next to report an increase in AVO. In this case, the change was only 0.04, so the change in the survey results may be due to the uncertainty arising from the sampling, and may not have anything to do with a change in the behavior of the population. For instance, we may have, by random chance, interviewed a few more carpoolers in our second sample that we did in our first sample, even though the proportion of carpoolers in the whole population did not change. This
situation becomes especially problematic as sample sizes get down into the 75-100 range.

Another way to use this formula is to decide how much sample you will need to detect a given change in behavior. Suppose we are again working with the above problem, but now we want to know, if we expect an increase in AVO from 1.06 to 1.10, how many people should we sample?

We will assume that we are doing this analysis before the program starts, and, to simplify the problem, we want to survey the same number of people before and after program implementation. The formula is:

\[
\text{Amount of change} = 1.96 \times \text{std dev 1}/(\text{sample size 1})^{0.5} + 1.96 \times \text{std dev 2}/(\text{sample size 2})^{0.5}
\]

\[
= 1.96 \times 2 \times \text{std dev}/(\text{sample size})^{0.5}
\]

(since sample size 1 and 2 are assumed to be equal, as are std dev 1 and 2)

Solving for the sample size yields:

\[
\text{sample size} = (1.96 \times 2 \times \text{std dev}/\text{change needed})^2
\]

so, assuming a standard deviation of 0.35 (you may have to look through some prior research results to get an idea of what a reasonable guess for what the standard deviation will be)

\[
\text{Sample size} = (1.96/0.04 \times 2 \times 0.35)^2
\]

\[
= 1,176 \text{ respondents per survey.}
\]

Remember, to double the precision, we have to quadruple the sample size, as this example and the last example fairly well demonstrate.

For proportions, the formula is a lot more involved.

\[
\text{Change needed} = 1.96 \times ((\text{sample size 1} + \text{sample size 2})/ (\text{sample size 1} \times \text{sample size 2}))^{0.5} \times (X \times (1-X))^{0.5}
\]

where
Managing Our Way
Through Congestion

\[
X = \frac{(\text{Sample size 1} \times \text{proportion 1} + \text{sample size 2} \times \text{proportion 2})}{(\text{sample size 1} + \text{sample size 2})}
\]

and the sample size needed to find a given change can be determined by:

\[
\text{Sample size} = \frac{(1.96^2 \times ((2 \times \text{estimated proportion}) + \text{change needed}))}{(\text{change needed}^2)}
\]

So to uncover a change from 32.5% to 37.5% we would need 1,075 respondents per survey.

There is a subtle difference between a "statistically significant change" and a minimum change of, say, 5% within the population. A "statistically significant change" means that there is at least some difference, even if you aren't sure what that difference is. Essentially, it means that there was an increase of more than 0 points. To show a minimum change of 5%, you need to perform a slightly different calculation.

Take the base number you are trying to find a change from, and use the above formula for "amount of change needed" but use 1.282 instead of 1.96 in the formula (the reasons for using 1.282 instead of 1.96 have to do with the probability distributions. Don't ask.) Find the number needed for a significant change, add 5 points to it, and then solve the "amount of change needed" for (Original proportion + sig. change + .05) using the same formula with 1.282, and also using the number of respondents in the second survey, and your result needed to show a minimum 5% change is given by (Original proportion + sig. change 1 + .05 + sig change 2). It's easier than it sounds.

You can use the same logic to determine if you had a change of "at least X" as you would for proportions. You will have to assume that the standard deviation doesn't change in the second survey.

**PROBLEMS/CASE STUDIES**

1. You are planning to run a campaign to increase awareness of paratransit services among the general population.
you are going to survey the general population, you also want to
determine if the overall perception of the quality of all mass transit
services has improved.

You want to use a survey to determine whether or not the
campaign had the desired effect. You are expecting aware­
ness to increase from 10% to 30%.

What sample size do you need to:

a) At a minimum, establish that there has been a
statistically significant increase in awareness?

b) Establish that awareness increased by at least 12
points (that is, both before and figures are measured
at a precision of + or - 4 percentage points)?

c). Suppose that mass transit was rated at a 6.5 on
overall quality with a standard deviation of 1.9.
Assuming you use the sample size determined in
question 1b, you get a similar standard deviation on
this survey, what minimum average score is required
to show a significant increase in the overall rating of
transit services?

2. You are asked to set up surveys to determine why the non-
bus-riding portion of the population doesn't like to ride
buses. While you have some ideas as to why this is, you
aren't sure that you know what most of the major causes
are, and you don't know how people feel each of the major
causes is really important. Turnaround needs to be fairly
rapid. What type of survey approach would you
recommend?
3. You are planning a program to increase awareness of carpooling, carpooling list availability, and preferential parking for carpoolers in the downtown area. You expect awareness to increase from about 10% to 20%. You want to find out if, over a 2-year period upcoming, awareness has

   a) increased significantly
   b) increased by at least 4 percentage points.

You need to submit a budget for the survey portion of the project. Rapid turnaround time is negotiable based on how much it will cost. Prepare a budget estimate for a rapid and slower turnaround time by determining sample size and survey methods required.
Goal Setting: Reasons why goal setting should occur after data collection and analysis:

1. Specific goals and objectives can be formulated to address problems that have been verified in fact.
2. Waiting until after data has been analyzed will reduce the potential that goals and objectives will have to be substantially revised.
3. If goals and objectives are developed too early, they can bias the planning process by focusing data collection on proving that early assumptions about the program were correct.

Customer-Driven Quality: Who are the “Customers”?

1. Commuters 5. Financial contributors
2. Employers 6. Public
3. Employees 7. Community
4. Suppliers

Continuous Improvement: Opportunities for improvement have four major sources:

1. Employee ideas
2. Research
3. Customer input
4. Comparative information on processes and performance

Why Evaluate? There are many reasons for developing a system to monitor progress, as follows:

- Designing the TDM evaluation requires the commuter assistance program (CAP) to examine the clarity of its objectives, the ease with which they can be measured, and the possibility of their being achieved.
- Redirecting efforts when it is determined elements of the program have or do not have desired results.
- Providing staff with data to reinforce their efforts or to recommend new directions in which to move.
- Providing management with a tool in directing the organization’s TDM program into productive channels.
- Showing evidence to other agencies and the public of the diligence and sincerity of the agency.
-Supplying powerful factual information for public relations campaigns.
- Helping other TDM programs anticipate problems in implementing
FHWA TDM MODEL

Module Goals

- Describes the essential characteristics and intended uses of the TDM Model, provides guidance on the understanding and use of the model.
- Identifies the key inputs and outputs.
- Offers a demonstration of its use.
- Discuss the limitations and potential pitfalls of this Model.

Assumptions

- Participants are familiar with TDM strategies.
- Participants have a basic understanding of the 4-Step transportation planning process.
- This module will not substitute for actual experience.

Introduction

The TDM model is an analytic tool that supports the design and quantitative evaluation of transportation demand management (TDM) programs. The model was developed for the Federal Highway Administration by COMSIS Corporation and R.H. Pratt, Consultant, Inc. The following information was extracted from the Users Manual.

The purpose of the TDM Model is to provide information on the probable impact of various TDM strategies.

The model allows the user to review a wide range of possible TDM strategies, alone or in combination.

The ideal combination of strategies depends on:
- who is implementing them
- cost implications
- regulatory environment
- starting point
The process of identifying this mix of strategies involves educating participants on the options, performing tradeoffs among options, and reaching consensus on the best balance options.

The model allows for the review of program options in a comprehensive, objective manner to estimate the transportation impacts of those options. The information can be used to build support for the program by various constituency groups.

What is the TDM Model?

The TDM Model appears to the user as a system of computer spreadsheets, where the user enters different assumptions about the types of TDM strategies he or she wants to evaluate. These strategies are then related to a system of travel demand forecasting procedures which estimate their impact on existing travel conditions.

For what situations was the TDM Model developed?

The TDM Model was designed for application primarily at an area-wide or regional level. At this level, a TDM program may affect a variety of employers and commuters. It may involve policy actions by employers and/or government. However, the model also may be used to evaluate the TDM program efforts of an individual worksite, travel corridor, or single employer.

What types of strategies can be considered?

The TDM Model can evaluate the impacts of any of the following strategies; individually or grouped into programs:

Employer-Based Strategies

- Transit, Carpool, or Vanpool Support and Informational Programs (includes on-site services, employee transportation coordinators, pass sales, guaranteed ride home, etc.).
- Alternative Work Schedules (include flexible and staggered work hours, compressed work weeks, and telecommuting).
- Incentives and Disincentives (includes parking management, parking pricing, and subsidies).
Area-wide Strategies

- Regulatory requirements (includes voluntary, full mandatory, and new mandatory)
- Transit service improvements (includes in-vehicle time and out-of-vehicle time)
- High Occupancy Vehicle (HOV) Lanes (includes minimum occupancy 2+ or 3+ and time savings)
- Market-based pricing measures (parking fees, tolls, taxes, and subsidies)

What does the TDM Model tell you?

The model informs the user through a number of useful measures and indices how effective the particular TDM program is likely to be. It estimates changes in travel that would be expected in relation to existing conditions. Based on the input, the model can provide estimates of changes to:

- Mode split
- Person-trips
- Vehicle trips (VT)
- Vehicle miles of travel (VMT)
- Average vehicle occupancy

Where do the estimates of impact come from?

The model estimates the impact of TDM on travel conditions through a combination of empirical and analytical relationships. At the core of the model is a disaggregate logit mode choice model, which predicts the change in travelers' likelihood to use particular modes of travel based on changes in the conditions of their use, as affected by the particular TDM strategy or strategies. Some TDM strategies are not well accounted for by analytic mode choice models; the effects of these strategies are inferred from empirical relationships which are accessed from "look-up tables".
For whom was the TDM Model designed?

The TDM model was designed for use both by transportation professionals and non-professionals. Transportation planners familiar with planning models and terminology should find the model relatively easy to use. It has been designed to link directly with the traditional 4-Step planning models and provide the planner with greater capability to perform travel demand/traffic impact analysis in a subarea or corridor travel system. The TDM model communicates with the 4-Step models through trip tables, which are passed back and forth as necessary.

At the same time, persons with an interest in TDM, but who are not traditional planning model specialists can use this model without great difficulty. The minimum requirement is that the user be familiar with TDM concepts and terminology.

DATA INPUTS

The TDM Model has been designed to apply to a range of different settings and needs. These include:

- A geographic subarea corridor or activity center;
- A metropolitan area (with limitations); and
- An individual employer site.

Each of these applications typically involves different types of analyses, and hence, carries different types of input data requirements.

Subarea Application:

The TDM Model was originally designed to evaluate TDM programs at a geographic subarea level, in order to allow for collective solutions of transportation and traffic problems in a specific impact area.

A "subarea" is defined as a geographic area -- usually defining a corridor or activity center -- within which there is a tangible traffic or mobility problem. For this type of application, the expectation is that the user will explore programs involving multiple employers of different types and sizes, under different legal/regulatory condi-
tions, and with possible inclusion of system wide measures such as transit improvements or HOV lanes.

For this application, the TDM Model requires input data in the form of "trip tables", such as are used in the traditional planning process of a Metropolitan Planning Organization (MPO). A trip table is a matrix which reflects the movement of travelers between specific individual geographic origins and destinations in the study area, defined as "traffic analysis zones". Separate matrices generally exist which represent:

- Person Trip movements;
- Private Vehicle Trip movements; and
- Transit Person Trip movements

for three different trip types:

- Home-Based Work (HBW) trips;
- Home-Based Other (HBO) trips; and
- Non-Home Based (NHB) trips.

In larger metropolitan areas, where traffic congestion imposes peak period demand on the transportation system, trip tables are often developed to reflect peak hour, as well as 24-hour travel patterns. Because TDM strategies are generally applied to commute travel, the TDM Model uses only the trip tables for Home-Based Work trips. Since these (HBW) trips are most prevalent in the peak hour, it is desirable to have peak hour HBW trip tables for the TDM Model; 24-hour HBW trip tables may be used, but the user must be conscious of their limitations for certain types of analysis, such as peak hour traffic analyses, or use of work hours shifting strategies.

When performing a subarea analysis, the TDM Model is linked in a parallel fashion with the traditional 4-step planning process. The user applies the traditional 4-step model preliminary analyses of trip generation from land use patterns, evaluate the effectiveness of capital (roadway) improvements, and subsequent traffic analysis through the assignment of these trips to specific facilities (offering a measure of congestion through the resulting volume-to-capacity ratio).

The TDM Model is used in this joint relationship to perform a more focused analysis of travel demand and modal split, since the choices of travelers among alternatives are influenced by the
Managing Our Way Through Congestion

various TDM strategies. The two models communicate back and forth in this tandem arrangement through trip tables. Specifically, primary scenarios are generated in the traditional planning model, and then trip tables defining home-to-work travel for the study area are passed to the TDM Model. Within the TDM Model, a variety of TDM program scenarios are identified, tested, and their effect quantified. Preferred TDM packages are then passed back to the 4-step process through modified trip tables where they are re-incorporated with the other trip tables and reassigned to the highway network for evaluation of traffic impacts.

Many planning organizations are now employing microcomputer planning systems to perform traditional 4-step planning process. Software packages which are in wide use include MINUTP, TRANPLAN, and EMME/2. These systems give the planner much more flexibility and ease in performing planning analyses, as well as graphical interfacing and feedback, and certainly enhance overall capability for traffic analysis when using the TDM Model. The TDM Model has been designed to directly interface with each of these software programs by accepting trip tables directly from those systems. A feature on the entry screen of the TDM Model allows for the user to designate the source planning software system.

If the user is not a planning professional or member of a planning organization, and it is desired to perform subarea analysis, it will be necessary to request trip table input data from the local Metropolitan Planning Organization. Exact specifications for formatting and entry of trip table data are provided in the Users Manual.

Regional Application:

While the TDM Model was primarily developed as a subarea sketch planning tool, requirements imposed on planning organizations by the 1990 Clean Air Act Amendments and the Intermodal Surface Transportation Efficiency Act are causing these organizations to examine TDM measures at a regional level as well. While the TDM model was not specifically designed for this type of application, it may be used with certain caveats.

It should be noted that the time required by the program to assess a TDM program scenario is directly related to the square of the size of the trip table which has been entered. Therefore, the model offers optimal speed and performance when the size of the trip
table is at a minimum; this is because of the large number of calculations the model performs for every origin-destination pari.

Physically, the current model is limited to a trip table of 1,100 zones (1,100 x 1,100 square matrix). This falls short of the size of the zonal system of most large metropolitan planning areas. Even if it did not, however, the model is intended to run at a much smaller matrix size than this, with the optimum size being 200 to 1000 origin-destination pairs. At this size, the calculation time for a TDM package ranges from 2 to 5 minutes, depending also on the capability of the individual computer.

Therefore, to run the model for an area of substantial scale, methods should be used to compress the trip table to an acceptable size. This may be done through:

- Use of analysis "districts", which combine several smaller zones into one larger zone; or
- Applying the model to segments of the metropolitan area one at a time, and then pooling the results for a regional summary; this method may also be combined with the use of districts (as above) or "subarea isolation" methods, where the detail on origins outside the destination area is reduced to “external stations”.

Again, as in the subarea application case, trip table inputs must be home-based work trips, and should reflect peak-hour conditions where possible.

**Individual Site Application:**

It may be desired to apply the TDM Model to investigate TDM impacts at an individual employment site. In this instance, the user relates the starting modal split conditions for the employment population to the model. These conditions are described in terms of:

- Total one-way person trips to site (during relevant analysis period, typically between 6 a.m. to 10 a.m. on weekdays);
- Total private vehicle trips;
o Total person trips by transit (if any); and

o Total person trips by vanpool (if any).

Note that the TDM Model does not account for use of non-motorized modes (walk or bicycle), taxi, or motorcycle/moped, either in the initial data inputs or in estimating effects of TDM strategies.

These input data are generally obtained through employee surveys. The user has two options in relating this information to the Model:

(1) **Create Trip Tables:** If the survey data contains information on location (origin-destination) as well as mode choice, the user can choose to develop trip tables. There is a special utility feature in the model that allows the user to enter the data in trip table format.

(2) **Single Modal Split:** The model can also be directed off a single “point” estimate of person trips and modal split. A special utility feature allows construction of a “unit” trip table, which is convenient if the input data source is of limited detail or if the user wishes rapid turnaround for preliminary or sensitivity analyses on a large number of measures.

**DATA OUTPUTS**

The TDM Model furnishes outputs to the user of two basic types:

(1) Those directly related to evaluation of the TDM scenario being tested in the model.

(2) Revised trip table information to return to the transportation planning/traffic simulation process for overall analysis of traffic impacts.

Direct user-readable outputs of the first (1) type include:

o **Tabular output** indicating the following measures of effectiveness for each scenario relative to the starting conditions:

  - Modal split (percentage of trips by travel mode)
- Number of private vehicle trips
- Number of person trips
- Average vehicle occupancy
- Vehicle miles of travel

0 Graphic output (colored bar charts) showing the area as a whole and for individual destination zones:

- Comparison of modal split before and after strategy
- Comparison of vehicle trips before and after strategy
- Comparison of single occupant vehicle trips before and after strategy
- Comparison of vehicle miles of travel before and after strategy
- Percent change in vehicle trips and single occupant vehicle trips
- Percent change in vehicle trips and VMT

Data of the second (2) type are formatted into trip table files of the stated format (MINUTP, TRANPLAN, EMME/2 or ASCII), which can be related directly back to the respective 4-step model for re-incorporation and assignment.

What the TDM Model tells the user is how many vehicle or person trips are being reduced by the particular strategy, and the corresponding reduction in vehicle miles of travel. This provides an immediate indication of effectiveness of the TDM action(s) on modal choice/travel behavior, by indicating the degree of reduction in vehicular travel. However, it does not indicate the impact on actual traffic conditions in the transportation system.

For this analysis, it is necessary to refer the modified trip tables back to the traditional 4-step planning process for assignment as described under Subarea Application above. Properly configured, an analysis process which links the two models can be worked back and forth to identify the more relevant and effective packages of TDM and other system mitigation measures.

OVERVIEW OF PROGRAM

This section provides an overview of how an analysis is performed with the TDM Model, using a step-by-step walk through the basic procedures. The figure on the next page provides a schematic view of these essential steps.
Managing Our Way Through Congestion

TDM MODEL: SCHEMATIC OF APPLICATION PROCESS

STEP 1:
SUPPLY INPUT DATA
Trip Tables
Survey Data

STEP 2:
CLARIFY DEFINITION OF MARKETS

STEP 3:
MODIFY STARTING CONDITIONS
Transit/Vanpool Use
Alter Trip Tables
Add Development Projects

STEP 4:
SPECIFY TDM PROGRAM

PUBLIC/AREA-WIDE STRATEGIES
PRIVATE/EMPLOYER-BASED STRATEGIES

STEP 5:
SPECIFY REGULATORY REQUIREMENT

STEP 6:
RUN CALCULATION ROUTINE

STEP 7:
TABLE OF PERFORMANCE MEASURES
COLOR GRAPHICS
TRIP TABLES
The program proceeds as follows:

**STEP 1: DATA ENTRY**

The first thing the user must do is enter data into the modal to define the starting conditions. As described in the previous section, these data must be consistent with the particular type of application desired, namely:

- Trip Table data for subarea and regional types of analyses; or
- Survey Data converted to a trip table or an estimate of modal split for employer or individual site analyses.

**STEP 2: DEFINE TRAVEL MARKETS**

Generally, the travel market which is to be the subject of the TDM analysis in the model will be defined directly by the input data entered in Step 1.

In the case of an individual employer/site analysis, the travel market is uniquely defined by the employer/site data on trips and modal split from site surveys.

In the case of subarea or regional applications, however, where the starting conditions are being taken from trip tables, there are frequently times when it is necessary to define the target market as a subset within the starting trip tables. Generally, TDM programs are directed at commuters whose destinations lie in a particular impact area, whereas, commuters to other locations may not be affected by these measures. Hence, if the starting trip tables entered into the model constitute all origins and destinations, it would be necessary to constrain the destinations of interest to a specific set or range. The TDM Model has an option which allows the user to fairly easily define the set of origins and destinations to which the program of TDM strategies will be applied.

When a strategy is tested with the TDM Model, that strategy is applied to all origin-destination pairs that have been specified. If it is desired to look at a special or unique strat-
egy for a particular destination, or origin-destination pair, it is necessary to communicate the appropriate geographic information to the Model. The Model is then capable of providing impact information for individual origin-destination groupings.

**STEP 3: MODIFICATION OF DATA/STARTING CONDITIONS**

The TDM Model gives the user flexibility to relate special conditions that may not be properly reflected in the starting data inputs. These include the following:

**Input Transit or Vanpool Starting Share**

There are occasions where an area has a transit service, but a formal transit trip table has not been developed. Because the TDM Model is a "pivot point" type of procedure, it must have some starting base of transit use (mode split greater than 0 percent) in order to compute the effects of transit-related TDM measures. If the transit modal split is known, the TDM Model will produce a "synthetic" transit trip to reflect this proportion. The same is true for vanpooling use.

**Alter Trip Tables**

If the user knows about specific deficiencies in the base set of trips tables, which would place in doubt the number of person trips or the number of trips by any mode, it is possible to access and adjust any or all elements in the trip tables. This is a convenient way to enter or make specific origin-to-destination changes in transit or vanpool trip levels, for example, where recent study information may update or improve upon the pre-existing table information.

**Add Development Projects**

A common situation that occurs in TDM planning is that new development projects are proposed, such that employment and trip-making in a particular zone or group of zones are changed from base conditions. The program allows the user to specify and estimate the effect of these changes. For the zone(s) in question, the user tells the program directly how many new person trips would be added (or reduced). The
program then converts these new trips into modal elements in the trip tables using proportioning methods.

STEP 4: SPECIFY TDM PROGRAM

The heart of the TDM Evaluation Model is the designation and testing of particular TDM strategies. The Model allows testing of any individual strategy, or as many of the user desires in combination. This is done through entry screens resembling "spreadsheets" which define the strategy, and offer the user blanks in which to enter the particular assumption. "Help" screens are provided for each situation, through which the user can request additional information as to the meaning of the strategy and typical values which may be entered.

Each time the TDM Model is "run," as many as four different trials, constituting unique TDM programs, can be tested under title of a given scenario. Typically, the user will exercise this option to test different levels of one particular strategy while holding all others constant, and view the incremental impact that results in the overall TDM program. Provision is made to write in a descriptive title for the particular run, or scenario, as well as each of the four individual trials. These titles subsequently appear both in the model screens and on printed output.

TDM strategies are separated by the Model into two groups: Public, or Areawide Strategies and Private, or Employer-Based Strategies. Areawide strategies are those which are assumed to be implemented by a local government or transportation agency, such that they become available for all travelers who choose to use them. Employer-based strategies, on the other hand, are actions which are assumed to be implemented by employers, and hence are affected by the type of employer and the degree to which those employers agree to "participate" (in relation to the legal requirement, described below) in the implementation of those strategies.
**Area-wide Strategies**

- Transit Service Improvements
- Transit Fair Subsidies
- HOV Lanes
- Parking Charges and/or Subsidies
- Miscellaneous Taxes or Fees
- Miscellaneous Travel Time
- Penalties/Savings

**Employer-based Strategies**:

- Transit Support Measures
- Carpool Support Measures
- Vanpool Support Measures
- Preferential Parking or other Transit/HOV Time Savings
- Parking Charges and/or Subsidies
- Flexible and Staggered Work Hours
- Compressed Work Weeks
- Telecommuting

The user may test assumptions involving any combination of these strategies. Each test is titled, saved and documented in a manner which facilitates access, review and modifications of sequential tests.

**STEP 5: SPECIFY REGULATORY REQUIREMENT**

The effectiveness of employer based strategies is directly affected by not only the TDM strategy, but the degree of participation of employers in implementing those strategies. Experience shows that under purely voluntary conditions, employer participation occurs at very low levels, i.e., only a small percentage of employers can be expected to participate. Under mandatory conditions, where a law or regulation forces participation, participation rates can be expected to be higher. For this reason, the TDM Model allows the user to test different levels of participation, reflecting environments ranging from voluntary to mandatory, with discretion to test special cases in between. The Model makes it possible to reflect different levels of legal requirement/participation for each individual TDM strategy.

Those users applying the model in the context of an individual employer will probably find this feature less important than area-wide planning situations where aggregate participation is an important factor in assessing the effectiveness of TDM on systemwide travel/traffic conditions. The individual employer can basically ignore this feature and assume full participation.

An important subcomponent of estimating the impact of both employer-based TDM strategies and the employer participation rate is accounting for the composition of the employment base, as cap-
tured in the employment distribution.

Research indicates that the effectiveness of TDM strategies, as well as the tendency of employers to implement those strategies, is linked to the type and size of employer. The model, therefore, attempts to account for this in the linkage of strategy effects to type and size of employer.

Employers are differentiated in the model by three characteristics: size, type and status.

- In terms of size, four categories of employers are represented:
  - Small: 1 to 49 employees
  - Medium: 50 to 99 employees
  - Large: 100 to 499 employees
  - Very Large: 500 or more employees

- In terms of type, employers are categorized as:
  - "Office", which corresponds to white-collar, professional and service type employment (SIC codes of 6000 and up); or
  - "Non-Office", which corresponds to industrial, manufacturing, and wholesale/retail trade activities (SIC codes under 6000).

- In terms of status, employers are categorized as existing or new. Status of employer relates to whether or not they would be affected by a future TDM regulatory requirement. Often, TDM regulations are applied only to employers who enter the impact area after a certain date, particularly as it affects enactment of an ordinance. Employers in residence before the regulation may be exempt, or expected to participate on a move voluntary basis.

A distribution matrix is provided within the model which divides the travel base into 16 cells, corresponding to the above employer type, size and status designations. The default distribution shown is the model is taken from the national census data.
Users of the model at a subarea or regional level are encouraged to supply their own information on the local employment distribution if possible. These data are supplied in Step 1 at the Input Data stage.

For those users who will be applying the model at the level of the individual site/employer, their task is reduced to determining which of these 16 categories best describes their situation, and then setting that cell to 100% in the distribution.

**STEP 6: RUN CALCULATION ROUTINE**

Once the TDM strategy assumptions have been made, the user initiates a calculation routine by pressing a single key [F2]. The user is asked to supply a output report file name for (plus the names of the trip tables, if they are desired), and then the calculation proceeds rapidly. On a 386-level computer with a math co-processor, calculation time for a TDM trial applied to a trip table of about 1,000 origin-destination pairs is about two (2) minutes.

**STEP 7: REVIEW CALCULATION RESULTS**

When the model has completed its calculations, the user may then gain access to the results in three different formats:

- **Tabular Summaries** which indicate the impact of each TDM program trial on baseline modal split, person trips, vehicle trips and VMT. These may be viewed on screen or sent to a printer for hard copy.

- **Color Graphic Displays** that illustrate key results like changes in modal split, trips or VMT across trials or across destination zones. This media is effective for education and consensus building.

- **Trip Tables** in machine-readable form are also produced for transfer back to the 4-step planning model for assignment, and analysis of network traffic impacts.
Transit Service Improvements

MODULE GOALS

- To define the types of transit service improvements that can help alleviate congestion.
- To understand how in-vehicle travel time and out-of-vehicle travel time impact commuter travel decisions.
- To examine the role transit plays as a TDM strategy.

ASSUMPTIONS

- Participants do not intend to run a transit property.
- Participants understand the difference between fixed-guide way vehicles and buses.
- We like transit, transit is our friend.

DESCRIPTION OF STRATEGY

Downtown, the regional urban core, where high trip densities created both the need for commuting alternatives, and the opportunity for transit to move large numbers of people efficiently is no longer the major destination for work trips. Transit systems everywhere are facing the same challenge, how to provide a reasonable quality of service to the less densely-developed areas scattered around the metropolitan area, within increasingly restrictive budgetary limits.

Three types of actions to consider are:
- New Services
- Service Improvements
- Connective Services.

New Services

- Brand new route
- Extension of an existing route.
- Tailored bus service
  -designed to meet the need of a specific population
  -examples include buspools and subscription bus services.
Service Improvements

- Reduce wait time
  - increase service frequency
  - modify routes to reduce headways
  - institute a timed transfer system.

- Reduce riding time
  - run buses in limited-stop or express operation
  - construct freeway or arterial bus lanes
  - implement traffic signal preemption for buses
  - restructure routes to provide more direct service.

- Transit terminals
  - construct or enlarge park-and-ride lots
  - develop transit transfer centers
  - construct bus stops and sidewalks within suburban activity centers.

- User cost
  - implement a fare prepayment plan
  - fare passes
  - coordinate fare policies across service providers
  - subsidize fares

Connective Services

- Shuttle Service-Activity centers are relatively isolated from other economic activities which are considered important by employees. Providing, easy access to retail, restaurants, and other support activities, using short-distance, high-frequency shuttle service can facilitate transit use.

- Peak Period Shuttles to nearby transit stations can link an employment site to an existing route, which may prove particularly beneficial for reverse commuters.

NATURE OF EFFECTIVENESS

Time Savings

Travel time has long been recognized as one of the most important variables affecting travelers' decisions. Commuters prefer travel modes that have the shortest travel time. Thus, transit's success in attracting riders is roughly proportional to its ability to save the commuter some time, compared to alternative modes. Travelers consider not only the time spent on-board the vehicle, but also how far they have to walk (or drive) to reach it at either end of the trip, how long they have to wait, and whether they have to transfer to complete the trip.
Transit service must compare favorably with the private automobile in total door-to-door travel time.

Transit travel time is composed of two elements:
- ride time
- access/wait time.

Travelers view access/wait time as roughly 2.5 times more burdensome than ride time.

Cost Savings

The cost of using transit is perceived in two contexts:
- how the transit fare compares with the cost of driving and parking
- ease of fare payment

### Methods of Payment
Sales by Tender Type for February 1995

- Visa/Mast 19.5%
- Cash 22.5%
- Other 4.2%
- Check 35.7%
- ATM Card 16.6%
- Transit Check 1.4%


Few commuters are aware of the true “hidden” cost to themselves or to society of driving one’s own auto.

Parking cost increases have been shown to be effective in motivating modal shifts to transit. Ease of fare payment is an important characteristic for many market segments that transit agencies could be targeting.

Convenience

Some individuals do not like to drive (particularly during congested hours) because of the stress, or they may prefer to read or sleep during their commute. Others want to save wear and tear on their automobile, or may face inconvenient or scarce parking at the workplace (even though it might be free).
Transit service that offers a choice of three or four departure times during the peak period is certainly more flexible than a pooling arrangement that offers only one departure time. Some commuters, however, consider themselves to be "SOV captive". For these people it is doubtful that improved transit service would ever convince them to switch travel modes.

Transit Dependency

Lower-income workers and those with disabilities may not have a clear choice. Such travelers are considered to be transit captive and are generally limited to jobs that are accessible by transit. This includes people who are choice-captive commuters who allow their primary vehicle to be used by other household members.

WHAT IS EFFECTIVE?

New Services

Some transit services, such as buspools which use over-the-road buses and serve only one workplace, often enjoy a high-quality, exclusive image among commuters. Fare prepayment schemes that are typical of buspools further enhance the attractiveness of such services.

Service Improvements

- **Wait Time**: Timed transfer system can almost eliminate transfer wait time and the uncertainty associated with transferring. Obviously, frequency is important as well.

- **Ride Time**: Some routes do not provide a sufficiently direct path from home to work. Consider restructuring bus routes to provide a shorter path between suburban residential and employment locations. For routes which are already direct, the provision of signal preemption, a separate freeway bus lane, or a toll bypass facility can give buses a time advantage. It is important to provide buses with a total time savings of at least seven minutes compared to driving alone.

- **Transit Terminals**: It is often preferable to concentrate bus service in a corridor so that a park-and-ride served by many buses can minimize overall wait time. "Peripheral" park-and-ride lots are established on the edge of downtown (or other built-up areas). By providing free or low-cost parking and shuttle bus service, such lots are effective in reducing downtown traffic.
User Cost: Fare subsidies encourage transit use by making it more competitive with the private SOV. Fare prepayment programs can greatly simplify what to many commuters seems an unnecessarily complicated transaction.

Is It Worth It?

Cost of providing the service is rarely completely paid by the rider. Numerous studies and service demonstration programs have concluded that this cost is justified only when the benefits are large. Benefits can be realized only when transit is implemented in the right setting, one in which the trip densities are large enough, and the service is competitive enough, to attract sufficient ridership.

APPLICATION SETTING

In the spectrum of TDM actions, transit service is a "high end" strategy which requires a relatively high density of trip ends for it to be successful. The reason why such high volumes are needed to justify transit service is that compared to other TDM measures, transit is a rather expensive strategy.

In short, transit service can be effective and efficient in removing SOV trips from the roadways only where there is enough demand to justify the costs of providing service. Once it is determined that there is sufficient demand to make it feasible to consider transit service, the next issue is whether transit can be competitive enough in a particular setting to attract enough trips to provide a reasonable revenue/cost ratio (or cost per SOV trip removed, or other similar measure). If the setting does not result in transit being competitive, transit may need to be "helped" along by implementation of one or more supporting strategies.

MAKING IMPROVEMENTS WORK IN SPECIFIC SETTINGS

Reverse Commuting

Many public transit systems provide reverse commute service. Reverse commute service can be provided through improvements to existing lines or new services. New reverse commute services can be operated by:

- existing public transit agency
- contracted to a private operator
- organized by the employer (or group of employers) as a buspool or subscription bus service targeted to selected employment and/or residential areas.
Suburban Route Restructuring

When suburban job sites are accessible via transit, making the trip often requires suburban residents to travel into the central city, transfer routes, and use another line to get back out to the suburban work site. It may be necessary to update the route structure to more closely match current suburb-to-suburb travel patterns and minimize the number of transfers.

If restricting routes is not feasible, it may be possible to implement a timed transfer system. The schedules of the various routes are coordinated so that many (or all) of the buses arrive at a central location at the same time, and lay over until all transfers are successfully completed.

Shuttle Connections

Using short (1-5 mile) shuttle routes with small buses to connect isolated office buildings with retail and other services can enable such employees to use transit for their travel to and from work.

In many suburban areas served by rapid commuter rail lines, nearby employment is often located too far from the rail station to access by walking. New routes or restructuring existing ones can link stations with suburban jobs, thus allowing both "inbound" and "outbound" workers to use the rail system for commuting to the suburbs.

Buspools/Express Bus Service

Situations often lend themselves to express bus service or buspool programs because the long travel distance or the need to cross a "choke point," such as a bridge, magnifies the inconvenience associated with driving.

MAKING TRANSIT COMPETITIVE WITH THE SOV

Supporting Strategies

Because the time and cost differences between transit and private automobile are sometimes subtle and often difficult to perceive, transit strongly benefits from a variety of supportive actions that magnify its advantages. The success of any new or improved transit service is often directly related to the quality of these supportive actions.
HOV Facilities: Special lanes or roadways on freeways or arterials, or a transit "mall" in the downtown area that reduces transit vehicle running time.

Parking Pricing: Parking taxes or surcharges are especially effective in creating a cost differential between driving and transit and encouraging a driver to seek alternatives to driving.

Parking Limitations: Zoning or similar restrictions that limit the number of parking spaces have the primary effect of increasing the inconvenience associated with driving (i.e., finding a space or being faced with high parking costs)

Fare Subsidies: Subsidizing transit fares can help get new services established and subsidies can be targeted at certain groups to help overcome an initial reluctance to use transit.

Convenient Payment: Fare passes and other pre-payment methods remove a major inconvenience to using transit, encourage regular ridership, and can be selectively (and discreetly) subsidized.

Information Services: Using transit requires information on routes, schedules, and fares that non-transit users often find difficult to obtain and understand; providing such details conveniently through a workplace kiosk removes yet another impediment to using transit, particularly if the kiosk is staffed with knowledgeable people.

Site Design: Many suburban employment centers have not been designed to accommodate transit vehicles easily, resulting in a long walk and an isolated wait at a bus stop on the main road. Relatively minor changes in site design guidelines can greatly improve the convenience and reduce the time associated with using transit.

Park-and-Ride Lots: These are a way of effectively extending transit's service area by providing a convenient transfer point. Park-and-ride lots allow transit routes to be concentrated, thus offering more frequent service than trying to cover a low-density area with the same number of routes.

Guaranteed Ride Home: For areas with limited hours of service (e.g., buses departing 4-6 pm only), a guarantee of a free or subsidized ride home (usually via taxi) can assure employees who occasionally must work late or who feel they might need to leave during midday (e.g., to attend end to family emergencies) that they will not be stranded at work.
o Mid-day Shuttles: A commonly given reason for not using transit is that a personal vehicle is needed for running errands during the day. Providing a shuttle bus to connect an isolated office park with nearby merchants and services allows employees to use transit to get to work without feeling "stuck" in the middle of the day.

TRAVEL AND TRAFFIC IMPACT POTENTIAL

Changes in Express Bus Service

Each 1 percent increase in express service frequency or route coverage (measured in bus trips or bus miles) has led to a 0.9 percent increase in ridership. When express service is implemented in an area already served by transit, some of the express riders are diverted from existing local routes. The local bus diversion ranged from 10 percent to 71 percent.

On average, a reduction of 0.89 percent in regional work trip VMT was calculated, equivalent to a reduction of 0.31 percent in total regional VMT. The cost per VMT reduced ranged from $0.36 to $0.54 (1991 dollars) and the cost per one-way work trip reduced ranged from $2.15 to $3.24 (1991 dollars).

Express Reverse Commute Service

The vast majority of the users of express reverse commute services come from existing local routes; only about 18 percent were in private vehicles (9 percent drivers, 9 percent passengers). The major benefit of express reverse commute service is in providing enhanced mobility to lower-income workers.

Changes in Local Transit Frequency or Coverage

"Before and after" studies from around the country indicate that the elasticity of bus ridership with respect to frequency (buses per hour) is approximately 0.5. A greater response can be expected in areas having a large number of potential choice riders, where the original frequency is three buses per hour or less. Research in the northeast United States suggests that the frequency elasticity of commuter rail riders is slightly higher: 0.6 to 0.7.

As with express service improvements, some of the riders of improved local service comes from other local routes. A region wide 25 percent decrease in wait time (equivalent to a 33 percent increase in buses per hour) would result in a 0.3 percent to 2.0 percent reduction in regional work trip SOV VMT.
Similar analyses of changes in area-wide transit service coverage indicate that the overall elasticity of ridership with bus miles of service is 0.8. In the large cities a 0.04 percent increase in bus miles resulted in a 0.13 percent reduction in VMT and in the smaller cities a 0.07 percent increase in bus miles resulted in a 0.03 percent reduction in VMT.

IMPLEMENTATION ISSUES

A commonly used guideline in implementing transit service in an environment of uncertain demand (which is usually the case) is to proceed incrementally. Various demonstration projects around the country have shown that services which start and respond quickly to changes in demand are more successful than large-scale start-up efforts.

There are numerous actions which either directly support transit use by helping to provide a time, cost, or convenience advantage, and other actions which indirectly help by removing real or perceived impediments to using transit. It is vital to implement at least some of these strategies along with any new or expanded transit service.

Access/wait time savings can be achieved only by extending the coverage of service to reduce walk times or by reducing the intervals between transit vehicles in order to decrease wait times. Some potentially less expensive ways of achieving access/wait time savings are:

- Restructuring routes to provide more direct origin-to-destination service (eliminates need to transfer and time spent waiting for second vehicle).
- Instituting a timed transfer system (minimizes time spent waiting for the second vehicle, when transferring is unavoidable).
- Extending park-and-ride service (in low density areas, it may be better to have commuters drive to a park-and-ride lot from which buses operate every 10 minutes, rather than provide walk access on a route that operates every 30 minutes).
- Making modest bus route extensions at the workplace end (i.e., move the bus stop closer to the building).
TRANSIT ORIENTED DEVELOPMENTS

MODULE GOALS

1. To introduce transit-friendly land use designs.
2. To understand the relationship between land use and transportation.
3. To provide the knowledge to review site plans for transit, bicycle and pedestrian access.

ASSUMPTIONS

1. Participants have a basic knowledge of planning.
2. A picture is worth a thousand words.
3. Future development must be transit-friendly.

PERCENTAGE OF TRIPS AND TRAVEL DISTANCES

1. To shopping, religious and education 24% 5 miles
2. To services and personal business 15% 7.7 miles
3. To social and recreational 20% 10.7 miles
4. Work and related activities 33% 10.6 miles

WHERE DO DOWNTOWN WORKERS GO DURING LUNCH?

1. 
2. 
3. 
4. 

IMPORTANT RIDESHARE INCENTIVES FOR EMPLOYEES

1. Lunchtime shuttles
2. Employee cafeteria
3. On-site childcare
4. Other on-site services
Managing Our Way Through Congestion

TEN REASONS WHY NEW COMMUNITIES ARE BETTER:

1. Recreational facilities 27%
2. Organization of land uses 25%
3. Attractiveness of community 16%
4. Street design 16%
5. Shopping facilities 15%
6. Open space/lack of crowding 15%
7. Preservation of natural features 14%
8. Schools 12%
9. Social programs 5%
10. Variety of housing types 3%

WHY OUR COMMUNITIES ARE NOT PEDESTRIAN FRIENDLY:

1. A quarter mile walk takes the average person five minutes.
2. Conventional zoning isolates uses and discourages easy flow.
3. Many streets are not designed to accommodate foot traffic.
4. Most blocks are too long, or do not have sidewalks.
5. The average household averages 14 auto trips per day.
6. Residential streets are subjected to higher speed design standards.
   -Broad turning radii
   -Gradual curves
   -Lane widths 12 feet or greater

THE EDICTS OF ANDRES DUANY

PROPOSED TND
YIELD: 1 UNIT/ACRE (GUARANTEED)
DENSIY: 80 HOUSES PER ACRE
INFRASTRUCTURE COST$70M

CURRENT ZONING
YIELD: 1 UNIT/ACRE (NET)
DENSITY: 1 ACRE LOT
INFRASTRUCTURE COST$100M
1. Reduce infrastructure costs through clustering.
2. Preserve natural space.
3. Facilitate pedestrian and recreational activity.
4. Improve connectivity.
5. Provide multiple paths.

Managing Our Way Through Congestion

NEOTRADITIONAL TOWN DESIGN

LINKED VERSUS SINGLE-PURPOSE TRIPS

Comparison of travel speeds and travel times

<table>
<thead>
<tr>
<th>Trip Purpose</th>
<th>Conventional Suburban Design</th>
<th>Neotraditional Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home-Shop</td>
<td>21 mph, 3.1 minutes</td>
<td>13 mph, 2.7 minutes</td>
</tr>
<tr>
<td>Home-Office</td>
<td>23 mph, 4.6 minutes</td>
<td>10 mph, 4.8 minutes</td>
</tr>
<tr>
<td>Home-School</td>
<td>21 mph, 3.7 minutes</td>
<td>13 mph, 2.8 minutes</td>
</tr>
</tbody>
</table>

THE VILLAGE CLUSTER DESIGN FEATURES


1. No street hierarchy.
2. Street corners as commercial enclaves.
3. Linked trips.
1. Transit routes on collectors not arterials.
2. Each neighborhood has variety of housing types.
3. Community centers provide services for all.
4. Pedestrian movement is easiest.
5. Village center has services that require highest volume of people.
CALTHORPE DESIGNS:

1. Everything relies on hierarchy of transit.
2. Communities/neighborhoods served by bus, connected to rail.
3. Bus stops as neighborhood centers.
4. Rail stops as activity centers.
5. Outlying areas served by park and ride at end of busline.
6. Higher densities within quarter mile of stops.
7. Maximum distance to transit stop is one mile.
8. Neighborhood centers have commercial and office on arterial.
9. Transit stops off arterial and integrated with parks.
10. High densities which support transit.
TRANSIT CORRIDOR DISTRICTS

GENERAL LOCATION OF TRANSIT CORRIDOR DISTRICTS

Arterial Street

Transit-Only Sections of Corridor Thru-Way

CONTROL OF THROUGH AUTO TRAFFIC


1. Special travel corridors designed to provide transit time savings.
2. Non-HOV vehicles prohibited from sections of roadway.
3. Arterials remain as is for autos only.
4. Transit stop reoriented to special corridors.
5. Transit way is surrounded by higher density housing.
6. Commercial uses linked to transit stops.
1. Restricted through travel.
2. Pedestrian protection.
3. Parking on-street and behind buildings.
4. Buildings oriented to street.
5. Human scale.
6. Auto as second class citizen.
7. Park and walk v. drive, park, and drive

**TRANSIT DESIGN GUIDELINES**

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Minimum Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>2,400 dwelling units</td>
</tr>
<tr>
<td>Commercial</td>
<td>375,000 square feet</td>
</tr>
<tr>
<td>Office</td>
<td>150,000 square feet</td>
</tr>
<tr>
<td>Industrial</td>
<td>1,400,000 square feet</td>
</tr>
</tbody>
</table>

TRANSIT ACCESS STANDARDS

TURNOUT BAY

THRU STREET

52.5' MIN

30' MIN

200' MINIMUM

35' RADIUS

52.5' RADIUS

NOT TO SCALE

CUL DE SAC

35' ENTRANCE CURVE RADIUS

52.5' RADIUS

30' RADIUS

NOT TO SCALE

THE BELMONT CASE: NEOTRADITIONAL V. LAND USE LAWS

-Managing Our Way Through Congestion

3-10
The neotraditional design
1. Variable paths to choose from.
2. Mixing of uses.
3. Reduced number of higher speed roadways.
4. Provision of many types of uses.

The required design variances:

<table>
<thead>
<tr>
<th>Feature</th>
<th>VDOT Standard</th>
<th>Variance requested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design speed</td>
<td>35-45 mph</td>
<td>20-35 mph</td>
</tr>
<tr>
<td>Landscaping</td>
<td>Not allowed in ROW</td>
<td>Within ROW</td>
</tr>
<tr>
<td>Streets</td>
<td>12 feet</td>
<td>10 feet</td>
</tr>
<tr>
<td>ROW Width</td>
<td>40-90 feet + sidewalks</td>
<td>34-70 incl. sidewalk</td>
</tr>
<tr>
<td>On-street parking</td>
<td>Yes-Removed as Needed</td>
<td>Yes-Permanent</td>
</tr>
</tbody>
</table>

The refined Belmont design
1. Lots of cul-de-sacs
2. Segregation of uses
3. Services only on arterial
4. More high speed streets
5. Cleared right-of-way
6. Loss of character
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SITE PLANNING ALTERNATIVES

1. POOR
   PEDESTRIAN ACCESS THROUGH PARKING LOT IS LENGTHY & UNPROTECTED

2. BETTER
   PEDESTRIAN ACCESS ALONG LANDSCAPED MEDIAN IS LENGTHY BUT PROTECTED

3. BEST
   PEDESTRIAN ACCESS IS SHORT & PROTECTED


FLEXIBLE ZONING ORDINANCES

1. Usually incorporates land use percentages
2. Higher densities
3. Building setback maximums
4. Self-sufficiency
Bicycle and Pedestrian Commuting

Module Goals:

- To understand the benefits of bicycling and walking.
- To learn about the potential of walking and bicycling as alternative modes within a multi-modal transportation system.
- To learn how bicycling and walking can be part of a TDM program.
- To learn strategies for making bicycling and walking more effective in your community.

Assumption:

- Mode choice of travelers may depend more upon the strength of public policy and government support for developing alternative modes than upon climate, geography, income, technology or degree of urbanization.

CURRENT USAGE

- 60% all trips < 5 miles long
  - Walking Trips: 7.2% of Total
  - Bicycling Trips: 0.7% of Total
- U.S. cities committed to bicycle planning
  - % Bicycle Commuters
    - 25.0 Davis, California
    - 10.0 Gainesville, Florida
    - 9.3 Boulder, Colorado
    - 8.0 Eugene, Oregon
- Davis, California bicycle commuter profile
  - Bicycle as Primary Mode
    - Students 53%
    - UC Davis Employees 27%
    - City Employees 6%
    - School District 9%
    - Private Sector Employees 7%
OBSTACLES TO WALKING/BICYCLING

- Inadequate facilities
- Low density, separated land uses
- Site and building design limitations
- Subsidization of auto travel
- Perceptions
- Others

FEDERAL PLANNING REQUIREMENTS

- ISTEA of 1991
  - State bicycle/pedestrian coordinator
  - Both states and MPOs
  - Include pedestrian/bicycle facilities in long range transportation plans and programs
  - Bike/pedestrian facilities as part of intermodal transportation system

STATE LEVEL PLANNING

- State level programs vary in emphasis
- California and New Jersey
  - Bicycle facility integration into highway design, 1970s-'80s
- North Carolina
  - Education, promotion, staff support
- Oregon
  - Dedicated funding
- Florida
  - State highway system requirements [Ch. 335.065(1)(a) F.S.]
  - Local comprehensive planning requirements [Ch. 163.3177(6)(j) F.S.]
  - ELMS amendments
  - Florida bicycle 2000
WHAT ARE THE BENEFITS OF BICYCLING AND WALKING TO:

- Society?
  -
  -
  -
  -

- Employers?
  -
  -
  -
  -

- Individual commuters?
  -
  -
  -
  -

PLANNING STRATEGIES

- Land use configuration
  - Mix
  - Location
  - Density

- Site and building design

- Land use planning tools
  - Zoning
  - Subdivision regulations
  - Site plan review
  - Site design standards

- Land use/transportation planning integration
  - Roadway patterns
  - Internal circulation
  - Access to adjacent land uses
  - Intermodal connectivity

- Transportation planning tools
Managing Our Way Through Congestion

- Comprehensive planning for bicycle and pedestrian modes (the 4 E's)
  - Engineering
  - Education
  - Encouragement
  - Enforcement

Transportation facilities provision and design
- Sidewalks and pedestrian amenities
- Trails/paths
- Bicycle lanes
- Intermodal links and conflicts

Operations and design techniques
- Traffic calming
- Traffic cells

FUNDING OPPORTUNITIES

ISTEA
- Surface transportation program (STP)
- National highway system (NHS)
- Congestion mitigation and air quality (CMAQ)
- Federal land highway
- Others

State and local level
- Set-aside programs
- DOT budget allocations
- Sales tax receipts
- Developer dedications

EDUCATION

Children
- Home-to-school study, University of Florida
- Florida traffic and bicycle safety education program
- Bicycle rodeos

Adults
- Effective cycling
- Public information campaigns
- Driver education and licensing
ENCOURAGEMENT
- Promotional literature
- Events
- Employer-sponsored programs

ENFORCEMENT
- Florida uniform traffic control law (Chapter 316 F.S.)
- 80% education/ 20% enforcement
- Police bicycle patrols

TECHNICAL ASSISTANCE
- State and local bicycle/pedestrian coordinators
- State DOT Public Transit Office
- State DOT regional or district offices
- Transportation Management Organizations (TMOs)
- TDM Clearinghouse, Center for Urban Transportation Research, USF
- Florida Institute for Marketing Alternative Transportation, FSU
- Florida Traffic and Bicycle Safety Education Program, UF
- Others

SOURCES:


CARPOOL/VANPOOL PROGRAMS

Goals

- To describe carpool and vanpool programs and their applications.
- To discuss the nature of effectiveness of carpool and vanpool programs including travel impacts and cost-effectiveness.
- To identify the implementation issues regarding carpool and vanpool programs.

Assumptions

- Participants can identify the advantages and disadvantages associated with carpooling and vanpooling.
- Workshop participants are familiar with current ridematching techniques.

CARPOOL PROGRAM

DESCRIPTION OF STRATEGY

Carpooling is the sharing of rides in a private vehicle among two or more individuals. Carpooling is the most prevalent type of alternative to driving alone. The process of grouping commuters into carpool arrangements, or carpool matching, occurs in one of three ways:

1. __________________________
2. __________________________
3. __________________________
The characteristics of these carpool matching systems can be grouped into three categories.

**Minimum Data To Match**
- home street address or alternate start point (day care, park and ride lot, etc.)
- work street address,
- stops (vanpool rider meeting areas),
- work schedules,
- availability of flexible work hours,
- date of entry/last update
- passenger preferences (smoking, emergency only, etc.),

**To Instill Confidence in the Matchlist to Facilitate Use**
- name of employer
- name of subdivision, apartment complex, or other landmark
- phone number(s)
- nearest intersection
- map showing location of persons on his or her matchlist
- preferred travel routes

**To Improve the Marketing of the Program**
- current mode
- how they heard of the program

**NATURE OF EFFECTIVENESS**

The effectiveness of carpool programs is based on the work-site and the related advantages and disadvantages associated with the location.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
APPLICATION SETTING

Carpooling seems to work best as a TDM strategy under the following conditions:

Travel Markets

The best market for carpooling are commuters traveling to and from work during the peak travel periods. This is true given the fact that the largest pool of potential ridesharers is derived under these conditions.

Who carpoools? The following table was adapted from The Demographics of Carpooling, a paper prepared by Dr. Erik Ferguson based on an analysis of the data obtained from 1990 National Personal Transportation Study.

Before you turn the page, try this short quiz.

<table>
<thead>
<tr>
<th>TRUE or FALSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Females are more likely to carpool.</td>
</tr>
<tr>
<td>2. As MSA population density increases so does percentage of people who carpool.</td>
</tr>
<tr>
<td>3. Participation in carpooling declines with age.</td>
</tr>
<tr>
<td>4. About one-half of carpoolers commute 5 miles or less.</td>
</tr>
<tr>
<td>5. People without kids are more likely to carpool.</td>
</tr>
</tbody>
</table>
How Different Groups Commute to Work

Based on 28,623 person work trips from the 1990 National Personal Transportation Study. Shown is how each group divided its method of commuting and, in parentheses, the percentage of person work trips belonging to each group.

<table>
<thead>
<tr>
<th>Trip Purpose</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home-based Work (23%)</td>
<td>79%</td>
<td>16%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Home-based Shopping (12%)</td>
<td>46%</td>
<td>52%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Home-based Social/Recreation (17%)</td>
<td>30%</td>
<td>64%</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td>Home-based Other (26%)</td>
<td>38%</td>
<td>57%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Not Home-based (21%)</td>
<td>39%</td>
<td>59%</td>
<td>1%</td>
<td>2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trip Distance</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 miles (43%)</td>
<td>76%</td>
<td>18%</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>6 to 10 miles (23%)</td>
<td>82%</td>
<td>14%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>11 to 15 miles (13%)</td>
<td>83%</td>
<td>14%</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td>16 to 20 miles (8%)</td>
<td>81%</td>
<td>14%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>21 to 30 miles (7%)</td>
<td>79%</td>
<td>16%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>31 and over miles (6%)</td>
<td>72%</td>
<td>21%</td>
<td>8%</td>
<td>0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geographic Location</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban—Inside Central City (35%)</td>
<td>74%</td>
<td>17%</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>Urban—Outside Central City (30%)</td>
<td>82%</td>
<td>14%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Not Urban (35%)</td>
<td>81%</td>
<td>18%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Urban Area Size</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000 to 199,999 (14%)</td>
<td>83%</td>
<td>14%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>200,000 to 499,999 (9%)</td>
<td>82%</td>
<td>16%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>500,000 to 999,999 (18%)</td>
<td>81%</td>
<td>16%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>1,000,000+ Without Rail (25%)</td>
<td>80%</td>
<td>16%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>1,000,000+ With Rail (34%)</td>
<td>70%</td>
<td>15%</td>
<td>12%</td>
<td>2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MSA Population Density</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 to 2,000 persons/sq mi (26%)</td>
<td>82%</td>
<td>14%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>2,000 to 3,000 persons/sq mi (19%)</td>
<td>81%</td>
<td>16%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>3,000 to 4,000 persons/sq mi (15%)</td>
<td>80%</td>
<td>16%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>4,000 to 5,000 persons/sq mi (11%)</td>
<td>79%</td>
<td>17%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>5,000 to 7,500 persons/sq mi (13%)</td>
<td>75%</td>
<td>18%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>7,500 to 10,000 persons/sq mi (6%)</td>
<td>73%</td>
<td>17%</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td>10,000 to 50,000 persons/sq mi (9%)</td>
<td>51%</td>
<td>14%</td>
<td>29%</td>
<td>5%</td>
</tr>
<tr>
<td>Over 50,000 persons/sq mi (1%)</td>
<td>22%</td>
<td>10%</td>
<td>54%</td>
<td>13%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-MSA Population Density (Persons/Square Mile)</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 to 0.10 persons/sq mi (28%)</td>
<td>79%</td>
<td>20%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>0.10 to 0.25 persons/ sq mi (25%)</td>
<td>81%</td>
<td>18%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>0.25 to 0.50 persons/sq mi (22%)</td>
<td>83%</td>
<td>16%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>0.50 to 0.75 persons/ sq mi (13%)</td>
<td>85%</td>
<td>14%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>0.75 to 1.00 persons/sq mi (9%)</td>
<td>83%</td>
<td>14%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>1+ persons per square mile (2%)</td>
<td>76%</td>
<td>16%</td>
<td>5%</td>
<td>2%</td>
</tr>
</tbody>
</table>
## Managing Our Way Through Congestion

### Age of Person

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 to 25</td>
<td>74%</td>
<td>19%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>26 to 35</td>
<td>78%</td>
<td>17%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>36 to 45</td>
<td>81%</td>
<td>15%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>46 to 55</td>
<td>83%</td>
<td>14%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>56 to 65</td>
<td>81%</td>
<td>15%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Over 65</td>
<td>76%</td>
<td>18%</td>
<td>5%</td>
<td>1%</td>
</tr>
</tbody>
</table>

### Gender

<table>
<thead>
<tr>
<th>Sex</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>81%</td>
<td>14%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Female</td>
<td>76%</td>
<td>19%</td>
<td>4%</td>
<td>1%</td>
</tr>
</tbody>
</table>

### Level of Education

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some high school</td>
<td>64%</td>
<td>29%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>High school graduate</td>
<td>80%</td>
<td>17%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Some college</td>
<td>81%</td>
<td>14%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Some graduate school</td>
<td>82%</td>
<td>11%</td>
<td>5%</td>
<td>2%</td>
</tr>
</tbody>
</table>

### Age of Youngest Child in Household and Sex

#### Male

<table>
<thead>
<tr>
<th>Age of Youngest Child</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Kids 43%</td>
<td>82%</td>
<td>12%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Youngest &lt;6 22%</td>
<td>79%</td>
<td>17%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Youngest 6 to 15 22%</td>
<td>81%</td>
<td>15%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Youngest 16 to 21 10%</td>
<td>82%</td>
<td>15%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>No Kids, Retired 3%</td>
<td>78%</td>
<td>16%</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>

#### Female

<table>
<thead>
<tr>
<th>Age of Youngest Child</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Kids 43%</td>
<td>81%</td>
<td>13%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>Youngest &lt;6 17%</td>
<td>66%</td>
<td>30%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Youngest 6 to 15 24%</td>
<td>75%</td>
<td>21%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Youngest 16 to 21 11%</td>
<td>77%</td>
<td>20%</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td>No Kids, Retired 4%</td>
<td>74%</td>
<td>20%</td>
<td>4%</td>
<td>1%</td>
</tr>
</tbody>
</table>

### Number of Adults in Household and Sex

<table>
<thead>
<tr>
<th>Number of Adults</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male - 1 Adult 9%</td>
<td>82%</td>
<td>9%</td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>Male - 2+ Adults 91%</td>
<td>81%</td>
<td>15%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Female - 1 Adult 16%</td>
<td>78%</td>
<td>15%</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td>Female - 2+ Adults 84%</td>
<td>76%</td>
<td>20%</td>
<td>3%</td>
<td>1%</td>
</tr>
</tbody>
</table>

### Number of Persons in Household

<table>
<thead>
<tr>
<th>Number of Persons</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 person 8%</td>
<td>83%</td>
<td>8%</td>
<td>6%</td>
<td>2%</td>
</tr>
<tr>
<td>2 persons 29%</td>
<td>81%</td>
<td>14%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>3 persons 24%</td>
<td>78%</td>
<td>17%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>4 persons 23%</td>
<td>79%</td>
<td>17%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>5+ persons 16%</td>
<td>73%</td>
<td>21%</td>
<td>5%</td>
<td>1%</td>
</tr>
</tbody>
</table>

### Number of Vehicles in Household

<table>
<thead>
<tr>
<th>Number of Vehicles</th>
<th>Drive Alone</th>
<th>Car-Pool</th>
<th>Transit</th>
<th>Non-motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 vehicles 2%</td>
<td>11%</td>
<td>26%</td>
<td>49%</td>
<td>13%</td>
</tr>
<tr>
<td>1 vehicle 18%</td>
<td>67%</td>
<td>23%</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>2 vehicles 47%</td>
<td>82%</td>
<td>15%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>3 vehicles 22%</td>
<td>84%</td>
<td>14%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>4+ vehicles 11%</td>
<td>85%</td>
<td>13%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>
Traffic Conditions

Carpooling may be promoted most aggressively by areawide agencies and employers in areas with the most severe traffic congestion and air quality problems. The existence of congestion, however, is not a perceived inducement to carpooling among commuters.

Carpools do not inherently provide an advantage over driving alone in congested areas. Quite the contrary, when carpooling involves added travel time to pick-up riders, the carpool is placed at a distinct disadvantage to driving alone.

Supporting strategies to give a time advantage back to carpools or provide incentives to carpooling can offset the disadvantages of carpooling in congested areas. Carpool programs are most effective when supported with strategies that "equalize" the commuting equation to make carpooling more attractive and/or driving alone less so.
**SUPPORTING STRATEGY**

| High Occupancy Vehicle (HOV) Facilities | Travel time savings |
| Preferential Parking | Walking time savings |
| Affording the carpooler with a "perk" or Making parking available for carpoolers while unavailable to solo drivers. |
| Employee Transportation Coordinator | On-site personalized service |
| Guaranteed Ride Home | Back-up ride to carpoolers who either miss their ride or need to attend to a mid-day emergency. |
| Parking cost savings realized by carpoolers (e.g., lower parking rate based on number of persons in the car). |
| Transportation Allowance | Monthly stipend for commuting that can be used to purchase a parking place, a transit pass, or share in a parking space with another employee. |

**TRAVEL AND TRAFFIC IMPACT POTENTIAL**

**Area Wide Programs**

Most comparative studies of the impacts of areawide carpool programs report findings in terms of vehicle miles of travel (VMT) reduced. This is a more precise indicator than the absolute number of trips reduced and clearly better than simply reporting the number of match lists produced by registering commuters in the matching system.

*Area-wide rideshare matching and promotion programs reduce work trip VMT by 0 percent to 3 percent.*

**Employer Programs**

Employer-based rideshare matching and promotion is probably
more effective than areawide efforts alone. Employer programs have been documented with reducing trips to percent over prevailing conditions, but these results are largely due to the financial incentives and parking management strategies observed as part of the most effective employer program. When evaluated alone, carpool promotion might only be expected to reduce trips a few percentage points.

COST EFFECTIVENESS

Area Wide Programs

The measures of cost effectiveness are most often stated as cost per carpooler placed or cost per VMT reduced. The cost per person placed into a carpool averaged $47 in the mid-1970's as compared to $144 among Virginia programs in 1985 and $123 per person placed by CTS in 1990. The average cost per carpool person trip was $0.10 in mid-1970's and the cost per VMT reduced was $0.024, comparable to the Virginia state-wide statistics in 1985 ($0.02).

The process of evaluating the cost-effectiveness of area-wide programs requires the collection of the following data.

Number of customers: Number of different commuters who have used the services over the reporting period. Usually, this is not the same as the total number of customers in the database as some of them may have been registered with the commuter assistance program (CAP) for longer than the reporting period. A standard definition (e.g., each individual who requested CAP assistance over the 12 month reporting period) has been agreed upon by the CAP and funding agency. It will be the key variable for monitoring effectiveness once the following rates are established.

Placement Rate: Percentage of customers who form a pool or ride transit as a direct or indirect result of the CAP's efforts. The placement rate is determined from a survey of the CAP's commuter customers. There are three types of placement rates to be identified:

- customer direct placement rate;
- customer indirect placement rate; and,
The general public indirect placement rate.
The direct placement rate focuses on those customers who change their travel behavior as a direct result of a CAP program or service. The customer indirect placement rate refers to those who change travel behavior but do not attribute the change to a specific service. The remaining group, the general public indirect placement rate, refers to those who are affected by marketing of the program or take advantage of a service (e.g., use a new bikepath) that never make direct contact with the CAP.

**Frequency:** Average number of days per week a person placed into a pool or bus actually uses this mode to commute. CAP services also should strive to increase the frequency of use of these options.

**Duration:** The average life of the carpool, for example, may be shorter or longer than the funding period. Some studies report a carpool duration average of two years. Including pool duration as an important variable in the effectiveness equation also recognizes the need and funding required for maintaining existing pools and bus ridership.

**Alternative Cost Effectiveness Measure: Cost Per Passenger Trip**

While the cost per trip reduced and other efficiency factors are useful for comparing progress from one year to the next or measuring against other TDM programs, another true test is its cost effective relative to other alternatives such as the cost to add highway capacity or providing other forms of transit service.

The operating expense per unlinked passenger trip is one performance measure used by the transit industry to measure cost effectiveness. A comparable measure can be estimated for TDM programs to provide a low cost basis for planners and funders to quickly evaluate the cost effectiveness of TDM programs.

By converting the TDM program results of placing people into non-single occupant vehicle modes to "passenger trips" and allocating the costs of the programs to those units, these parties will have a basis of comparison of TDM programs to other transit alternatives. However, a cautionary note is required.

Clearly, there are significant market differences between transit
and TDM programs and this sketch planning tool should not be the sole basis used for allocating funds.
Furthermore, there are several issues to be resolved; some of the issues reduce or increase the comparable transit cost.

Unlike TDM programs, transit agencies offset some of their costs through the collection of revenue. Comparing the operating costs would clearly give the misleading impression that the bus average cost per trip of $1.82 is significantly less cost effective than TDM programs. The exclusion of some forms of revenue (e.g., passenger fares) for transit appears to provide a reasonable basis for comparison. As an alternative, planners or funding agencies might treat only the State and Federal grant shares for transit as a comparative standard.

Other issues include the exclusion of capital cost depreciation for transit, and the fact that unlinked passenger trips overstate the number of person trips from origin to ultimate destination by including transfers. Accounting for these issues would increase the cost basis for transit.

Another issue is the duration rate for pool formation. CUTR recommends that the “investment” in the people placed into a pool or bus be allocated over the life of that pool, regardless of the reporting period.

EXAMPLE: TDM, Inc., a non-profit transportation management organization served 2,500 commuters in 1994. Research found that 15 percent of these commuters were placed into a non-SOV mode. These commuters used these options an average of 3 times per week. Additional research found that commuters only remained in this arrangement for 6 months. Based on this information, TDM, Inc. cost per passenger trip is $1.71.

### Operating Expense Per Unlinked Passenger Trip by Mode 1988-1992

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>$1.43</td>
<td>1.47</td>
<td>1.56</td>
<td>1.65</td>
<td>1.82</td>
</tr>
<tr>
<td>Heavy Rail</td>
<td>1.53</td>
<td>1.46</td>
<td>1.63</td>
<td>1.77</td>
<td>1.61</td>
</tr>
<tr>
<td>Commuter Rail</td>
<td>5.17</td>
<td>5.54</td>
<td>5.87</td>
<td>6.01</td>
<td>6.92</td>
</tr>
<tr>
<td>Light Rail</td>
<td>1.29</td>
<td>1.30</td>
<td>1.36</td>
<td>1.58</td>
<td>1.64</td>
</tr>
<tr>
<td>Demand Response</td>
<td>7.03</td>
<td>7.53</td>
<td>8.53</td>
<td>9.47</td>
<td>11.03</td>
</tr>
</tbody>
</table>

Source: National Transit Summaries and Trends: From the 1992 National Transit Database
HOW TO ESTIMATE COST PER PASSENGER TRIP

1. Enter No. of commuters served: ___ commutiners
2. Enter Pct. commuters placed: ___ %
3. Multiple #1 by #2 ___ No. placed
4. Enter Non-SOV frequency ___ days/week in
   non-SOV mode
5. Enter Avg. Duration (Non-SOV) ___ weeks
6. Multiply #4 by #5 ___ days in non-SOV
   mode
7. Multiply #3 by #6 by 2 trips/day ___ pass. trips in
   non-SOV mode
8. Enter costs for given period $ ___
9. Divide #8 by #7 ___ cost/pass. trip

Employer Programs

Cost effectiveness is measured as the cost to employers per trip reduced and the average cost per daily vehicle trips reduced. Among the 12 employer programs examined as part of the 1990 FHWA study the cost per daily trip reduced was $1.31.

Empirical evidence suggests the following costs associated with various measures of carpool program effectiveness have been documented:

Cost per Person Placed by Area-wide Program = $120-140
Cost per VMT Reduced by Area-wide Program = $0.02
Cost per Trip Reduced by Employer Program = $1.10
IMPLEMENTATION ISSUES

Carrying out carpool programs requires different strategies and tactics for the commuters on the Commuter Continuum.

For the customer who ...
then the role of the TDM program is to ...

Knocks little or nothing about the TDM program or its services
Increase awareness, establish credibility and offer understanding.

Inquires about the TDM program's services
Be prepared by identifying the features of the products and services and translating them into benefits for the customer.

Raises objections
Anticipate objections and build value by addressing what it means to them.

Is ready to make a decision about their commute habits.
Make it easy to make the decision to use a non-SOV mode (e.g., promote trial use of mode. Provide transit passes on site.) and ask them to make that decision.

Refuses to buy at this time.
Politely express appreciation for consideration and offer to help in future if need arises. Keep in touch.

Makes the decision to use a non-SOV mode.
Reinforce the buying decision immediately (e.g., talk about the money and wear and tear to be saved. Remind them about the features of the guaranteed ride home program).

Is a satisfied customer.
Turn customers into goodwill ambassadors.

Generally, carpool programs, no matter how implemented (employer, developer, rideshare agency), require several key elements for success:

1. a well-maintained pool of prospective commuters who might
Share rides;

2. Sound market research information on types of employees to target for rideshare matching and promotion;

3. Good, up-to-date information on commute options and potential matches made available to interested employees in a timely manner;

4. Consistent follow-up: a "personalized" approach to persuade employees to try carpooling and contact a fellow worker or even a stranger;

5. High-level corporate support by employers so that carpooling becomes part of the "corporate culture";

6. Financial support to assure a sound, lasting program;

7. Supporting programs which staff the carpool program, distribute marking materials, promote specific incentives and generally promote the carpool program and other commute alternatives; and,

8. Customer feedback system (e.g., comment cards) to monitor and improve customer satisfaction.

Carpool matching systems and support should have the following characteristics to be optimally successful in inducing commuters to use alternatives:

Accurate

Comprehensive

Timely

Personalized

Persistent

User-Friendly

Secure

Flexible
VANPOOL PROGRAMS

Vanpools represent an important alternative to driving alone, falling midway between transit and carpools in terms of carrying capacity and flexibility, economics and convenience to the user. Vanpools usually involve groups of 7 to 15 people -- mainly commuters -- traveling together in a passenger van on a routine basis. Normally, one member of the group serves as the driver, and also assumes the responsibility for the organizational and maintenance details of the operation. Riders typically pay a weekly or monthly fee to cover expenses to the driver, who frequently rides free and may have off-hours use of the vehicle.

To form a vanpool, it is necessary to:

- Identify a group of at least seven travelers whose trip patterns, time schedules, and personal characteristics are sufficiently compatible to form a stable, ride-sharing unit.
- Support the cost of acquiring, fueling and maintaining a vehicle.
- Find an acceptable arrangement for sharing responsibility in terms of driving, organization/scheduling, and vehicle maintenance.
- Assume the risk and expense of insuring the vehicle.

For simplicity, the three fundamental methods of vanpool organization are described below:

1. Owner-Operated Vans:

2. Employer-Sponsored Vanpools:

3. Third-Party Vanpools:
NATURE OF EFFECTIVENESS

Society:

Vanpooling offers relief as a vehicle trip reduction measure. Because vanpools carry between 7 and 15 passengers per vehicle trip, each vanpool potentially removes a similar number of single-occupant vehicle trips from congested highways. Moreover, because vanpools normally serve longer trips, they can have an even greater impact on reducing vehicle miles of travel (VMT), which is a primary determining factor in highway capacity needs and vehicular emissions.

The number of passengers carried by a vanpool allows it to serve an important niche in the transportation market. A van:

- 

- 

Concerns about vanpooling center on the is of vanpool competition with transit service, and hence possibly reducing transit’s cost-recovery potential in certain markets.

Employers:

For employers under requirements to reduce trips in conjunctions with trip reduction, growth management or air quality initiatives, vanpooling is a potentially effective option for meeting these requirements. Vanpools also represent a potentially cost-effective way for employers to gain access to labor pools which are either mobility or economically restricted. Some employers have claimed that vanpooling has indirectly helped their business by raising employee morale and reducing absenteeism and tardiness.

Employers objections to vanpools, concern:

- the cost and administrative burden of setting up and operating a formal vanpool program;
Managing Our Way
Through Congestion

The retention rate for vanpools is high, with over 90 percent of person starting in a vanpool staying with it.

- adherence to a vanpool travel schedule compromising professional staff commitments and performance; and
- employees or proprietary information being lost to other firms if a pool mixes employees from different employers.

**Individual Traveler:**

Having a viable vanpool alternative offers the benefits of possibly reduced cost, convenience, more effective use of travel time, and freedom from driving and the use and wear on one's own vehicle. Many vanpoolers like social aspects of vanpooling, with the pool groups developing tight, long-term social bonds.

Vanpools must be perceived as offering tangible benefits. The following considerations are important when evaluating the option of riding in a vanpool:

**Increased Travel Time:** To vanpool, the traveler often experiences longer travel times. This results from either having to travel to a pick up location, or traveling on a circuitous route to pickup or drop off other riders. What this generally means is that vanpools, to be perceived as being advantageous to the individual traveler, serve longer trip lengths where these additional time penalties become a smaller portion of the overall trip.

**Schedule Constraints:** A vanpool imposes schedule rigidity. Professionals who frequently find it necessary to work late or have unpredictable hours may find the rigid schedule of a vanpool too confining or unrealistic.

**Cost Factors:** Sharing costs in a multi-passenger, shared-ride arrangement would presumably result in attractive costs to the vanpool traveler in compared to driving alone. However, SOV travelers frequently fail to perceive a compelling cost advantage, for two primary reasons:

1. SOV users often do not regard the full costs of operation when making their travel decisions.
2. Parking at employment sites is frequently free or heavily subsidized.
In light of these factors, and based on the principle that a vanpool is financially self-sustaining, travelers *might not* in many cases conclude that the shared cost of a vanpool is sufficiently less to make it more attractive than driving alone, particularly for shorter trips.

**APPLICATION SETTING**

**Travel Markets:**

The market for vanpooling has been limited primarily to long-distance commuters. The reasons for this lie in the minimum travel distance/time necessary to make the cost per mile and total trip time after group assembly attractive relative to alternatives. It is generally thought that a one-way trip length of at least 20 miles is the minimum necessary to support a vanpool. Because only about 9 percent of U.S. workers have trips that exceed 20 miles, this prequalification would appear to place a sharp upper limit on the initial market potential for vanpooling.

The market for vanpooling has also been associated with large employers, i.e., those employing 500 or more workers at a single site. Nationally, employers of this size account for only about 25 percent of all employment situations. The implied upper limit for vanpooling would be 9 percent x 25 percent, or 2.2 percent of all trips.

<table>
<thead>
<tr>
<th>Trip Distance (in miles)</th>
<th>0 - 5</th>
<th>6 - 10</th>
<th>11 - 15</th>
<th>16 - 20</th>
<th>21 - 29</th>
<th>30+</th>
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<tr>
<td>Employer Size</td>
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<tr>
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<td>0.4%</td>
<td>11.6%</td>
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<tr>
<td>100 - 499</td>
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<td>5.4%</td>
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<td>0.9%</td>
<td>25.0%</td>
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<tr>
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<td>2.6%</td>
<td>1.6%</td>
<td>1.3%</td>
<td>0.8%</td>
<td>25.0%</td>
</tr>
<tr>
<td>All</td>
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<td>21.3%</td>
<td>10.1%</td>
<td>6.5%</td>
<td>5.0%</td>
<td>3.4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Traffic Conditions:**

While congestion makes driving alone less attractive, it doesn't make riding in a vanpool any shorter, since in most cases the vanpool must drive on the same crowded roads as single occupant vehicles.
Setting:

Vanpools can function viably in most any setting. Interestingly, they may be at their greatest advantage in some of the settings traditionally served by transit, specifically from suburbs into congested Central Business Districts. Where vanpools have an advantage over transit is that they can reach into the farther, lower-density suburbs (or "exurbs"), because they require fewer passengers to be viable, and those passengers find the most efficient way to assemble and meet with the service.

Type of Traveler:

Studies also suggest that vanpoolers tend to be drawn from certain socio-economic groups. Data indicate that a high percentage of existing vanpoolers hold white-collar jobs and earn above-average incomes.

Data indicate that:

Vanpool riders had jobs in ________________, are primarily ___ , with an average age of _____.

Supporting Strategies:

Travel Time
Travel time penalties incurred in picking up or dropping off passengers can be made up through priority measures that give time savings back to vanpoolers. The most common of these are:

- **Priority HOV Facilities:** Making available special lanes for vanpools that allow them to bypass congestion and travel at a higher rate of speed.

- **Preferential HOV Parking:** By providing close-in parking for vanpools (and other HOVs) at worksites, and forcing SOVs to park further away, walk time savings are afforded to vanpoolers.

Scheduling

In order to use a vanpool, one must either be able to adapt his/her schedule to the pool, or find alternative means to travel on those
occasions where he/she cannot connect because of a conflict. These concerns are handled in two major ways:

- **Flexible/Variable Work Hours**: Vanpoolers may be more inclined to use a vanpool if the employer permits some flexibility in the setting of hours to be compatible with the needs of the pool.

- **Guaranteed Ride Home**: Studies have shown that an important reason for driving a car to work is a perceived need to have a car available in case of a family emergency, or for working late. Offer an alternative method of travel, in case of such situations occurring, ranging from a free or discounted taxi ride to use of a company fleet vehicle.

**Travel Cost**

Vanpools are generally expected to be financially self-supporting, meaning that all costs related to the ownership and operation of the vehicle must be covered by the riders. Under current law, employers are permitted to subsidize both transit and vanpool use up to $...... per month without tax liability accruing to the employer.

These restrictions notwithstanding, there are important ways in which employers can reduce the cost and financial risk of vanpooling to employees:

- **Lifecycle Capital Depreciation**:

- **Parking Charges/Subsidies**:

- **Insurance**:

- **Startup Cost and Risk Minimization**:
TRAVEL AND TRAFFIC IMPACT POTENTIAL

Vanpooling’s transportation impact can be shown as follows:

### Commute Vehicle Trip Reduction

<table>
<thead>
<tr>
<th>AVO</th>
<th>Vanpool Market Share of Commuter Trips</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>0.3%</td>
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<tr>
<td>1.05</td>
<td>0.3%</td>
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<td>1.10</td>
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<th>Vanpool Market Share of Commuter Trips</th>
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<tr>
<th>AVO</th>
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<td>0.3%</td>
<td>0.9%</td>
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### Commute VMT Reduction

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<table>
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<tr>
<th>Vanpool Market Share of Commuter Trips</th>
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<thead>
<tr>
<th>AVO</th>
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<td>1.30</td>
<td>1.6%</td>
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### COST EFFECTIVENESS

The effectiveness of vanpooling as a travel option in cost terms relative to other courses of action is again best described in terms of its impact on three groups: society at large, employers, and the individual traveler.

#### Cost to Society

In an analysis using extensive highway construction and maintenance data from its 1990 Maryland State Commuter Assistance Study, COMSIS Corporation estimated the cost to society to supply the necessary incremental highway capacity to support an additional SOV trip demand at $6.75 per one-way trip. This assumes a work trip of 10.5 miles in length, and incorporates both capital and O&M costs.

If the traveler made the same 10.5-mile work trip in a 12-passenger vanpool, assuming the vehicle itself did not require any additional...
highway space due to its size than a standard automobile, the cost to society per person transported would be reduced to $6.75/12 or $0.56, representing a savings per one-way trip of $6.19. This level of savings total $12.38 per day and $3,220 per year for every person trip that would be made in a vanpool rather than in a SOV. The cost savings through vanpooling increases with the length of the trip.

Cost to the Employer

The major cost typically borne by employers to support employee travel is in the provision or subsidization of parking.

For 72 firms who were able to report data on their costs to provide parking, the average total financial commitment came to $64 per space and $73.50 per employee per year.

For the 38 firms who estimated the cost to provide expanded parking, the cost averaged $3,930 per space, suggesting a very high penalty cost to providing overflow parking.

When administrative costs were not considered, the average subsidy per van paid by the sample of employers was $1,283 per year per van. If administrative costs are considered, they add $70/year per van. Significantly, even with administrative charges, 60 percent of the firms paid $0 to $10,000 per year to support their vanpooling program. Assuming 12 passengers per van, this subsidy works out to $12.35/year per employee, compared to $73.50 per year per employee to provide parking. Consideration of less tangible benefits further enhances the attractiveness of this option.

Cost to the Individual

To the individual traveler, choice of a particular travel mode confers the following primary benefits:

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Travelers themselves tend to consider only the short-run marginal costs associated with using private vehicles; in other words, they consider only the fuel costs and whatever obvious out-of-pocket costs they experience on a daily basis (tolls, parking fees), and ignore the much larger costs of vehicle ownership, including capital cost, maintenance and insurance.

The average cost per mile to operate an automobile assuming an annual utilization of 10,000 miles is $0.458, of which only 9.1 cents are operating costs (fuel, oil), while 36.7 cents account for the fixed costs of depreciation, maintenance and insurance. The average commuter considers only the marginal costs of fuel and oil to represent the cost of using an automobile for the work trip, the cost per mile will be a straight 9.1 cents per mile for any trip length.

If only short-run SOV variable costs are considered, riding in a vanpool will only begin to show cost savings at significant trip distances, typically 20 miles or more.

IMPLEMENTATION ISSUES

Despite the significant appeal of vanpooling as a medium-density modal option with high traffic-impact potential and traditional economic self-sufficiency, efforts to boost use of the mode will meet with numerous barriers. At a minimum these include the following:

- Public transit operators are likely to fear competition from vanpooling in certain markets.
- Some public transit operators will actually see cost and other advantages to higher levels of vanpool service in their service areas, but may be constrained by political, institutional and funding issues in seeking to make greater use of vanpool options.
- While some employers view vanpools as an important employee benefit and management strategy, many employers are resistant to vanpooling for such reasons as:
  - Loss of flexibility
  - Added administrative bother and expense
  - Security and confidentiality

Many transportation planners, employers and individual travelers perceive vanpools as being limited to only special situation, namely long commute trips and large employers. Many of these barriers
can be mitigated and the utilization of vanpools greatly increased:

- Cost effective alternative to serve various transit markets that are not easily served by transit.
- Vanpool market penetration need not be limited to trips of 20 miles or more if favorable economics and commensurate time savings are made available. This can be achieved through:
EMPLOYER SUPPORT MEASURES

Module Goals:

o Discusses how the effectiveness of TDM strategies can be enhanced by providing complementary programs and services.

Assumptions:

o Complementary programs do little to change the relative attractiveness of different commute modes.

o The function of complementary programs is to support and encourage use of TDM strategies that can make commute alternatives enticing.

DESCRIPTION OF STRATEGY

Complementary programs and services increase commuters' awareness of their alternatives, enhance the convenience of using an alternative, or reduce the need for a personal automobile during the work day. These programs and services fall into three categories:

o TDM program marketing

o Site amenities and design

o Supporting activities

TDM MARKETING BY EMPLOYERS

Marketing of TDM can be directed to commuters at several geographic levels: regional, local area or activity center, and individual employment sites. Employer marketing efforts do sometimes include general promotion of TDM, but most often market the specific TDM services and incentives provided by the employer or options available only to travelers at that site.

There are three components of TDM marketing by employers that warrant attention:
1. **Information Dissemination** - Typically relies on posters, bulletin boards, flyers distributed desk-to-desk, in-house newsletters, new employee orientation, and periodic promotional events such as rideshare fairs.

2. **Employee Transportation Coordinators (ETC)** - Offer individual trip planning assistance at employment sites.

3. **Special Promotions** - Includes periodic prize drawings, contests, awards for ridesharing, commuter or bicycle clubs and other activities to attract the attention of commuters, generate excitement about the use of commute alternatives, and reward ridesharers.

The key to the success of the TDM marketing effort at employers is the ETC. The purpose of an ETC and how the function and responsibilities fit into the overall transportation scheme will vary, depending on who is asked. The answers reveal much about the immense value of their contribution toward shaping our transportation future. Generally, the ETC is the individual responsible for promoting TDM by providing personalized trip planning assistance to employees at the employment site.

The ETC's specific responsibilities are defined by the needs of the community, employer, and employee. The needs of the community and employer require changing commuter behavior. These needs can not be effectively met until the ETC first succeeds in satisfying the needs of the individual employee.

The role of an Employee Transportation Coordinator is multi-faceted. The ETC must be one part insightful planner, one part effective communicator, one part consummate customer service representative, and another part proficient transportation analyst. The ETC will find that many of these skills will be called upon as the organization proceeds with the development and implementation of the TDM plan.

The duties of a typical ETC could include:

- Investigate the existing transportation situation, develop a data base, and determine the potential for change.

- Select goals and objectives, plan appropriate strategies and the tasks for carrying them out, develop a timetable and
establish a budget.

- Actively solicit support from management, other departments and key individuals within the organization.

- Advertise and market the program to employees in order to create awareness and interest in participating in alternate commute modes.

- Create conditions and incentives which will encourage employees to change their commuting patterns.

- Personally facilitate the formation and utilization of commute options.

- Track and report changes in commuting patterns.

Other highly desirable qualities sought in ETCs include the desire for variety in their work and capable to adapt quickly to change. In developing a TDM plan or expanding an existing one, the roles the ETC plays will change with each stage of its development. As the program matures, however, it isn’t unusual for the ETC to assume many of these roles within the same day. It isn’t enough to perform one function well; the ETC must excel in many aspects of the job. Fortunately, the employer and the ETC have other sources of outside help including local transit and ridesharing agencies and consultants.

SITE AMENITIES AND DESIGN

In addition to the above marketing efforts, employers can support various TDM strategies in the design of the worksite and surrounding areas.

"Rideshare Friendly" Work Site Design - Accommodate the space and maneuvering needs of transit and vanpool vehicles; provide safe, attractive rideshare loading areas; and minimize the walking distance for carpoolers, vanpoolers, and transit riders. Some sites also target the special needs of bicycle and pedestrian commuters. They include bicycle parking protected from theft and from the weather, showers and personal storage lockers, and bicycle maintenance facilities. For pedestrians, the provision of sidewalks and markings can make it easier for those who live nearby to walk to and from work.
GUARANTEED RIDE HOME (GRH) PROGRAMS

TAMPA BAY AREA GRH (TAMPA, FL)

Employees who participate in ridesharing, riding the bus, etc., at least two days per week are eligible for GRH. Employees must register with their ETC to be eligible for GRH Program. Participating employees are eligible if an emergency arises or unscheduled overtime is required. The ETC needs to verify validity of emergency or overtime. HARTLine, Tampa's transit system, will pay up to $20 for a taxi ride. If a participating employer is not located within a TMA service area, the employer will pay the difference in fare. The TMAs will pay this difference for employers in their service area. Taxi fare is limited to $70.

DENVER REGIONAL COUNCIL OF GOVERNMENTS (DENVER, CO)

The Denver Regional Council of Governments (DRCOG) RideArrangers' GRH is sold to employers on a stand-alone basis or as part of the ECO Pass program. The ECO Pass is available only through employers and like the GRH, must be purchased for all employees at any company location whether or not they currently ride the bus. With the photo I.D. which represents the Eco Pass, patrons have unlimited rides on the transit system (RTD) for the life of the pass (usually one year).

RTD contracted with DRCOG to provide the GRH for Eco Pass holders and paid a flat rate of $2 per employee per year for the GRH. The GRH is also sold separately to employers. Companies with less than 250 employees are charged $3 per employee; those with 250 to 2,499 are charged $2 per employee, and those with 2,500 or more are charged $1 per employee. When sold alone, a minimum contract amount of $100 is charged for administration. After the first nine months, 311 companies were enrolled (22,000 employees enrolled). Cost of taxi service per enrolled employee was $0.76 per year.

WARNER CENTER TRANSPORTATION MANAGEMENT ORGANIZATION (WOODLAND HILLS, CA)

A mix of taxi and rental car services are used to deliver the GRH based on travel distance. Shuttles are used when rental cars can't be used for some reason and only to certain areas. Limits exist on
number of trips, distances, and side-trips. The TMO covers all eligible costs according to a negotiated schedule with the providers. No pre-registration is necessary. The ETC arranges for transportation for the employee based on TMO procedures. According to their report, the TMO spent $13,600 for 245 trips over its second year. Providers bill the TMO. Of the employees surveyed, 59 percent said that the GRH provided by the Warner Center Transportation Management Organization in the West San Fernando Valley of Los Angeles was important in their decision to carpool, vanpool, or ride a bus.

The actual reasons for using the GRH differed from the TMO's expectations. The TMO had assumed child-related emergencies would occur most often but employee illness and overtime accounted for over half of the 140 trips taken during the evaluation period.

<table>
<thead>
<tr>
<th>Reason</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Employee illness</td>
<td>30.7%</td>
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<tr>
<td>Overtime</td>
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<tr>
<td>Child need</td>
<td>15.7%</td>
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<tr>
<td>Family illness</td>
<td>12.9%</td>
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<tr>
<td>Carpool driver ill</td>
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</tr>
<tr>
<td>Death in the family</td>
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</tr>
<tr>
<td>Car/van breakdown</td>
<td>4.3%</td>
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<tr>
<td>Other</td>
<td>0.7%</td>
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</table>

THE TMA GROUP (BRENTWOOD, TENNESSEE)

In the Brentwood, Tennessee area, the TMA Group includes the GRH as part of its services offered to employer-members and include the cost in its dues structure. Estimated reimbursement was $2,000 for taxi and rental cars for 63 trips over a 19 month period. Providers bill TMA.

RIDEFINDERS (RICHMOND, VIRGINIA)

In Richmond, Virginia, Ridefinders, the regional commuter travel service, provides a guaranteed ride home program to customers who live in one of the three counties that contribute to the organization. These three jurisdictions also have a reciprocal taxi agreement. Carpoolers, transit riders, and vanpoolers must pre-register. In the initial stages, commuters paid for the first mile ($1.50) and were reimbursed for the balance by Ridefinders. The commuters were free to choose from any cab company. The average cost per trip was about $15 and they had a usage rate of 30 percent.
On-Site Services - Employers can reduce the number of trips and vehicle miles of travel by providing easy access to commonly used services such as day care facilities, postal centers, cafeterias and restaurants, dry cleaners, ATMs, convenience shopping, and copy shops at the worksite or vicinity.

SUPPORTING SERVICES

Guaranteed Ride Home Programs - Guaranteed ride home (GRH) programs, also called guaranteed return trip or emergency ride home, are "commuter insurance". Many commuter surveys have shown that an important factor in commuters' reluctance to rideshare is the fear they will not be able to respond to a personal emergency, such as picking up a sick child at school, or be stranded without transportation if they have to work late unexpectedly. GRH programs offer free or subsidized emergency transportation, generally by taxi cab or rental car, to commuters who do not drive to work alone.

An examination of guaranteed ride home programs identified seven methods of providing a GRH service:

- **Back-up Vanpool.** In most cases, the vans are used during the day for a vanpool service. Straggler vans follow a fixed route and the passengers are picked up from and dropped off at pre-determined locations. Back-up vanpools pick up all riders at the same point but dropped off at locations of their choice. Shuttle vans from airports operate in a similar fashion.

- **Back-up Carpool.** Carpool ridematches are provided to those who need to work late or whose carpool partners are unavailable. There are several projects testing the use of "real time" ridematching or carpool on-demand.

- **Taxi Service.** A person in need of a ride calls a taxi and pays for the ride. He or she is later reimbursed by the employer or TDM agency or is provided a voucher to give to the cab driver.

- **Rental Car.** For long distance commuters, arrangements are made to have a rental car delivered for use as a GRH. However, if the person is ill or emotionally distressed (e.g., loved-one injured), a taxi may be used.
o **Company Fleet Car.** Employees are permitted use of a company car to get home.

o **Escort Service.** The employee makes arrangements with the security office to have a security guard escort him or her to nearby transit stop.

o **Public Transit.** As a GRH program, this form operates in a manner similar to the taxi with the user receiving reimbursement.

**Corporate Commitment.** Corporate commitment refers to the overall level of support for the TDM program. In general, it reflects a willingness of upper level corporate management to devote resources to the program, provide tangible incentives, establish a corporate “culture” that supports (rather than penalizes) employees’ use of commute alternatives, and participate in local and regional transportation-related programs.

A strong commitment typically is demonstrated by an extensive package of incentives offered to commuters, but also includes supportive work environment policies such as:

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**Other Program Marketing.** The institution of trip reduction regulations on employers has sparked numerous creative marketing and promotion efforts designed to increase enthusiasm and interest in TDM and to make TDM “fun”. For example, employers have included the following promotions in their TDM programs:

o Free walking shoes for pedestrian commuters;

o Free, on-site vehicle fueling and detailing for the “Vanpool of the Week”;

o Drawings for commuter prizes (e.g., bicycle helmets)
Managing Our Way Through Congestion

- Cash bonuses based on number of days in a non-single occupant vehicle.
- Car washing by the CEO of the company for the “Carpool of the Quarter,” (Promotion held at lunchtime to allow employees to watch);
- "Carpooler of the month" is allowed to move to the head of the company cafeteria line;
- A car was given as a prize to the "Carpooler of the Year" (donated by the car manufacturer);
- Ridesharers are given free coffee and donuts in the company cafeteria; and
- The ETC distributes chocolates to ridesharers during the day.

NATURE OF EFFECTIVENESS

Many commuters are unaware of specific commute services and incentives that are available to them. Increasing awareness of such services could lead to an increase in commute alternative use by those commuters who are receptive to a shift to a HOV mode, but need information on ridesharing partners or transit service.

This is borne out by a 1990 survey conducted in Warner Center. Nearly 20 percent of the respondents who had begun ridesharing during the previous year indicated that “help finding people with whom to carpool” or receiving “bus route and schedule information” was important in their decision to rideshare.

An important psychological impediment to ridesharing is a reluctance to try the unknown. Several of the complementary program elements, such as on-site services and guaranteed ride home (GRH) programs, support decisions to rideshare by reducing commuters’ need for a personal automobile during the day. GRH programs have been shown to be highly valued by ridesharing commuters and to have been a supporting factor in their decision to rideshare.

Just how important is guaranteed ride home program to making carpooling more attractive and convenient to commuters? In Rich-
mend, Virginia, nearly 270 commuters who were randomly selected by an independent market research firm were asked two questions to evaluate the potential value of adding a GRH. The first question sought to establish the value of the ridematching system by asking how attractive and convenient would carpooling be if services such as locating someone who lives and works nearby and has a similar work schedule were offered. The commuters were then asked if having a guaranteed ride home in the event of an emergency or having to work late made carpooling more attractive and convenient.

The ridematching system made carpooling at least somewhat more attractive and convenient for 31 percent. The guaranteed ride home program made carpooling at least somewhat more attractive and convenient for 48 percent of commuters.

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<thead>
<tr>
<th>Matching</th>
<th>With GRH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A great deal more attractive and convenient</td>
<td>11.2%</td>
</tr>
<tr>
<td>Somewhat more attractive and convenient</td>
<td>19.7%</td>
</tr>
<tr>
<td>Not at all attractive and convenient</td>
<td>66.2%</td>
</tr>
<tr>
<td>Don't know</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

Source: Southeastern Institute of Research, Inc. Research Report to Ridefinders. 1990

Other types of complementary programs can encourage ridesharing by creating an environment in which ridesharers are seen as "special" and an asset to the company and the community.

APPLICATION SETTING

Travel Markets

The primary application of complementary programs is to the home-to-work (or home-to-school) commuting market, particularly for those programs implemented at employment sites (or universities). But other elements, such as site design and general information dissemination, can be targeted to several travel markets.

TDM programs in residential developments can include site design features that encourage pedestrian travel within the development, and on-site services, such as convenience shopping, that allow residents to perform errands without driving. Program marketing at other non-work sites can also encourage use of alternative modes,
primarily transit, for non-work trips to these developments. For example, transit use for trips to shopping centers could be promoted by distributing transit schedules at the center, offering discounts from merchants to transit riders, and designing safe, convenient transit access at the center.

Information programs also can promote ridesharing for travel to special recreational events such as concerts or sporting events where localized congestion before or after the event would likely occur.

**TRAFFIC CONDITIONS**

**Overall Impact of Employer Marketing:** The research discussed above suggests that program marketing, although an important element of a TDM program, largely is ineffective alone. Shifts to ridesharing as a result of information programs can be expected to be only 0-3 percent. The presence of an on-site Employee Transportation Coordinator seems to make TDM programs slightly more effective, but again, only a marginal impact is likely.

**Overall Impact of Work Site Design:** Work site design and the presence of on-site services may contribute incrementally to employees' decision to rideshare, by making ridesharing a more convenient mode than before, but conclusive data are not available. Provision of special facilities for bicycling and walking seems to be more effective in increasing use of those modes, but the absolute numbers of commuters typically remain small even when percentage increases are large.

**Overall Impact of Guaranteed Ride Home Programs:** Seattle Metro also found evidence that the GRH program it implemented in 1988 had been a factor in some employees' commute mode choice. At the end of a six-month demonstration period, participants were surveyed to determine GRH's impact on their mode choice. Twelve of the 142 participants (8.5 percent) reported a shift in mode.

Metro data suggest that GRH may have more impact on keeping current ridesharers from switching to SOVs. "GRH played a role in helping to maintain the level of HOV usage for those who were already using a HOV mode most of the time," but that "the GRH incentive on its own does not appear to be as useful for motivating people to enter ridesharing as to continue it."
The importance of GRH as a supporting element in trip reduction seems to be clear, although as with other complementary programs, its impact alone likely is small. It is a "very important" incentive for a small percentage of commuters, and perhaps strongly contributes to the mode choice decision of 2-5 percent of commuters who shift to ridesharing.

**Overall Impact of Corporate Commitment:** The influence of a strong corporate commitment on decisions to rideshare, although suggested by ETCs at many companies, is so overshadowed by the impacts of the comprehensive TDM incentive packages implemented by these companies that it is impossible to assign a numerical impact.

**COST EFFECTIVENESS**

The following table shows typical costs for marketing and administration of TDM programs and for GRH programs.

<table>
<thead>
<tr>
<th>Typical Cost of Complementary Program</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program Marketing</strong>(1)</td>
</tr>
<tr>
<td>Employer programs</td>
</tr>
<tr>
<td>- fewer than 1,000 employees</td>
</tr>
<tr>
<td>- over 1,000 employees</td>
</tr>
<tr>
<td>Area-wide programs</td>
</tr>
<tr>
<td><strong>Guaranteed Ride Home</strong>(2)</td>
</tr>
<tr>
<td>Planning/Administration Cost</td>
</tr>
<tr>
<td>Estimated Annual Trip Cost (15 mi. trip):</td>
</tr>
<tr>
<td>- 100 eligible commuters</td>
</tr>
<tr>
<td>- 500 eligible commuters</td>
</tr>
<tr>
<td>- 5,000 eligible commuters</td>
</tr>
</tbody>
</table>

(1) Program marketing includes costs for one staff member (65 percent), marketing materials (15 percent), special promotions (15 percent), other (5 percent). Source: COMSIS 1991 Case Studies of TDM programs.

(2) GRH trip cost ranges assume 1 percent to 10 percent use rate (percent of eligible employees who use GRH program during a year) and 15-mile average trip ($30.00 per trip by taxi or rental car). Source: Guaranteed Ride Home: Taking the Worry Out of Ridesharing, Commuter Transportation Services, Los Angeles, California, 1991.
If we assume that an employer with 1,000 employees implements a moderate TDM program with marketing and a GRH program, its cost is likely to be on average $26,000 ($23,000 for part-time ETC and marketing and $3,000 for GRH). If the complementary program alone increases ridesharing by no more than 3 percent, or 15 trips at this employment site (if all switch to 2-person carpools), the cost per trip removed would be $1,734 per year of $6.88 per trip per day. Marketing and GRH programs generally support the implementation of more tangible program elements, however, and the total TDM program trip reduction probably would be higher. With the same level of marketing effort, the contribution of complementary programs to the total cost per trip reduced likely would be smaller.

IMPLEMENTATION ISSUES

The effectiveness of program marketing can be increased by the following:

Information materials should reflect the characteristics and attitudes of the target population (e.g., travelers' interests in environment versus cost saving).

Promotions should be appropriately scaled to the target population (e.g., mass media advertising for regional information campaigns and desk-to-desk information distribution at employment sites; vanpool information targeted to long-distance commuters and bicycle information to short-distance, etc.).

Marketing should be highly visible and continuous to reach new employees or residents of the target area, and travelers whose travel needs have changed.

Information centers (on-site or off-site) should be in easily accessible locations and staffed with trained commute professionals.

Administration of the program should consider the following issues:

Promotions that include prizes and drawings for ridesharers should be clearly defined as "rewards" for ridesharing, to avoid equity issues with single occupant drivers, who are not permitted to participate.
Company (or agency) policies regarding TDM use and incentives should be clearly defined and monitored, to ensure compliance with the policies.

The TDM program should establish goals and progress should be evaluated on a regular basis to ensure the program incentives and complementary program elements are effective (and cost-effective relative to other potential strategies and techniques).

If employers (or other TDM implementors) are implementing an untested TDM strategy, they should consider implementing a demonstration or pilot program, to evaluate its effectiveness and estimate the costs on a small scale.

The following table lists the program elements of a GRH and parameters to be considered. The table was prepared by The Risk Management Center, Inc. for the Virginia Department of Rail and Public Transportation. Virginia's proposed comprehensive GRH program is one of the transportation control measures that could be adopted if the Northern Virginia area is not found be in conformity. According to VDRPT, their research found the primary value of GRH is retaining existing ridesharers and transit riders in high occupancy vehicle modes.

VDRPT also collected data to examine the potential of the program to become self-sufficient. They found only 1 of 16 scenarios that would allow the program to have the potential to breakeven.
### Program Element

<table>
<thead>
<tr>
<th>Parameter Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating area</td>
</tr>
<tr>
<td>within urban area</td>
</tr>
<tr>
<td>within TMO service area</td>
</tr>
<tr>
<td>within select areas</td>
</tr>
<tr>
<td>Eligibility</td>
</tr>
<tr>
<td>Residents of area</td>
</tr>
<tr>
<td>Commuters to the area</td>
</tr>
<tr>
<td>TMO members</td>
</tr>
<tr>
<td>Part-time employees</td>
</tr>
<tr>
<td>Students</td>
</tr>
<tr>
<td>Transit riders</td>
</tr>
<tr>
<td>Carpoolers</td>
</tr>
<tr>
<td>Vanpoolers</td>
</tr>
<tr>
<td>Bicyclists/Walkers</td>
</tr>
<tr>
<td>Database registrants</td>
</tr>
<tr>
<td>Other Eligibility Criteria</td>
</tr>
<tr>
<td>Must use a non-SOV mode</td>
</tr>
<tr>
<td>a min. # of times/wk</td>
</tr>
<tr>
<td>Must preregister</td>
</tr>
<tr>
<td>No preregistration</td>
</tr>
<tr>
<td>Destinations</td>
</tr>
<tr>
<td>To home</td>
</tr>
<tr>
<td>To work</td>
</tr>
<tr>
<td>No. of Intermediate Stops</td>
</tr>
<tr>
<td>Allowed</td>
</tr>
<tr>
<td>One</td>
</tr>
<tr>
<td>More</td>
</tr>
<tr>
<td>Reasons for Use</td>
</tr>
<tr>
<td>Sickness or accident of</td>
</tr>
<tr>
<td>- ridersharing</td>
</tr>
<tr>
<td>- children</td>
</tr>
<tr>
<td>- spouse</td>
</tr>
<tr>
<td>- parents</td>
</tr>
<tr>
<td>Family emergency</td>
</tr>
<tr>
<td>Car or vanpool breakdown</td>
</tr>
<tr>
<td>Unscheduled overtime</td>
</tr>
<tr>
<td>Scheduled but unusual</td>
</tr>
<tr>
<td>Unscheduled</td>
</tr>
<tr>
<td>Car or vanpool breakdown</td>
</tr>
<tr>
<td>Driver (vacation, sick,</td>
</tr>
<tr>
<td>etc.)</td>
</tr>
<tr>
<td>Car or vanpool driver had</td>
</tr>
<tr>
<td>to leave work early.</td>
</tr>
<tr>
<td>Car or vanpool does not</td>
</tr>
<tr>
<td>operate on a holiday but</td>
</tr>
<tr>
<td>employee must work</td>
</tr>
<tr>
<td>Business requirements</td>
</tr>
<tr>
<td>Taxi - any available</td>
</tr>
<tr>
<td>Modes of Transportation</td>
</tr>
<tr>
<td>Taxi - contracted provider</td>
</tr>
<tr>
<td>Airport limo type</td>
</tr>
<tr>
<td>Rental car</td>
</tr>
<tr>
<td>Public transit</td>
</tr>
</tbody>
</table>

### Comments

- The extension of the distance increases the cost.
- Access to program may be an issue (member vs non-member)
- Political issues are important to consider.

In the event of sick carpool driver, bad weather, etc.
- For self or family
- Concern of working parents.
- Person can only go to one of the places permitted and must continue to final destination at own expense.
- To limit abuse potential, waiting time for a taxi or contract provider must be limited.

- Must be defined

- Backup driver would take van home but driver would use GRH

- This could be a two-way trip
- Late meeting
- Best options seem to be a combination of various modes.
- This allows customization and meets the needs of more people.

- Waivers and age requirements of rental car companies are important. Another important issue is the practice of rental agencies putting a "hold" on credit card limits to guarantee...
<table>
<thead>
<tr>
<th>Program Element</th>
<th>Parameter Considerations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modes of Transportation</strong></td>
<td>Straggler/backup car or vanpool</td>
<td>Simplicity lowers costs and facilitates use.</td>
</tr>
<tr>
<td><strong>Hours of Service</strong></td>
<td>Normal work hours</td>
<td>Control must be reasonable but not too restrictive. People should use it to prove it works.</td>
</tr>
<tr>
<td></td>
<td>Extended coverage</td>
<td>Limiting dollar reimbursement caps potential program cost.</td>
</tr>
<tr>
<td></td>
<td>24 hours, 7 days per week</td>
<td>Consumers will probably accept a small copayment or deductible.</td>
</tr>
<tr>
<td><strong>Who arranges ride?</strong></td>
<td>Employer</td>
<td>Requires people to join.</td>
</tr>
<tr>
<td></td>
<td>Central agency (e.g., TMO)</td>
<td>One of the problems initially is to gather the data to predict usage. After several years,</td>
</tr>
<tr>
<td></td>
<td>Private sector - provider</td>
<td>accurate data will be developed that will enable a more accurate estimate of true costs.</td>
</tr>
<tr>
<td></td>
<td>Private sector - contract administrator</td>
<td>By combining methods, the program can benefit by negotiated contracts with large volume carriers to control costs.</td>
</tr>
<tr>
<td></td>
<td>Local rideshare agency</td>
<td>Existing programs show low levels of awareness of GRH.</td>
</tr>
</tbody>
</table>
| **Limitations to control abuse** | Limit frequency of use by:  
- maximum reimbursement  
- maximum mileage  
- maximum number of times  
Small user co-payment  
Distance from work  
Authorization to use:  
- none needed  
- supervisor signature  
- central agency dispatcher  
Penalty for no-shows  
Preregistration | Monitors cost. by: maximum travel constraint  
Combining methods, the program can benefit from negotiated contracts with large volume carriers to control costs.  
Existing programs show low levels of awareness of GRH. |
| **Control of Adverse Selection** | Establish a multi-tiered membership payment dependent upon distance  
**Funding** | To existing ridesharers  
Registered rideshares database  
Commuters in targeted areas  
All commuters  
Employers  
**Marketing Targets** |  
**Other Issues** |  
**User payment methods** | User pays and is reimbursed. Provider bills service directly.  
Combination of the above depending upon transportation mode. | Efforts must be made to ensure that providers will operate in a safely. Liability releases are advisable.  
Customer satisfaction and forecasting |
Managing Our Way Through Congestion

NOTES

1-16
PREFERENTIAL HOV TREATMENTS

Module Goals:

- Identifies the types of High Occupancy Vehicle (HOV) facilities and design considerations.
- Discusses various marketing and enforcement strategies for HOV facilities and the role they play in the effectiveness of HOV treatments.

Assumptions:

- An effective HOV program can be an integral part of a region's commuter assistance program.
- For an HOV program to be successful, it must be well-designed, marketed, and enforced. If any of these elements are missing, the facility will fail.

PREFERENTIAL HIGH OCCUPANCY VEHICLE TREATMENTS

- **Benefits:**
  - Encourage a shift to more efficient, multi-occupancy modes of travel
  - Increase the people-moving capacity of the roadway and corridor;
  - Reduction in travel-time for users;
  - Less costly alternative to increasing the vehicle capacity of the corridor through capital projects;
  - Increases the productivity of the transit system, allowing it to compete more effectively with other modes;
  - Reduce fuel consumption
  - Assist in meeting air quality standards.

- TDM relies on HOV systems as a major strategy, while HOV depends on the enhancement provided by practically all other TDM measures for ensuring its success. These measures include:
  - Ride-matching and car-pooling,
  - Employer incentives,
  - Parking restriction and pricing policies,
  - Support facilities that help to collect and distribute HOV users
  - Marketing projects to inform and educate the public.
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<table>
<thead>
<tr>
<th>Implementation Cost</th>
<th>Site Specific</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Least costly fixed transit facility, especially when developed in existing right-of-way.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implementation Time</th>
<th>Planned, designed and constructed in a 3- to 8-year time frame</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction involves well-known technology</td>
</tr>
<tr>
<td></td>
<td>Fastest approach for getting some form of fixed-transit guideway into operation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Staged Opening</th>
<th>HOV lanes can be opened as each section is completed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited Risk</td>
<td>If the lane is not sufficiently used, it can be converted to other useful functions, such as mixed-flow lanes or emergency shoulders.</td>
</tr>
<tr>
<td>Cost Effectiveness</td>
<td>Evaluation of HOV lanes on congested highways shows that benefit/cost ratios are high.</td>
</tr>
<tr>
<td>Multi-Agency Funding</td>
<td>High-occupancy vehicle facilities are eligible for local, state, and federal funding from highway and transit agencies.</td>
</tr>
</tbody>
</table>

**RECENT DEVELOPMENTS FAVORING HOV FACILITIES**

**The 1991 Intermodal Surface Transportation Efficiency Act**

One of the key requirements of this act is that congestion management systems be developed by each state. This is one of four management systems required for the National Highway System, the other three being pavement, bridges and safety. The types of strategies considered appropriate for a congestion management plan are those that expand the operational capacity of the existing designated National Highway System and this includes the use of HOV facilities.

The concept of a congestion management plan was initiated as part of the recent legislation which increases the intermodal flexibility of USDOT program funds allowing the supplementation in both directions between mass transit and highway funds. Since HOV facilities satisfy the requirements of both programs it would seem that the legislation enhances the opportunities for funding HOV projects. The congestion management plan is still in its developmental stages and there are many issues still to be resolved. However, the concept holds significant promise for the integration of HOV projects into current metropolitan highway and transit programs.

**The 1990 Clean Air Act Amendments**

The Act recognizes the potential of HOV facilities for reducing pollution in urban areas and hence its usefulness as a strategy measure for meeting its requirements. But the Act also indirectly favors the development of HOV facilities through two of its requirements:
• It requires the private sector to participate in addressing the issue of employee transportation. Employers with more than 100 employees in designated, non-attainment areas will be required to increase average occupancy rates for work-trips by at least 25% above the average for all work-trips in the area.

• If sanctions are eventually imposed on these non-attainment areas, the Department of Transportation may exempt only certain types of projects, among which are the construction or reconstruction of HOV facilities.

The Environmental Protection Agency has the primary responsibility for interpreting, developing and implementing the requirements of the act, but the FHWA and the Department of Transportation have a consulting and concurrent role.

POLLUTION AND FUEL CONSUMPTION REDUCTIONS

• Connecticut DOT
  - 1.90 kg/mile/day estimated reduction of Volatile Organic Compounds (VOCs)
  - 0.20 kg/mile/day estimated reduction of Nitrogen Oxides (NOs)

---

**Estimated Impacts of HOV Alternatives on Air Quality**

*Katy Freeway, Houston, Texas*

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>3 directional freeway lanes plus reversible HOV lane</th>
<th>4 directional freeway lanes with no HOV lane</th>
<th>3 directional freeway lanes with no HOV lane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocarbons</td>
<td>1.1</td>
<td>1.5</td>
<td>2.1</td>
</tr>
<tr>
<td>Nitrous Oxide</td>
<td>1.8</td>
<td>2.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>7.1</td>
<td>10.3</td>
<td>19.3</td>
</tr>
</tbody>
</table>

Source: TTI Simulation Analyses
5 a.m. to noon, peak direction, 1991 demand levels
MARKETING HOV FACILITIES

Audience

- Public.
- Elected officials, including local, regional, state and national officials;
- Public agency staff in agencies with a direct interest in the project;
- Planning organizations;
- Community groups and employers;
- Media

Reasons:

- Heighten public awareness of the mission of the organization;
- Build constituencies, create partnerships and foster support;
- Increase public confidence and reduce hostility;
o Develop accurate expectations;

o Facilitate immediate use of the facilities, ensuring increased utilization; and

o Provide information that could enhance future project planning activities.

Activity Tasks:

Data Gathering: Provides a clear assessment of the social and political environment in which the project is taking root, as well as historical knowledge and insight of other similar projects. It would involve a selection of the following: literature search, surveys, focus group studies, executive interviews and an identification of the issues and the stakeholders in the project.

Public and Private Communication: This phase should be designed to develop a rapport with business and political leaders and eventually to mold support for the project. Activities should be specifically targeted towards each of the six constituency groups involved in the project, in order to ensure that the concerns of each interest group are identified and addressed in the HOV project planning process.

General Awareness Campaign: This has been the traditional focus of most HOV programs, as with many transportation projects. Success requires a clear theme and a coordinated effort involving a variety of activities.

Evaluation: The marketing process will be incomplete without an evaluation of the results. Evaluation should measure not only the performance of the new facility, but the public's perception and acceptance as well. It would also provide useful information on the results of the marketing campaign that can be helpful in planning future strategies.

- Plan
- Check

- Do
- Act

ITS APPLICATIONS FOR HOV FACILITIES

Electronic toll collection, that would allow the electronic recording of a vehicle as it passes through a toll facility, without the need to stop. Information systems, providing real time information to current and potential customers.
Identification and enforcement, aiding the identification of vehicles that violate the requirements of the HOV
Ridematching, based on a more efficient system of real-time location of car- or van-pool vehicles.

COST OF FACILITY, FDOT - 1994

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Lanes</td>
<td></td>
</tr>
<tr>
<td>New Construction (Interstate)</td>
<td>$2,712,700</td>
</tr>
<tr>
<td>New Construction (Undivided)</td>
<td>2,534,400</td>
</tr>
<tr>
<td>New Construction (Divided)</td>
<td>2,851,200</td>
</tr>
<tr>
<td>Milling &amp; Resurfacing (Arterial)</td>
<td>633,600</td>
</tr>
<tr>
<td>Milling &amp; Resurfacing (Interstate)</td>
<td>638,300</td>
</tr>
<tr>
<td>Add 2 Lanes (To Existing 8 Ln)</td>
<td>1,802,200</td>
</tr>
<tr>
<td>Add 2 HOV Lanes (Interstate-Inside)</td>
<td>1,971,200</td>
</tr>
<tr>
<td>Routine Maintenance (Annual)</td>
<td>71,500</td>
</tr>
</tbody>
</table>

Source: Estimates Office, Maintenance Office - Florida Dept. of Transportation

SUCCESSFUL HOV MARKETS

Profile
- High percentage of work-travel during peak hours.
- Repetitive travelers gain familiarity with facility
- Congestion provides incentive to try lane

Traffic Conditions
- Enough congestion to perceive a time savings for commuter
  - Expect 5-7 minutes saved per ten miles of facility

Location
- Radial corridors into major central cities-effective
- population/employment density
- travel volumes
- congestion levels
- overall time savings and conditions at the destination area

- Suburban/exurban (circumferential corridors or suburban arterials)-less effective
  - very little experience
  - diffuse trip patterns
  - trips may be too short on arterial to realize time savings by changing mode

- Other strategies
  - Conditions at destination discourage driving alone
  - Excellent transit service in corridor taking advantage of savings
  - Employer-based car/vanpool programs including information, formation assistance and incentives.
  - Park and ride lots, formation areas

DESIGN TYPES

Exclusive HOV Facility, Separate Right-of-Way (Separate Roadways).

- A roadway or lane developed in a separate right-of-way and designated for the exclusive use of high-occupancy vehicles.

Examples:
- Ottawa, Canada, 38 miles, several bus-only facilities.
- Pittsburgh, PA, two bus-only facilities, PatWays, includes light rail on one facility.

Exclusive HOV Facility, Freeway Right-of-Way (Barrier Separated)

- Roadways or lanes built within the right-of-way that are physically separated from other freeway lanes and are designated for the exclusive use of high-occupancy vehicles during at least portions of the day.

Examples:
- Houston, two one-lane, reversible facilities separated by concrete barriers, 69 miles.
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- Los Angeles, two-lane facility on I-10.
- Washington, D.C., two facilities: Shirley Highway, two-lane, reversible in the median and separated by barriers, and I-66, two lanes in peak direction during peak periods.

**Concurrent Flow Lane (Non-separated)**

- A freeway lane in the peak direction of travel (commonly the inside lane), not physically separated from the other general traffic lanes, and designated for exclusive use of high-occupancy vehicles (usually buses, vanpools, and carpools) during at least portions of the day.

**Examples:**
- Denver, concurrent-flow lane on I-25.
- Honolulu, inside lane for east-bound traffic only during peak periods.
- Los Angeles, inside freeway shoulder during afternoon peaks on the Artesia Freeway.
- Miami, inside lane for peak direction during peak period.
- Orange County, California, inside lane is HOV 24 hours.
- Orlando, inside lane striped on I-4, 6.2 northbound and 14.5 southbound miles.
- San Francisco, two major projects: Three westbound, toll-approach lanes to the Bay Bridge are HOV during a.m. and p.m. peaks; US 101, inside freeway lane is concurrent flow during peak, connects with a contraflow lane in p.m..
- Seattle, two concurrent flow lanes; I-5 inside lanes are concurrent all day and the outside shoulder on SR 520 is concurrent HOV from start of morning peak to end of afternoon peak-only concurrent project on the outside shoulder.

**Contraflow Lane**

- A freeway lane (commonly the inside lane in the off-peak direction of travel), designated for exclusive use by high-occupancy vehicles (usually buses only or buses and vanpools), travelling in the peak direction during at least portions of the day.
o The lane is typically separated from the off-peak direction travel lanes by insertable plastic posts or pylons.

o Takes a lane from the off-peak travel direction for peak travel HOVs.

o Examples:
  - Honolulu, a.m. peak HOV lane on Kalanianole Highway, not a freeway facility.
  - New York City, the approach to the Lincoln Tunnel is contraflow in a.m. peak.
  - San Francisco, one contraflow lane on US 101 near the Golden Gate Bridge, p.m. peak only.

---

**DIRECT HOV CONNECTORS**

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BUFFER SEPARATED HOV FACILITY


CONTIGUOUS HOV LANES

BARRIER SEPARATED REVERSIBLE HOV FACILITY


TWO WAY BARRIER SEPARATED HOV FACILITY

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2-12

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NOT TO SCALE
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TYPICAL BEGINNING AND TERMINATION POINT SIGNING AND PAVEMENT MARKING FOR HOV FACILITIES

CONTIGUOUS FACILITIES

BUFFER SEPARATED FACILITIES


INGRESS AND EGRESS WEAVE DISTANCE AT BUFFER SEPARATED FACILITIES

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Through Congestion

TYPICAL HOV DROP RAMP
TO OVERCROSSING

NOTE:
1. ANY DEVIATION FROM THE PATTERNED GEOMETRIES REQUIRES A DOCUMENTED ENGINEERING ANALYSIS AND A DESIGN EXCEPTION ATTACHMENT.
2. SEE NEXT PAGE FOR SECTION 4.0
3. SEE REAR COVER FOR SITE, TYPICAL & OTHER DIMENSIONS NOT SHOWN.


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Queue Bypass Facilities

- An entrance ramp, intersection, or lanes at a ramp/intersection for priority access or bypass of mixed traffic queues.

Tolls

- Reduced Tolls
  - Free or reduced fares for HOVs

- HOV Toll Lanes
  - No/less queue for HOVs

- High Occupancy Toll (HOT) Lanes (HOV Buy-In)
  - Allow SOVs to use HOV lanes for a fee
  - HOVs travel corridor for free
  - Pilot program with underutilized HOV lane using electronic pricing technologies to preserve time-savings.
  - Estimated to be self-supporting, permitting construction with private capital
  - Good introduction of variable or congestion-pricing to public
  - Congestion pricing to keep free-flow of traffic

Examples:
- Orange County, Private toll-lanes on Riverside Freeway, HOV-3
  - Estimated 17% return on investment, shared with State

- San Diego, I-15 HOV lane conversion
  - Opened October, 1988
  - 1,600 vehicles in peak hour, 50% unused capacity
  - Trying to avoid “Commuter-revolt”
  - Phase One, Low-Tech subscription decal system - Payment
  - Phase Two, Fully automated Electronic Toll Collection (ETC)

- Washington State Program
  - Congestion Pricing, traffic ≥ 45mph, electronic toll collection
  - Convert existing under-utilized HOV to HOT
  - Phase Two (planned) - Privately build publicly-planned HOV
Phase Three (planned) - Impose tolls on all existing freeway lanes to push carpooling, vanpooling, busing, and off-peak travel

HOV IMPLEMENTATION

- Add a Lane
  - Reduces VMT
  - Reduces emissions
  - Fuel savings

- Take a Lane
  - Reduces VMT
  - May not save energy or lower emissions
  - Higher chance of Commuter-revolt

HOV PROJECT ADVANTAGES

- Implementation Cost
  - Least costly fixed transit facility, especially if developed in existing rights-of-way.

- Implementation Time
  - Planned, designed and constructed in a 3- to 8-year time frame.
  - Well-known construction techniques

- Staged Opening
  - Lanes can be opened as sections are completed.
  - Unsuccessful in Virginia Beach, section yielded no perceived benefits
  - Must be adequate length to save time, affect total trip

- Limited Risk
  - If underutilized, lanes can be converted to mixed-flow or emergency shoulders.

- Cost Effectiveness
  - High benefit/cost ratios

- Multi-Agency Funding
  - Eligible for local, state, and federal funding from highway and transit agencies.
o Multiple User Groups
- Vanpools, carpools, and transit use, increasing average vehicle occupancy (AVO)

o Operating Speed
- Express and nonstop, intended to operate at 50+ mph

o Flexibility
- HOV facility may or may not be adjacent to park and ride lots or transit stations, existing street system is used for collection/distribution of traffic.

o Time Adjustable Operation
- During non-peak hours, HOV lane may serve as emergency lane, shoulder, or extra general-use lane.

EFFECTIVENESS

o Commuter
- Time savings to balance time lost to connect to car/vanpool, "give-back" travel time.
- Reliability of trip length in time (greater perceived than actual savings)
- Desire of SOV to be in the fast, free lane, and try HOV

o State Agency
- Cost effective based upon travel time alone
- Average annual travel time savings > 10% of the construction cost of the project.

PER-LANE EFFICIENCY

o Assumptions for Calculation
- A constant stream of benefits is assumed over the life of the project.
- HOV lane has a 20 year life with no salvage value.
- Four percent discount rate used in calculation
- Nine dollars per hour (1992) value of time used in calculation.
- A figure of 250 working days per year is used in the calculation.
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### Hypothetical example of efficiency equations

**o Before HOV project measure, peak-hour/direction**
- 1,750 persons/lane (in three general purpose lanes)
- 22 mph Travel Speed

Peak hour, per-lane efficiency = \( \frac{(1,750 \times 22)}{1,000} = 38.5 \)

**o After HOV project measure, peak hour/direction**
- 1,650 persons per general purpose lane
- 4,100 persons per HOV lane
- 25 mph general purpose lane speed
- 45 mph HOV lane speed

Per-lane efficiency of HOV lane = \( \frac{(4,100 \times 45)}{1,000} = 184.5 \)
Per-lane efficiency of general lane = \( \frac{(1,650 \times 25)}{1,000} = 41.3 \)
Per-lane efficiency of facility = \( \frac{(184.5 \times 1) + (41.3 \times 3)}{4} = 77.0 \)

### Table: Efficiency Equations

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak Hour</td>
<td>Peak Period (Duration)</td>
<td>Peak Hour</td>
<td>Balance of Peak Period</td>
<td></td>
</tr>
<tr>
<td>Katy (I-10)</td>
<td>4,810</td>
<td>10,080 (3.5)</td>
<td>138</td>
<td>55</td>
<td>72</td>
</tr>
<tr>
<td>I-394</td>
<td>3,830</td>
<td>7,260 (4.0)</td>
<td>4.0</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>I-5 North</td>
<td>5,640</td>
<td>12,240 (3.0)</td>
<td>2.5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

1. The travel time savings experienced by HOV lane users relative to the general-purpose freeway lanes.
2. The average time savings experienced by HOV lane users during the portions of the peak period that are before the beginning and after the end of the peak hour.
3. The annual value of time saved by HOV lane users was computed by assuming that the value of time was $9 per hour and that there were 250 working days in a year.
4. The construction costs associated with the HOV facility and any support facilities (e.g., park-and-ride lots).
5. The annual value of time saved divided by construction costs, expressed as a percentage.


MEASURABLE BENEFITS

1. Increase lane volume

![A.M. Peak-Hour/Direction Person Volumes per Lane for HOV and Freeway Lanes]

Source: TTL "High-Occupancy Vehicle Project Case Studies." 1992

2. Increase volume of carpools

![Increase in A.M. Volume: Peak Hour/Direction 2+ Carpool Volume (Freeway + HOV)]

Source: TTL "High-Occupancy Vehicle Project Case Studies." 1992
MARKETING

HOV Support Issues and Obstacles

- Commuter
  - Will not initially embrace HOV lane
  - Wants additional general flow lane
  - Resent restrictions on use of public roads

- Elected officials
  - Senses mistrust of public and business community
  - HOV not supportive of economic development and political goals

- Communities or Jurisdictions
  - Disagree on facility which affects them differently

- Agencies
  - Disagree on benefit or desirability
  - Transit agencies may fear losing riders to adjacent corridors or carpools

Building Support for HOV Facilities

- Adding a lane rather than taking one will provoke less resistance.

- Advance notification to public that a lane will be exclusive HOV-less shocking.

- Initiate lane with modest minimum occupancy requirements (HOV-2), and adjust over time.

- Develop programs to support lane use, including carpool formation and incentives/disincentives, parking management programs, park and ride lots, and transit improvements.

- Enforcement will keep the facility performance high, and improve credibility for the maintenance of integrity and dedicated use.

Occupancy Levels

- Low 2+
  - Good introduction of commuters to lane and alterna-
tive commute modes
- Can be changed if congested

- Too low
  - Lane gets congested, no time savings perceived

- High 3+
  - Free flow, high speeds, perceived and real time savings

- Too high
  - Ineffective use of resources, too much inconvenience to form 3+ car/vanpools

Houston Transitway System

- Initially only available to buses and authorized vanpools

- End of 1989, 36.6 miles completed, now 95.5 mile system

- Typical installation
  - One-way facility in the freeway median
  - 20 feet wide
  - Reversible
  - Separated from traffic flow by concrete barriers
  - Access by grade-separated HOV ramps

- Time savings real vs. perceived
  - Older system, 5-14 minutes real - 20 minutes perceived
  - Newer system, 2-3 minutes real - 10-20 minutes perceived

Effectiveness

- Houston North Transitway
  - 20% vehicles/person trip reduction during introductory phase

- Northern Virginia's Shirley Highway
  - 16% corridor-wide gain in vehicles/person trip efficiency
  - Substantial time-savings offered
  - Supporting strategies
  - Unique employment characteristics - U.S. Capital
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- New Jersey I-495 Lincoln Tunnel approach
  - Low impact on vehicles/person
  - Largest volume of all HOV lanes - 34,700 passengers in one peak hour
  - Single contraflow lane
  - 8 minute savings for transit riders in peak
  - Stabilized bus ridership
  - 40% increase in auto capacity by shifting buses into contraflow lane

- Minneapolis, I-394 interim HOV lane
  - Benefitted by opening of 2 lots with free (registered) carpool parking downtown
  - 9% reduction in vehicles/person

- California, 90 ramp meter bypasses
  - Mainly in the Los Angeles area
  - Average 1.5 minute savings
  - 25% increase in carpool volume
  - Doubling of carpools in prime locations, even split of new pools and existing pools changing route.

- Typical expectations
  - 10% decrease in vehicles required per person in freeway or separate rights-of-way corridors.

<table>
<thead>
<tr>
<th>Percentage of HOV Lane Carpoolers Who Previously Drove Alone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HOV Facility</strong></td>
</tr>
<tr>
<td>Katy Freeway (1990)</td>
</tr>
<tr>
<td>I-394 (1986)</td>
</tr>
<tr>
<td>Shirley Highway (1974)</td>
</tr>
<tr>
<td>I-45 North, Houston (1990)</td>
</tr>
<tr>
<td>US 290, Houston (1990)</td>
</tr>
<tr>
<td>I-45 South, Houston (1989)</td>
</tr>
<tr>
<td>San Bernadino Freeway, Los Angeles (1977)</td>
</tr>
<tr>
<td>SR 237, Santa Clara County (1988)</td>
</tr>
</tbody>
</table>

ENFORCEMENT

Penalties
- Fines, $25 - $1,000
- Points, penalties, 0-3 points
- Citations issued
  - Traffic Control Device violation
  - Trespassing
  - Improper Lane Change
  - Reckless Driving
  - Speeding
- Seattle's HERO Program, phone "snitch-lines"
  - Commuters report violators' license, and info
  - Reported info matched to owner's registration
  - 1st offense, HOV Brochure mailed to home
  - 2nd offense, DOT Letter mailed to home
  - 3rd offense, Highway Patrol warning mailed
  - Repeat violators are waited for by Patrol on I-5

- Connecticut HOV lane enforcement
  - Violation
carpool lane $40 fine
Improper Lane Change - $58 fine
Speeding - $73+ fine
- 5,023 tickets, first year (Sept. '89-Aug. '90)

Enforcing Agency
- Dedicated Officers, as low as 5% violation rate (WA and CA)
- Part of Patrol, 10-25% violation rates
- No enforcement, up to 75% violation rate (Orlando)
- Design issues
  - Safety Zones, shoulders, pull-over areas
  - Officer visibility, deterrent
  - Access for officers to monitor (both directions) from stationary location

Courts
- Magistrates' and Judges' adjudication decisions and impressions of effectiveness and penalties for lane
  - Points, fines, charges, and insurance rates
### HOV LANE ENFORCEMENT

<table>
<thead>
<tr>
<th>Facility</th>
<th>Fine</th>
<th>Violation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houston</td>
<td>$45</td>
<td>1%</td>
</tr>
<tr>
<td>Virginia</td>
<td>$50</td>
<td>2%</td>
</tr>
<tr>
<td>Pittsburgh</td>
<td>$90.50</td>
<td>3%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>$271-$1,000+</td>
<td>5-15%</td>
</tr>
<tr>
<td>Orlando</td>
<td>$57</td>
<td>75%</td>
</tr>
<tr>
<td>Ft. Lee, NJ</td>
<td>$75</td>
<td>30%</td>
</tr>
<tr>
<td>New York</td>
<td>$65</td>
<td>2%</td>
</tr>
<tr>
<td>Seattle</td>
<td>$67</td>
<td>10%</td>
</tr>
<tr>
<td>Hartford</td>
<td>$60</td>
<td>5%</td>
</tr>
</tbody>
</table>

Sources:


Appendix

Florida State Statutes

STATE UNIFORM TRAFFIC CONTROL

316.074 Obedience to and required traffic control devices.-

(1) The driver of any vehicle shall obey the instructions of any official traffic control device applicable thereto, placed in accordance with the provisions of this chapter, unless otherwise directed by a police officer, subject to the exceptions granted the driver of an authorized emergency vehicle in this chapter.

(2) No person shall drive any vehicle from a roadway to another roadway to avoid obeying the indicated traffic control indicated by such traffic control device.

(3) No provision of this chapter for which official traffic control devices are required shall be enforced against an alleged violator if at the time and place of alleged violation an official device is not in proper position and sufficiently legible to be seen by an ordinarily observant person. Whenever a particular section does not state that official traffic control devices are required, such section shall be effective even though no devices are erected or in place.

(4) Whenever official traffic control devices are placed in position approximately conforming to the requirements of this chapter, such devices shall be presumed to have been so placed by the official act or direction of lawful authority unless the contrary shall be established by competent evidence.

(5) Any official traffic control device placed pursuant to the provisions of this chapter and purporting to conform to the lawful requirements pertaining to such devices shall be presumed to comply with the requirements of this chapter unless the contrary shall be established by competent evidence.

322.27 Authority of department to suspend or revoke license.-

(3) There is established a point system for evaluation of convictions of violations of motor vehicle laws or ordinances, and violations of applicable provisions of s. 403.413(5)(b) when such violations involve the use of motor vehicles, for the determination of the continuing qualification of any person to operate a motor vehicle. The department is authorized to suspend the license of any person
upon showing of its records or other good and sufficient evidence that the license has been convicted of violation of motor vehicle laws or ordinances, or applicable provisions of s. 403.413(5)(b), amounting to 12 or more points as determined by the point system. The suspension shall be for a period of not more than 1 year.

(a) When a licensee accumulates 12 points within a 12-month period, the period of suspension shall be for not more than 30 days.

(b) When a licensee accumulates 18 points, including points upon which suspension action is taken under paragraph (a), within an 18-month period, the suspension shall be for a period of not more than 3 months.

(c) When a licensee accumulates 24 points, including points upon which suspension action is taken under paragraphs (a) and (b), within a 36-month period, the suspension shall be for a period of not more than 1 year.

(d) The point system shall have as its basic element a graduated scale of points assigning relative values to convictions of the following violations:

1. Reckless driving, willful and wanton - 4 points.

5. Unlawful speed:
   a. Not in excess of 15 miles per hour or lawful or posted speed - 3 points.
   b. In excess of 15 miles per hour or lawful or posted speed - 4 points.

7. All other moving violations (including parking on a highway outside the limits of a municipality) - 3 points.

318.141 Enforcement traffic control officers and traffic infraction enforcement officers.-

(2)(a) Any sheriff's department or police department of a chartered municipality may employ, as a traffic infraction enforcement officer, any individual who successfully completes at least 200 hours of instruction in traffic enforcement procedures and court presentation through the Selective Traffic Enforcement Program as approved by the Division of Criminal Justice Standards and Training of the Department of Law Enforcement, or through a similar program, but who
does not necessarily otherwise meet the uniform minimum standards established by the Criminal Justice Standards and Training Commission for law enforcement officers or auxiliary law enforcement officers under s. 943.13. Any such traffic infraction enforcement officer who observes the commission of a traffic infraction or, in the case of a parking infraction, who observes an illegally parked vehicle may issue a traffic citation for such infraction when, based upon personal investigation, he has reasonable and probable grounds to believe that an offense has been committed which constitutes a noncriminal traffic infraction as defined in s. 318.14.

(b) Such traffic enforcement officer shall be employed in relationship to a selective traffic enforcement program at a fixed location or as part of an accident investigation team at the scene of a vehicle accident or in other types of traffic infraction enforcement officer's duties be performed under the immediate supervision of a fully qualified law enforcement officer.

NOTES
ECONOMIC INCENTIVES

MODULE GOALS

- Provide an introduction to the various types of economic incentives that support TDM programs.
- Know how to implement a "Cash-Out" program.
- Ability to relate various tax issues and incentives to employers and employees.

ASSUMPTIONS

- Economic incentives and disincentives will affect commuter behavior.
- The federal government is having a positive influence on TDM through their policies and tax laws.

TYPES OF ECONOMIC INCENTIVES

Employer-Provided Incentives

- Transit Pass Subsidies
- Vanpool Operating Subsidies
- Rideshare Subsidies
- Travel Incentives
- Financial Incentives Without Direct Payments

The above list represents broad categories of economic incentives. Individual employers usually tailor the incentives they provide based on their willingness to provide the subsidy and identified needs and wants of their employees. The types of incentives that can be offered by employers are also dependent on the types and amount of incentives provided by public agencies.

- Transit Pass Subsidies

Employers that make a total or partial purchase of transit passes, tickets or tokens for employee use are participating in a transit pass subsidy program. The employer can purchase the transit passes and sell or give them to employees or agree to reimburse the employee after they purchase the pass.
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- Vanpool Operating Subsidies

This type of subsidy can take many forms. Employers can provide in-kind services such as providing vehicles, underwriting insurance and/or capital costs, and assistance in arranging vanpool leases. Defraying costs is another form of vanpool subsidy and can include:

- Free or subsidized fares for the first one to six months of usage
- Monthly subsidies for loyal riders
- Free fares and use of van by drivers

- Rideshare Subsidies

Employers that offer a user subsidy to any employee using any commute alternative such as carpools, vanpools, or transit. The subsidies can be offered on a daily, monthly or annual basis.

- Travel Allowance

Employers can provide travel allowances on a monthly basis and employees use the allowance to defray the costs of using any travel mode including driving alone. Travel allowances are usually tied to parking charges where employees can apply all or part of the allowance to parking fees, or use the allowance to pay for their portion of a ridesharing arrangement. Employees that bicycle or walk to work see the allowance as a windfall. Another form of allowance is a differential parking allowance, where users of commute alternatives receive a higher allowance than SOV users.

- Other Financial Incentives

These incentives provide a real, monetary incentive to using commute alternatives without involving direct subsidy payments to users. These include:

- Use of fleet vehicles for ridesharing
- Free or discounted fuel for pooling vehicles
- Reduced maintenance and repair fees for HOVs
- Extra vacation time for commute alternative users
- Free or discounted equipment (i.e. bicycle helmets)

Public Agency Provided Incentives

- Transit Fare Discounts
- Transit Subsidies
- Vanpool Start-Up Subsidies

The above list represents major types of incentives offered by public agencies. Actual incentives should be tailored to meet local needs.
Transit Fare Discounts

Direct subsidy of fares is usually provided through discounted rates for targeted user groups. Some transit properties have even offered free fares for short periods to attract new riders. However, given that peak-period and express services are usually the most expensive transit services to operate, discounted fares to commuters are not very popular.

Transit Subsidies

Offering direct subsidies to commuters who use transit is another economic incentive. This type of incentive is usually associated with a match program, the public agency matches all or a portion of the employer subsidy. Transit operators can also sell passes to employers at a discount for the employer to sell to its employees.

Vanpool Start-Up Subsidies

This type of incentive is usually accomplished by providing a one time start-up subsidy to the new vanpool or by discounting each individual users fare for the first few months of operation. In California a vanpool start-up subsidy was offered during a highway reconstruction project to mitigate adverse impacts of the construction delays.

Supporting Strategies

Subsidy scheme need to be tied to a package of TDM programs to be completely successful. In addition to availability of transit and vanpool programs, two key supporting strategies have been identified.

Rideshare subsidies are most effective when combined with parking surcharges for SOV users. Either independently or through travel allowances, parking charges force employees to make mode choice decisions, and when commute alternatives are reinforced with specific subsidies. The parking revenues can also help pay for the subsidies.

Subsidy programs must also be supported by strong marketing, promotion and corporate backing. If employees are unaware of the incentives, the alternatives available, and the management support, effectiveness will be diminished. If not constantly reinforced, new and existing employees will not participate.
Travel and Traffic Impact

The impacts of economic incentives are usually evaluated based on their effect on mode choice.

<table>
<thead>
<tr>
<th>Employer</th>
<th>Subsidy/Incentive</th>
<th>%Solo</th>
<th>%Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allergan</td>
<td>100% Transit Subsidy</td>
<td>82%</td>
<td>7.6%</td>
</tr>
<tr>
<td></td>
<td>1-2 days vacation for R/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Union Bank</td>
<td>100% Transit Subsidy</td>
<td>50%</td>
<td>15.0%</td>
</tr>
<tr>
<td>Ventura Co.</td>
<td>$200-$300 Annual Incentive</td>
<td>69%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Varian</td>
<td>25% Transit Subsidy</td>
<td>57%</td>
<td>17.7%</td>
</tr>
</tbody>
</table>

From an impact potential standpoint several key findings should be recognized.

*Based on over 20 employer-based TDM programs, financial incentives for the use of commute alternatives are effective in reducing trips by 8-18 percent. Financial disincentives in the form of parking charges, when not supported by a TDM program, can also produce similar results. However, when financial incentives are combined with disincentives to driving alone (parking charges) the reductions can approach 50 percent.*

*Transit fare prepayment discounts and fare reductions, when analyzed alone, do not seem to have a significant impact on transit usage. When combined with employer subsidies, discounts and fare reductions can contribute to more substantive results.*

*Employer programs that offer financial incentives and those that combine subsidies with parking controls exhibit a broad range of costs. However, parking revenue greatly reduces the cost per trip reduced, subsidize financial incentives, or even realize a net cost savings.*

*Public agency subsidies and transit discounts are most cost-effective when combined with employer participation in financial matching programs.*
I. PURPOSE

This notice addresses issues relating to the provision for qualified transportation fringes in section 132 (f) of the Internal Revenue Code. As part of the Energy Policy Act of 1992 (the Act), Pub. L. No. 102-486, Congress amended section 132 to incorporate three basic changes in the tax treatment of employer-provided transportation benefits. First, it increased the exclusion for transit passes from $21 to $60 per month and provided that only the value of a transit pass in excess of the statutory limit would be includible in gross income. Second, Congress added an exclusion for van pools. Up to $60 per month may be excluded, but the $60 exclusion applies to the aggregate of van pools and transit passes. Finally, Congress eliminated the working condition fringe benefit for commuter parking and provided that the amount of employer-provided parking excludable from gross income is limited to $155 per month.

II. APPLICATION

Q-1: What is a qualified transportation fringe?

a. In general. A “qualified transportation fringe” is any of the following that is provided by an employer to an employee and meets the requirements described in this notice: (1) transportation in a commuter highway vehicle, (2) transit passes, and (3) qualified parking. Nothing in section 132 (f) of the Code or this notice prohibits an employer from simultaneously providing an employee any combination of these three benefits.

b. Transportation in a commuter highway vehicle. A “commuter highway vehicle” is any highway vehicle that has a seating capacity of at least six adults (excluding the driver) and meets the two requirements for mileage use. At least 80 percent of the vehicle’s mileage use must be reasonably expected to be (1) for transporting employees in connection with travel between their residences and their place of employment, and (2) on trips during which the number of employees transported for commuting is, on average, at least one-half of the adult seating capacity of the vehicle (excluding the driver).

c. Transit passes. A “transit pass” is any pass, token, farecard, voucher, or similar item entitling a person to transportation (or transportation at a reduced price) (1) on mass transit...
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facilities (whether or not publicly owned), or (2) provided by any person in the business of transporting persons for compensation or hire in a highway vehicle with a seating capacity of at least six adults (excluding the driver).

d. Qualified parking. "Qualified parking" is access to parking provided to an employee on or near the employer's business premises or at a location from which the employee commutes to work by car pool, commuter highway vehicle, mass transit facilities, transportation provided by any person in the business of transporting persons for compensation or hire, or by any other means. The term does not include parking on or near property used by the employee for residential purposes.

Qualified parking means parking for which an employer pays (directly to a parking lot operator or by reimbursement to the employee), or that an employer provides on premises it owns or leases.

For purposes of the definition of qualified parking, a car pool means two or more individuals who commute together in a motor vehicle on a regular basis.

Q-2: Is there a limit on the value of qualified transportation fringes that may be excluded from an employee's gross income?

a. Transit passes and transportation in a commuter highway vehicle. Up to $60 per month is excludable from the gross income of an employee for transit passes and transportation in a commuter highway vehicle provided by the employer. One $60 limit applies whether these benefits are provided separately or in combination with one another.

b. Parking. Up to $155 per month is excludable from the gross income of an employee for qualified parking provided by the employer. This exclusion is available whether an employer provides only qualified parking or qualified parking in combination with other benefits described in this notice.

c. Limitation on employees of a controlled group of corporations. All employees treated as employed by a single employer under section 414(b), (c), (m), or (o) of the Code are treated as employed by a single employer for purposes of section 132(f). Thus, an employee of one corporation that is part of a controlled group of corporations may, under certain circumstances, be eligible to receive qualified transportation fringes from another corporation within the controlled group. The statutory dollar limitations with respect to that employee, however, are not increased under this rule.
d. Result if the value of the otherwise qualified transportation fringe exceeds the statutory limit. Generally, an employee must include in gross income the amount by which the fair market value of the benefit exceeds the sum of the amount, if any, paid by or on behalf of the employee, and any amount excluded from gross income under section 132 or another section of the Code. See section 1.61-21(b)(1) of the regulations. Thus, if an employer provides an employee with a qualified transportation fringe that exceeds the statutory limit, the excess value must be included in the employee's gross income for income and employment tax purposes.

EXAMPLES

Example 1. Each month Employer M provides a transit pass valued at $70 to Employee D. D does not reimburse M for any portion of the pass. Because the value of the monthly transit pass exceeds the statutory limit by $10, $10 must be included in D’s wages for income and employment tax purposes.

Example 2. Each month Employer M provides parking valued at $165 to Employee E. Because the fair market value of the parking exceeds the statutory limit by $10, $10 must be included in E’s wages for income and employment tax purposes.

e. Payments by employees for qualified transportation fringes. If an employee pays the employer for a qualified transportation fringe, the amount includible in the employee’s gross income is the amount by which the fair market value of the benefit exceeds the amount paid by the employee plus any amount excludable under section 132 or another section of the Code.

Example. Employer P provides qualified parking with a fair market value of $200 per month to its employees, but charges the employees $45 per month. Because the amount paid ($45) by the employees plus the amount excludable ($155) for qualified parking equal the fair market value of the benefit, no amount is includible in the employee’s gross income.

f. Exclusion applies on a monthly basis. The value of qualified parking, transit passes, and transportation in a commuter highway vehicle must be calculated on a monthly basis to determine whether the value of the benefit has exceeded the limits on qualified transportation fringes. If the value of the benefit does not exceed the statutory limit in any month, the unused portion of the exclusion may not be carried over to subsequent months. Similarly, if the employer provides a benefit having a monthly value greater than the statutory limit, the value in excess of the statutory limit may not be excluded by combining the monthly exclusions. An employer may, however, reimburse an employee for costs incurred for
Managing Our Way Through Congestion

qualified parking, transit passes, and transportation in a commuter highway vehicle in subsequent months, so long as the value of the benefit is calculated on a monthly basis.

Example. Employer Q, at the end of a three-month period, reimburses Employee A for transit passes purchased during the preceding three months. A purchased a $60 transit pass each month, and Q reimburses A $180 in cash at the end of the third month. Because the value of the reimbursed expenses did not exceed the statutory limit in any month, the $180 reimbursement is excludable from A’s gross income as a qualified transportation fringe. See Q-3b for the specific rules governing reimbursements.

g. “Month” defined. A “month” is a calendar month or a substantially equivalent period applied consistently.

Q-3: Are cash reimbursements permitted under new section 132(f)?

a. In general. The term “qualified transportation fringe” includes cash reimbursements by an employer to an employee for qualified parking, transit passes, or transportation in a commuter highway vehicle. The term “cash reimbursement” does not include cash advances.

b. Recordkeeping requirements. Employers that make cash reimbursements must establish a bona fide reimbursement arrangement to ensure that their employees have, in fact, incurred expenses for parking, transit passes, or transportation in a commuter highway vehicle. An employee must demonstrate to the employer that an amount equal to the reimbursement was expended for qualified parking, transit passes, or transportation in a commuter highway vehicle. For example, an employee may present a used transit pass to the employer at the end of the month and certify that he or she purchased and used it during the month, or may present a transit pass to the employer at the beginning of the month and certify that he or she purchased it and will use it during the month. What constitutes a bona fide reimbursement arrangement may vary depending on the facts and circumstances, including the method or methods of payment utilized within the mass transit system.

c. Special rules for transit passes. The term “qualified transportation fringe” does not include reimbursements for transit passes if a voucher or similar item that may be exchanged only for a transit pass is readily available for direct distribution by the employer to employees. A voucher or similar item is “readily available” if an employer can obtain it on terms no less favorable.
than those to an individual employee and without incurring a significant administrative cost.

d. Example. Company C in City X sells vouchers to employers in the metropolitan area of X. Several different bus, rail, van pool, and ferry operators service X, and a number of the operators accept the vouchers either as fare media or in exchange for fare media. Employers can easily obtain vouchers for distribution to their employees. To cover its operating expenses, C imposes on each voucher a charge that is not significant. Employer M disburses vouchers purchased from C to employees who use operators that accept the vouchers. Because M is not making cash reimbursements of its employees' transit expenses with respect to these operators, M need not maintain a bona fide reimbursement arrangement for these transit expenses. The vouchers disbursed to M's employees are qualified transportation fringes.

Q-4: Can employers reduce their employees' compensation in exchange for providing qualified transportation fringes?

Section 132(f)(4) of the Code prevents employers from reducing their employees' compensation in exchange for providing qualified transportation fringes. This rule applies even if state or local law requires employers to offer employees the choice of receiving a qualified transportation fringe or a higher salary.

Example 1. Employer X reduces its employees' compensation by $60 per month and provides $60 per month in transit passes. Each employee is required to include $60 per month in gross income, even though the employee received an otherwise qualified transportation fringe.

Example 2. Employer Y offers its employees a choice between $45 per month intransit passes and $45 per month in additional compensation. Every employee of Y is required to include $45 per month in gross income, whether the employee selected cash or transit passes.

Q-5: To which employers and employees do the qualified transportation fringe rules apply?

a. Employers. Section 1911 of the Act does not exclude government employers from coverage. Accordingly, section 132(f) of the Code applies to both non-government and government employers.

b. Employees. Qualified transportation fringes may be provided only by employers to employees. For this purpose, employees are individuals who are employees within the meaning of section 1.132-1(b)(2)(i) of the regulations. This definition in-
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cludes common law employees and other statutory employees, such as officers of corporations. Self-employed individuals, who are employees within the meaning of section 401(c)(1) of the Code, are not employees for purposes of section 132(f). Therefore, partners, 2-percent shareholders of S corporations, sole proprietors, and other independent contractors are not employees for purposes of section 132(f). An individual who is both a 2-percent shareholder of an S corporation and an officer of that S corporation is not considered an employee for purposes of section 132(f).

Q-6: Are there any special rules for qualified parking for vehicles provided by law enforcement agencies to their employees?

Section 1911 of the Act does not provide special rules for vehicles provided by law enforcement agencies. Accordingly, section 132(f) of the Code applies to qualified parking provided to law enforcement officers who travel from home to work in vehicles provided by a law enforcement agency unless the vehicle is a qualified nonpersonal use vehicle as described in section 1.274-5T(k) of the regulations.

Under section 1.132-5(h)(1) of the regulations, 100 percent of the value of the use of a qualified nonpersonal use vehicle (as described in section 1.274-5T(k)) is excludable from gross income as a working condition fringe. This exclusion applies to employer-provided parking for qualified nonpersonal use vehicles as well. Thus, if an employee drives from home to work in a vehicle described in section 1.274-5T(k) of the regulations, the parking provided for that vehicle is excludable from the employee's gross income as a working condition fringe.

As with employer-provided parking for other types of vehicles used solely for business purposes, parking provided for law enforcement vehicles used exclusively for business purposes is a working condition fringe and the rules of section 132(f) do not apply.

Q-7: May partners and 2-percent shareholders of S corporations continue to use the rules that applied to transit passes and parking prior to the Act?

a. Transit passes. The existing de minimis and working condition fringe rules remain available for transit passes provided to partners and 2-percent shareholders of S corporations. For example, the de minimis fringe rule for transit passes continues to apply to partners and 2-percent shareholders of S corporations to the extent it applied prior to the Act. Tokens or farecards provided
by a partnership to a partner that enable the partner to commute on
a public transit system (not including privately-operated van pools)
are excludable from the partner’s gross income if the value of the
tokens and farecards in any month does not exceed $21. See
section 1.132-6(d)(1) of the regulations. If the value of a pass
provided in a month exceeds $21, however, the full value of the
benefit is includible in gross income.

b. Parking. The Act eliminated the working condition fringe
exclusion for commuter parking. However, if a partner performing
services for a partnership or a director of a corporation would be
able to deduct the cost of parking as a trade or business expense
under section 162 of the Code, the value of free or reduced-cost
parking is excludable as a working condition fringe. See sections
1.132-5(a)(1) and 1.132-1(b)(2) of the regulations. The de minimis
fringe rules remain available for parking provided to partners and
2-percent shareholders of S corporations that qualifies under the
general de minimis rules. See section 1.132-6(a) and (b).

Example. G is a partner in partnership P, which maintains
offices at various locations in city C. G commutes to and from G’s
office every day and parks free of charge in a reserved space in P’s
lot. G periodically drives to P’s other offices in C for business
reasons and parks in lots leased by P. G must include in income
the full monthly value of G’s reserved parking space. Because G
would be allowed a deduction under section 162 of the Code for the
cost of using the parking spaces at P’s other offices, the value of
that parking is excludable from gross income as a working condition
fringe.

Q-8: How does section 132(f) affect transit passes and parking
provided to independent contractors?

Even though qualified transportation fringes cannot be
provided to self-employed individuals (see Q-5b), the existing de
minimis fringe rules for transit passes and parking continue to apply
to independent contractors to the extent they applied prior to the
Act.

a. Transit passes. Tokens or farecards that enable an
independent contractor to commute on a public transit system (not
including privately-operated van pools) are excludable from the
independent contractor’s gross income if the value of those tokens
and farecards in any month does not exceed $21. See section
1.132-6(d)(1) of the regulations. If the value of a pass provided in
a month exceeds $21, however, the full value of the pass is
includable in gross income.

b. Parking. An independent contractor may exclude the
value of parking from income as a de minimis fringe if the require-
mments of section 1.132-6(a) and (b) are satisfied. See also section 1.132-1(b)(2) of the regulations.

Q-9: How do the qualified transportation fringe rules apply to van pools?

a. Van pools operated by or for the employer.

   (i). In general. This category covers two types of arrangements: (1) employers purchase or lease vans to enable employees to commute together, and (2) employers contract with and pay a third party to provide the vans, maintenance, and liability insurance. Up to $60 per month of the value of transportation in the vans may be excluded from the employees' gross incomes, provided the van qualifies as a "commuter highway vehicle" as defined in Q-1b of this notice and section 132(f)(5)(B) of the Code.

   (ii). Valuation. The regulations under section 61 of the Code provide that the fair market value of a fringe benefit is based on all the facts and circumstances. As an alternative, transportation in an employer-provided commuter highway vehicle may be valued under the following special valuation rules, which existed prior to the Act: (1) automobile lease valuation rule, see section 1.61-21(d) of the regulations, (2) vehicle cents-per-mile rule, see section 1.61-21(e), and (3) commuting valuation rule, see section 1.61-21(f).

For general rules applicable to each of the special valuation rules, see section 1.61-21(c) of the regulations.

The Act does not affect the availability of these rules for valuing an employee's personal use of an employer-provided vehicle that does not qualify as a commuter highway vehicle.

Example. Employer V purchases a van for purposes of transporting its employees from home to work. The van qualifies as a "commuter highway vehicle" within the meaning of Q-1b and section 132 (f) (5) (B) of the Code. V elects to value employee travel in its vans using the commuting valuation rule. In one month, Employee C commutes to and from work in V's van 20 days. Under the commuting valuation rule, the value of each one-way commute is $1.50 (for a total of $3 per day); therefore, the value of C's travel for the month is $60. The full value of the benefit is excludable from C's gross income because it does not exceed the statutory limit. See Q-2d and Q-2e for the rules governing the treatment of amounts in excess of the statutory limit and payments by employees for in-kind qualified transportation fringes.

b. Van pool operated by employees. Cash reimbursements by an employer to employees for transportation in a van pool
operated by employees independent of their employer are excludable as qualified transportation fringes, provided the van qualifies as a "commuter highway vehicle" as defined in sections 132 (f) (5) (B) of the Code. The amount that may be excluded from an employee's income is limited to $60 per month. See Q-3b for the rules governing cash reimbursements.

c. Private or public transit-operated van pools. The qualified transportation fringe exclusion is available for transit passes for travel in van pool owned and operated either by public transit authorities or by any person in the business of transporting persons for compensation or hire. The van must seat at last six adults (excluding the driver). See Q-3c for the special rule for cash reimbursements for transit passes.

Q-10: How is the value of parking determined?

a. In general. The valuation rules of section 1.61-21(b) of the regulations apply both for purposes of determining whether the amount of qualified transportation fringes exceeds the amount (if any) includable in income. Generally, the value of parking provided by an employer to an employee is based on the cost (including taxes or other added fees) that an individual would incur in an arm’s-length transaction to obtain parking at the same site. If that cost is not ascertainable, then the value of parking is based on the cost that an individual would incur in an arm’s-length transaction for a space in the same lot or a comparable lot in the same general location under the same or similar circumstances. An employee’s subjective perception of the value of the parking is not relevant to the determination of its fair market value.

Example. Employer Z operates an industrial plant in a rural area in which no commercial parking is available. Z furnishes ample parking for its employees on the business premises, free of charge. The parking provided by Z has a fair market value of $0 because an individual other than an employee ordinarily would not pay to park there.

b. Rate. Under the general valuation rules of section 1.61-21(b) of the regulations, the monthly rate may be used to determine a monthly value rather than the daily rate multiplied by the number of days in the month. If an annual rate is available, the monthly rate may be determined by dividing the annual rate by twelve. If a space is available for less than a month, the space may be valued according to the daily rate multiplied by the number of days the employee has access to the space. In no case is it necessary, however, for the monthly value to exceed the monthly rate. The rates described above may only be used if they are available to the general public.
c. Parking available primarily to customers. Employer-provided parking that is available primarily to customers of the employer, free of charge, will be deemed to have a fair market value of $0. This rule does not apply, however, if an employer maintains "preferential" reserved spaces for employees. A reserved space if "preferential" if it is more favorably located than the spaced available to the employer's customers.

Example 1. Employer X's place of business is situated in a shopping mall. Ample free parking is available to X's customers and employees alike in the mall parking lot. None of the spaces is reserved for employees. The parking provided to X's employees is deemed to have a fair market value of $0.

Example 2. Employer Y's place of business is situated in a shopping mall. Ample free parking is available primarily to customers in the mall parking lot. Spaces reserved for employees are not close to the mall than the spaces available to customers. The spaces reserved for employees have a fair market value of $0 because the spaces are not "preferential" reserved spaces.

Example 3. Employer Z provides ample free parking to its employees and customers. Z maintains a separate lot near the entrance to its business premises for management level employees. Customers are not permitted to park in the employees' lot, but may park in the customer lot across an access road from Z's business premises. The parking provided to Z's employees in the separate lot is preferential reserved parking.

d. Parking valued according to access rather than use. The value of the parking subject to tax under section 61 of the Code is the right of access on any given day to employer-provided parking, and not the actual use of the parking by the employee.

Example 1. Employer V maintains a parking lot for its employees. V requires its employees to apply for parking spaces prior to the month in which the space is to be used. V distributes a monthly parking pass to each employee who applies to park and does not allow anyone without a pass to park in its lot. No value in includible in the gross incomes or employees who do not apply for parking passes because they do not have access to employer-provided parking. The value of parking provided to employees who apply for and receive passes is the full monthly value.

Example 2. Employee D has unlimited access to qualified parking provided by Employer M. During one particular month, D used the parking space 5 days, because D was away on business travel for 1 week and on a personal vacation for 2 weeks. Because D had access to the parking space for the entire month, the amount includible in D's gross income is the amount by which full monthly
fair market value exceeds the statutory limit ($155). See Q-2d. See also Q-2e for the result if M charges D for the parking.

Q-11: How does section 132 (f) interact with other fringe benefit rules?

Under section 132(f) (7) of the Code, a de minimis fringe does not include any qualified transportation fringe. If, however, an employer provides local transportation, other than transit passes or transportation in a commuter highway vehicle, the value of the benefit may be excludable, either totally or partially, under fringe benefit rules other than the qualified transportation fringe rules under section 132(f).

a. Occasional local transportation fare. Section 1.132-6(d) (2) (i) of the regulations provides that local transportation fare (such as taxi fare) provided to an employee is excludable from income as a de minimis fringe if the benefit is reasonable and is provided on an occasional basis because overtime work necessitates an extension of the employee’s normal work schedule.

b. Transportation provided under unusual circumstances. Section 1.132-6(d) (2) (iii) of the regulations provides that if an employer provides transportation (such as taxi fare) to an employee for use in commuting to, from, or both to and from work because of unusual circumstance and because, based on the facts and circumstances, it is unsafe for the employee to use other available means of transportation, the excess of the value of each one-way trip over $1.50 per one-way commute is excluded from gross income.

c. Valuation of local transportation provided to "qualified" employees. Section 1.61-21(k) of the regulations provides a special valuation rule for location transportation provided, solely because of unsafe conditions, to "qualified" employees who would ordinarily walk or use public transportation to and from work. If unsafe conditions exist and the employee is valued at $1.50 per one-way commute. Because section 2.61-21(d) is a special valuation rule under section 61, it is not affected by section 132 (f) (7). Therefore, employers may continue to provide local transportation to employees meeting the requirements of section 1.61-21(k).

Q-12: When and how do employers withhold and report the value of qualified transportation fringes includible in gross income?

a. Noncash benefits. Taxable fringe benefits are ordinarily treated as wages for federal income tax withholding, Federal Insurance Contributions Act, and Federal Unemployment Tax Act
purposes and are reported on an employee's Form W-2, Wage and Tax Statement. Employers may use the guidelines in Announcement 85-113, 1985-31 I.R.B. 31, for reporting and withholding on taxable noncash fringe benefits. Announcement 85-113 provides that employers may elect, for purposes of the FICA, the FUTA, and federal income tax withholding purposes, to treat noncash fringe benefits as paid on a pay period, quarterly, semi-annual, annual, or other basis, provided that the benefits are treated as paid no less frequently than annually.

b. Cash reimbursements. Because employers may not use Announcement 85-113 for cash reimbursements to employees (for example, cash reimbursements for transit passes or qualified parking), cash reimbursements in excess of the statutory limits under section 132(f) of the Code are treated as paid for employment tax purposes when actually paid. Employers must report and deposit the amounts withheld in addition to reporting and depositing the amounts withheld in addition to reporting and depositing the employer portion of the FICA taxes and the FUTA tax. See Q-3b for the rules governing cash reimbursements.

Q-13: How do employers report income for qualified parking provided to car and van pools?

a. Prime member. If an employee obtains a qualified parking space as a result of membership in a car or van pool, the individual to whom the parking space is assigned, the “prime member” must bear the tax consequences attributable to that space. If the space is not assigned to a particular individual, then the employer that provides access to the space must designate one of its employees as the person who will bear the tax consequences. The employer of the prime member is responsible for reporting any taxable income to the employee.

An amount of money (reasonably calculated to cover actual costs, including taxes) received by a prime member from fellow car or van pool members for their share of transporting them to and from work constitutes reimbursement by them for the operation of the vehicle for their mutual convenience. This money is not includible in the gross income of the prime member for federal income tax purposes. Rev. Rul. 55-555, 1955-2 C.B. 20. See also Rev. Rul. 80-99, 1980-1 C.B. 10.

b. No aggregation of exclusions. Members of a car or van pool are not permitted to combine their $155 parking exclusions for the pool. For example, employees L, M, and B belong to a car pool and use, at no charge, qualified parking worth $165 a month. M is designated as the “prime member” of the car pool and must bear the tax consequences. M may not use the exclusions attributable to B.
Accordingly, M must include $10 per month in gross income, the amount by which the fair market value of the parking exceeds the excludable amount.

Q-14: What is the effective date of section 132 (f)?

a. Effective date. Section 132(f) of the Code applies to benefits provided after December 31, 1992. The rules in this notice can be applied to comply with section 132(f) of the Code for benefits provided after December 31, 1992, and before April 1, 1994, and must be applied to comply with section 132(f) for benefits provided after March 31, 1994.

b. Transition rule. For qualified transportation fringes provided after December 31, 1992, and before April 1, 1994, employers may use any reasonable good faith method of compliance with section 132(f) of the Code in lieu of the rules contained in this notice. Efforts to comply with section 132(f) of the Code and to determine the fair market value of benefits that differ from the rules contained in this notice will be considered reasonable good faith compliance so long as they are based on a reasonable good faith interpretation of section 132(f).

PARKING CASH-OUT: The President's Parking Subsidy Reform Program

The Problem
- The average home-to-work trip results in about 0.8 tons of carbon per year
- Home to work trips are a primary contributor of urban smog and poor air quality in US cities
- The rush hour means traffic congestion and the need to spend scarce resources on new road construction

Free Parking at Work is an Ubiquitous Fringe Benefit
- 95% of all Americans who drive to work receive free parking from their employers
- Even in the central business districts of the largest US cities, over half of all commuters who drive to work receive free parking from their employers
- Almost no one is offered the choice of a cash allowance or other benefit instead of parking

Who pays for "free" parking?
- US businesses spend $40-$70 billion per year on 'free' parking spaces.
- All of this parking is tax-exempt, a loss to the Treasury of $12-$25 billion per year
- Since free parking is an invitation to drive, it raises the cost of maintaining the highways.
Driving means pollution, which increases industry's burden in meeting clean air goals.

What is the Tax Exemption for Parking at Work?
- Section 132 of the Internal Revenue Code qualifies employer-provided parking as a 'transportation fringe benefit'
- Makes offering free parking tax-smart
  - Tax-Deductible business expense for employers
  - Tax-free income for employees (up to $155 per month)
  - Also untouched by state income, social security, unemployment, and other taxes
- Makes offering other choices tax-stupid
  - Parking tax break is lost if other options are offered (even if employees choose parking)
  - Transit passes have a tax break, but less than half the size of that for parking.

The President's Cash-Out Proposal
- Keeps the tax advantages of free parking, but makes it tax-smart for employers to offer cash and transit pass options as well.
- Increases commuter choices, but does not add business costs or tax burdens
- Amend Internal Revenue Code Section 132(f) paragraph(5)(C), which defines qualified parking:
  - Qualified Parking-The term 'qualified parking' means parking provided to an employee on or near the business premises of the employer...
- By adding the following cash-out provision:
  - ...if the employer offers the employee the option to receive, in lieu of the parking, the fair market value of the parking, as taxable cash or a qualified transit subsidy.

Cash Out Makes the Tax Code Work for the Environment
- Parking provided by employers to employees is, as before, tax-deductible and tax exempt
- But only if parking is offered with the choice of a commuter allowance equal to the cost of the parking.
  - The commuter allowance may be taken by employees in the form of cash, which would be taxable income to the employee
  - Up to $60 per month of the commuter allowance may be taken in the form of a transit pass, which would be tax-exempt
The Proposal:
Cash Out Employer-Provided Parking Subsidies
- Make the tax code work for the environment: Encourage employers to offer workers who get free parking the option of taking cash or a transit pass instead.
- Keep parking tax free and do not increase costs to business
- Target urban areas where parking costs more, and employers with greater flexibility to reduce parking costs.

The Benefits: More Choices Mean Less Pollution
- More choices for commuters
- Without significant increased cost to employers
- Cleaner air and reduced greenhouse gas emissions
- Less traffic congestion
- Lower costs for Clean Air Act compliance
- A boost to transit, carpooling, and other commuting alternatives
- A positive step for downtown business

Under Current Law, it is Tax-Smart for Employers to Offer only Free Parking

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For a typical married worker with total family income of $50,000
California's Cash Out Law
- Requires employers who offer subsidized parking to also offer the choice of a cash allowance in lieu of parking to employees
- Reason
  - Subsidized parking creates a strong incentive for solo commuting, leading to traffic congestion and air pollution
  - When offered the choice of a cash allowance, many employees choose to take it and find other ways to get to work
- Expected Impacts
  - Improved air quality and reduced fuel use
  - Reduced traffic congestion
  - Increased transit ridership, carpooling and biking to work.
- Passed with bipartisan support

Where it is offered, the Cash Out Option Works
- California Chamber of Commerce, Sacramento
  - The cash option was offered to all 85 employees. 23% gave up their parking spaces for cash in the first year.
- Sierra Research, Sacramento
  - The cash option was offered to all 31 employees of this small firm. 9 employees (29%) chose cash over parking.
- City of West Hollywood, CA
  - Offered cash out to city employees and quickly reduced driving to work by 16%.
- Warner Center, West LA
  - When given the opportunity to save money by giving up a parking space, employees of a large firm reduced solo driving by nearly 1/3, although the building is not well served by transit. Carpool participation shot up from 6% to 31% of employees.

Commuter Cash is good for Downtown Business
- Because downtown parking is more valuable, downtown employers can offer more commuter cash to their employees.
- Vacated parking spaces make downtown more attractive to shoppers and other commerce
- Downtown congestion is reduced
- Reduced demand for parking means less need for new garages, more room for downtown development.
The Cash Out Provision would be applicable to employer-paid parking:

- Provided by firms of 25 or more employees
- Located primarily in urban areas
- Located in a controlled parking lot
- Not owned by the employer
- Not offered to military personnel
- But all employers may participate
PARKING SUPPLY AND PRICING MANAGEMENT

Module Goals

- Demonstrate the relationship of parking policies to mode choice.
- Identify the types of parking management strategies.

Assumptions

- The relationship of parking to mode choice is generally understood by participants but they are unaware of the degree of its effect.
- The TDM community is divided on the tax treatment of parking as a working condition fringe benefits.

DEFINITION

Parking management is a set of strategies used to balance the supply and demand for parking. Parking management also is one of the most powerful tools used to modify mode choice. The decision of commuters to drive alone, carpool, vanpool, or use mass transit is strongly influenced by:

1. ___________________________
2. ___________________________
3. ___________________________

The benefit of a parking management program for an employer is that it can substantially reduce the need for parking and it will modify the mode split. In most urban areas, it costs a minimum of $1,800 per space for a surface parking space, $5,000 to $10,000 per space for an above ground parking deck, and up to $20,000 per space for below ground parking. There are also on-going costs for maintaining and operating of parking lots. A parking management program can result
in major cost savings for the employer or developer. Some employees like parking management programs because they reward the non-solo drivers for choosing an alternative mode. Parking management programs can also reduce traffic congestion.

The parking pricing and travel allowance strategies are ideal for a setting in which on street and/or off street parking supply is limited and expensive. Initially, most pricing programs are faced with antagonism from the employees. Preferential parking works best in areas where parking is cheap and abundant. Preferential parking is not appropriate where parking is convenient and near the entrances.

A review of studies which have documented the changes and travel behavior clearly demonstrates the effectiveness of ending or reducing parking subsidies. The solo driver mode share has been shown to decrease between 18 and 81%.

PARKING MANAGEMENT MEASURES

- Supply Measures
  - Zoning
  - Flexible Parking Requirements
  - Facility Operation
  - Parking Caps
  - Preferential Parking
  - Park-and-Ride
  - Fringe Parking

- Demand Measures
  - Pricing
  - Employer Subsidized Transportation
  - Transportation Allowance
  - Parking Taxation

- Enforcement Measures
  - Ticketing
  - Towing/Vehicle Immobilization
  - Adjudication

- TDM Measures
  - TMAs, CAPs
  - Transportation Management Districts
DESCRIPTION OF STRATEGY

Local Parking Policy

The public sector plays several roles in parking:

- Setting "parking requirements" in codes.
- Building and managing off-street parking supply.
- Controlling the supply and regulation of on-street parking.
- Influencing the revenues and rates charged by private providers of parking.

The Federal government also influences parking policy. The IRS exempts from taxes free or subsidized parking offered by employers to employees up to $_____ per month. The result is more employee demand for parking, higher local parking requirements and less incentive for use of transit and ridesharing compared to the case where subsidized parking is taxed.

Considerable recent and past research suggests that supply and price of parking may be the most potent demand management strategy.

Pricing

Governments may take several approaches to pricing parking. They may:

- Impose or increase fees and surcharges for solo drivers or long-term parkers in public parking facilities;
- Give price preference to carpools and vanpools;
- Tax the providers of parking, whether commercial operators of parking or all public and private entities providing parking;
- Impose parking pricing through regional regulations, for example air quality regulations or special legislation; and
Especially regarding state government, tie funding allocations for road improvements to requirements for local trip reduction plans incorporating parking pricing among other demand management strategies.

Employers, developers, and Transportation Management Associations also can play a role in pricing. One or more of these entities can:

- Remove, reduce, or cash out employer-provided parking subsidies (see the following table that converts the value of an employer subsidy for parking to a per-mile subsidy);
- Reverse “early bird” or monthly discounts favoring long-term commuter parking;
- With or without government regulation, impose parking pricing and discount parking for carpoolers where free parking prevails, or where carpoolers enjoy no price breaks; and
- Develop parking regulations and pricing for commercial and retail mixed-use areas and manage and enforce parking.

| Equivalent Cost per mile for Employer-Paid Parking. Assumes a 10-mile commute |
|----------------------------------|-----------|-----------|-----------|-----------|
| Average Parking Price | Subsidy Rate |
|                       | 25% | 50% | 75% | 100% |
| $25               | $0.01 | $0.03 | $0.04 | $0.06 |
| $50               | $0.03 | $0.06 | $0.09 | $0.12 |
| $75               | $0.04 | $0.09 | $0.13 | $0.18 |
| $100              | $0.06 | $0.12 | $0.18 | $0.24 |

Supply Management
Localities influence the supply of parking at and around developments through:
Parking code measures;

On-street controls (meters, timed zones, neighborhood preferential parking); and

Controls on the amount of parking built and operated by the public sector.

Parking codes establishing the amount of parking developers must provide ("minimum" required) can be set with low minimums and/or maximums ("maximum" which can be provided) to insure overly ample supplies are not provided. Or, localities can allow reductions in minimum requirements ("flexible" requirements) in return for traffic mitigation. Developers can reduce the minimum amount of parking required in return for supporting transit, carpooling, cycling and other alternatives to solo driving.

NATURE OF EFFECTIVENESS

Pricing

The effectiveness of parking pricing in reducing solo driving and increasing use of alternative modes of travel depends on several factors, including:

The level of price and the share of cost actually borne by the traveler; and

The attractiveness of travel and parking alternatives.

With regard to the attractiveness of alternatives at least two factors are important to the effect of pricing:

Generally, pricing can be expected to be the most effective in shifting commuters to alternative modes where the quality of those modes is higher. The following tables show the impact on solo driving and number of vehicles per 100 employees before and after introducing a charge for parking program.
### How Employer Parking Subsidies Affect Solo Driving

<table>
<thead>
<tr>
<th>Case Study and Type</th>
<th>Solo Driver Mode Share</th>
<th>Decrease in Solo Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employer Pays for Parking</td>
<td>Driver Pays for Parking</td>
</tr>
<tr>
<td>Mid Wilshire, Los Angeles (Before/After)</td>
<td>42%</td>
<td>8%</td>
</tr>
<tr>
<td>Warner Center, Los Angeles (Before/After)</td>
<td>90%</td>
<td>46%</td>
</tr>
<tr>
<td>Century City, Los Angeles (Before/After)</td>
<td>92%</td>
<td>75%</td>
</tr>
<tr>
<td>Civic Center, Los Angeles (with/without)</td>
<td>72%</td>
<td>40%</td>
</tr>
<tr>
<td>Downtown Ottawa, Canada (Before/After)</td>
<td>35%</td>
<td>28%</td>
</tr>
<tr>
<td>Average of Case Studies</td>
<td>66%</td>
<td>39%</td>
</tr>
</tbody>
</table>

Source: Richard W. Wilson and Donald C. Shoup, "Parking Subsidies and Travel Choices: Assessing the Evidence"

### How Employer Parking Subsidies Affect Auto Trips

<table>
<thead>
<tr>
<th>Case Study and Type</th>
<th>Autos Driven per 100 Employees</th>
<th>Decrease in Solo Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employer Pays for Parking</td>
<td>Driver Pays for Parking</td>
</tr>
<tr>
<td>Mid Wilshire, Los Angeles (Before/After)</td>
<td>48</td>
<td>30</td>
</tr>
<tr>
<td>Warner Center, Los Angeles (Before/After)</td>
<td>92</td>
<td>64</td>
</tr>
<tr>
<td>Century City, Los Angeles (Before/After)</td>
<td>94</td>
<td>80</td>
</tr>
<tr>
<td>Civic Center, Los Angeles (with/without)</td>
<td>78</td>
<td>50</td>
</tr>
<tr>
<td>Downtown Ottawa, Canada (Before/After)</td>
<td>39</td>
<td>32</td>
</tr>
<tr>
<td>Average of Case Studies</td>
<td>70</td>
<td>51</td>
</tr>
</tbody>
</table>

Source: Richard W. Wilson and Donald C. Shoup, "Parking Subsidies and Travel Choices: Assessing the Evidence"
Supply Management

The supply of parking is an important determinant underlying commuter choice of travel mode. Generally, the tighter the parking supply, the more likely drivers will consider using alternative modes. The relevant "supply" includes all available parking to commuters, both on and off-site within walking distance. Evidence for the importance of parking supply comes from two recent studies.

Localities with the best prospects for realizing reductions in solo driving through parking supply restraints are where some or all of the following conditions apply:

- Developer and lender preferences or minimum parking codes result in more parking than is utilized. In such settings, minimums might be lowered if they are the cause of overly ample supplies. Or, maximums might be imposed to prevent developers and lenders from creating excessive supplies.

- Mixed uses are available or planned where parking supplies can be shared. In this setting, localities can negotiate for parking supplies serving several compatible uses instead of separate and more extensive supplies serving each use.

- Commercial and public parking is well utilized, thereby limiting opportunities for parkers to simply shift parking locations as supplies are tightened.

- The costs of providing parking are high compared to traffic mitigation alternatives. In such settings, developers and lenders may be more willing to reduce supplies.

- Transit capacity is frequent and not saturated, offering a good alternative for drivers affected by tightened supplies.

- Uncontrolled supplies (streets, vacant land, neighborhoods) are at a minimum or new controls are planned.
APPLICATION SETTING

Pricing

Pricing can be applied to:

- Individual developments and employers;
- Entire employment centers in urban or suburban settings;
- Public facilities, typically in downtown areas;
- Commercial parking through rate regulation or parking taxes; and
- Regions through air quality or funding allocations legislation.

National surveys show private off-street parking makes up from 15 to 60 percent of all off-street parking depending on the locality. Thus, the focus on public versus private and commercial parking will vary from locality to locality.

The best candidate localities for pricing strategies are those where some amount of parking pricing already is in place. These strategies are the most applicable where:

- The public supply makes up a substantial proportion of the total parking supply;
- There are few opportunities for spillover parking (into retail or neighborhood areas with no pricing or parking regulation); or
- Transit into the priced zone has some capacity or will be improved.

Two other opportunities are important to consider. "Early bird specials" These policies might be reversed through regulation or negotiation with the commercial parking industry. Another opportunity exists where employers provide parking subsidies to employees. ("cash out") One study of Los Angeles commuters estimates the cash out might reduce solo driving by as much as 24 percent.
Supply Management

The best candidate localities for supply strategies may be suburban communities. Surveys of suburban office parks show supplies between 3.5 and 4.0 spaces per 1,000 square feet of floor space, and surveys of usage in California and Texas found office workers only required about 2.2 spaces per 1,000 square feet.

- Nuclear Regulatory Commission, 12 percent reduction in solo driving compared to before pricing (though the 42 percent solo share is about 40 percent below solo shares of other employers in the area);
- Bellevue City Hall, 17 percent compared to before pricing;
- CH₂MHill, 25 percent compared to before pricing;
- Twentieth Century Corporation, 25 percent decline; and
- Pacific Northwest Bell, 40 percent lesser proportion of solo drivers compared to other employers in the area.

Parking pricing again has been effective. However, several of the cases suggest certain cautions in designing pricing programs:

- City of Madison: The City imposed a peak period surcharge of $1.00 at four parking facilities combined with new shuttle service. Five to eight percent of commuters switched to transit. However, 22 percent shifted parking location, and six percent parked after the peak.

- City of Seattle: The City reduced parking charges for carpoools at two Seattle parking facilities downtown, from $25 to $5 per month at one facility and $0 at another. Twenty-five percent of the participants in the program were previous solo drivers, suggesting considerable trip reduction. However, some participants were previous transit users (45 percent) and carpoolers (29 percent), suggesting the importance of monitoring the effects of pricing programs on all modes of travel.
Managing Our Way Through Congestion

- **U.S. Federal Government:** The Federal Government charged employees for parking at selected federal facilities, reversing a previous policy of free parking. Rates were changed from mostly free to one-half the rates at nearby commercial lots. The reduction in the number of autos commuting ranged from one to 10 percent in central city areas, and between two and four percent in suburban locations.

- **City of Chicago:** The City raised rates from 30 to 120 percent, bringing fees up to levels at nearby commercial space. Number of all-day-parkers arriving before 9:30 a.m. dropped 72 percent. Revenues from municipal facilities increased. The important lesson from this case is the potential that pricing has to not only reduce long-term parking and influence mode of travel, but to increase parking revenues at public facilities.

The potential for pricing to shift where parking takes place, and the need for enforcement strategies to accompany pricing.

**Supply Management**

Parking supply strategies also have exhibited success in trip reduction through increased transit use and reduced solo driving. Two examples illustrate the execution of parking code supply management strategies, and results associated with the strategies:

- **Portland, OR:** The parking code sets a maximum number of parking spaces allowed depending on proximity to transit, with no minimum except for residential uses.

**TRAVEL AND TRAFFIC IMPACT POTENTIAL**

This study reviewed 22 individual TDM programs and both documented the elements of their TDM program and estimated their effectiveness in reducing vehicle travel. It becomes quite apparent when reviewing the experience of these particular programs that parking management measures are key to the performance of the successful examples.
Effectiveness of Parking Management Measures in Employer TDM Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Type Area</th>
<th>Vehicle Trip Reduction</th>
<th>Parking Charges</th>
<th>Restricted Parking</th>
<th>Reserved Parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travelers</td>
<td>CBD</td>
<td>47.9%</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>US West</td>
<td>SBD</td>
<td>47.1</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NRC</td>
<td>ISI</td>
<td>41.6</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GEICO</td>
<td>SBD</td>
<td>38.6</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CH&amp;M Hill</td>
<td>SBD</td>
<td>31.2</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>State Farm</td>
<td>SBP</td>
<td>30.4</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pacific Bell</td>
<td>SBP</td>
<td>27.8</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hartford Steam</td>
<td>CBD</td>
<td>26.5</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Swedish Hospital</td>
<td>ISI</td>
<td>26.1</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bellevue</td>
<td>CBD</td>
<td>22.7</td>
<td>Yes</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>City Hall</td>
<td>ISI</td>
<td>21.0</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>San Diego Trust</td>
<td>CBD</td>
<td>19.1</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>&amp; Savings</td>
<td>CBD</td>
<td>17.7</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pasadena</td>
<td>SBP</td>
<td>13.4</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>County</td>
<td>OSI</td>
<td>13.0</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>COMSIS</td>
<td>SBD</td>
<td>10.5</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>3M</td>
<td>OSI</td>
<td>9.7</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Allergan</td>
<td>SBP</td>
<td>7.0</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>UCLA</td>
<td>ISI</td>
<td>5.5</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Chevron</td>
<td>SBP</td>
<td>3.7</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

1 Key: CBD = Central Business District
        SBD = Suburban Business District
        ISI = Inner Suburb, Isolated
        OSI = Outer Suburb, Isolated
        SBP = Suburban Business Park

COST EFFECTIVENESS

Pricing

Implementation costs depend on whether a pricing action is merely a change in existing pricing or whole new pricing plan. It also depends on whether or not pricing is packaged with other strategies such as expanded TDM services.

The resulting economic benefits are generally substantial for imple-
menting parking pricing strategies but the direct costs are not. For example, when San Francisco implemented the parking tax, gross revenues from the tax amounted to $5.5 million per year. Parkers may not divert to commercial lots because the price hikes brought prices up to those found at those commercial facilities.

Supply Management

For the public sector there will be little cost implication, provided only new minimum or maximums are implemented. In this case, however, flexible requirements will require more administrative review of proposed traffic mitigation strategies and plans.

For the private sector, cost implications are greater. Where developers provide less parking due to new minimums, maximums or flexible requirements, there will be cost savings in parking spaces provided. An evaluation of costs and benefits of employer traffic mitigation programs and reduced parking requirements in King County estimated savings in construction costs for structural lots at $4,200 per space and annual operation and maintenance at $200 per year.

As an illustration of the cost effectiveness of a parking management strategy, consider a developer allowed or required to reduce the amount of on-site parking in return for implementing a demand management program:

Cost-effectiveness of a Parking Management Strategy to Developers (Example)

<table>
<thead>
<tr>
<th>Developer Costs:</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor &amp; Fringes</td>
<td>60,000</td>
</tr>
<tr>
<td>(part-time TDM Coordinator and secretary)</td>
<td>10,000</td>
</tr>
<tr>
<td>Amortized Fixed costs</td>
<td></td>
</tr>
<tr>
<td>Showers, information centers and bike racks</td>
<td></td>
</tr>
<tr>
<td>Total Costs</td>
<td>70,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Developer Savings:</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amortized value of Parking reduction</td>
<td>95,500</td>
</tr>
<tr>
<td>(1,000 spaces @$900 30yrs@10%)</td>
<td></td>
</tr>
<tr>
<td>Operations &amp; maintenance @$100/space</td>
<td>100,000</td>
</tr>
<tr>
<td>Total Savings</td>
<td>195,500</td>
</tr>
</tbody>
</table>

| Total Net Savings | 125,500 |
| Total Net Savings per day (261 workdays per year) | 481 |
| Cost per trip reduced (assume 100 trips reduced) | 4.81 |
IMPLEMENTATION ISSUES

Pricing

1. Objectives and Instruments

Parking pricing serves the objective of trip reduction. Whether by way of increased rates or surcharges at public and private facilities, removal of parking subsidies, implementation of regulations and developer agreements encouraging parking pricing as a demand management measure, changes in early-bird or other rate schedules in commercial parking, parking taxes or other means, pricing can reduce vehicle trips significantly in both suburban and urban settings.

2. Implementation

Once objectives are clearly established, the next step is an assessment of certain key variables. Depending on objectives, it will be important to estimate:

- Character and size of the travel market to whom the actions will be applied, including the proportion of through traffic;
- Amount of use of available parking supplies, including overall demand as well as proportion of long- versus short-term use and shoppers versus commuters;
- Availability of parking nearby the priced zone, to assess spillover parking potential;
- Difference between public and private parking supplies and rates, since some parkers may simply shift to commercial facilities if public rates exceed commercial rates;
- Whether pricing mechanisms are already in place or must be stated from scratch (particularly in suburban areas);
- Degree of employer subsidization of employee parking;
- Quality and capacity of transit services, carpool matching programs, bicycling facilities and other alternatives to solo...
Managing Our Way Through Congestion

driving;

- Available policy instruments, including demand management ordinances and developer agreements which might be modified to encourage pricing, or state or county funding allocation formulas and legislation (e.g., Congestion Management Plan) which might be modified to encourage pricing; and

- Local regulatory power over commercial parking rates, and authority to implement and enforce parking taxes.

With this information in hand, planners can then devise possible alternatives for consideration. For example, if the objective is to reduce traffic and vehicle trips in a core downtown area or activity center, a good candidate for consideration would include rate hikes or surcharges in public facilities, carpool discounts and public transit encouragements. Important considerations in determining the worth of such strategies include:

- What proportion of parking does the public sector control?

- Are public sector rates below or at a par with commercial rates?

- Is through traffic a large proportion of traffic in the zone?

- Are employees generally subsidized for parking or not?

- Are transit capacity and carpool matching services good or will they be improved with the pricing program?

The simplest public sector pricing option may be to increase rates to near commercial rates without altering rate structure. A more aggressive policy would be to increase rates more for long-term parkers while promoting transit and carpooling. A parking surcharge for morning entry might also be considered, though the surcharge should be applied to most facilities because commuters are likely to simply shift parking destinations if surcharges are in place at only a few facilities. For maximum effect, priced parking permits can be required for parking in the zone both on and off-street.
Implementation rate hikes in the public sector may be the easiest to accomplish of all pricing options. No new authority is required. No new pricing technology or enforcement procedures are needed. Of course, public acceptance and decision-maker approval may well stand in the way of implementation, but some likely objections can be met with careful planning. Some key issues include:

- Where increased revenues will go;
- Whether shoppers will find more or less parking available;
- Whether parkers will shift to unprotected neighborhood streets; and
- Whether low income workers are disadvantaged.

Collateral actions will be important to implementation feasibility. Important actions to consider include:

- Increased transit and carpool services;
- Preferential parking for residents in nearby neighborhoods;
- Set-aside or validated parking for shoppers;
- Preferential parking by location and rate for carpools; and
- Increased enforcement funded by increased revenues.

Finally, any parking pricing scheme must be monitored and evaluated. Parking managers and planners should track:

- Mode shares of commuters into the zone;
- Parking utilization and turnover at priced facilities and at nearby facilities and streets;
- Parking violations and meter feedings. Some commuters can be expected to feed meters and shuffle cars in time-restricted zones; and
- Parking revenues, along with any increased costs associated with the program.
SUPPLY MANAGEMENT

1. Objectives and Instruments

Parking supply measures support the objective of trip reduction. Revising minimum or maximum rates, allowing below minimum rates in proximity to transit or for demand management programs, and providing shared parking at mixed-use developments, are all important considerations in a trip reduction program.

2. Implementation

Implementing maximum rates or flexible parking requirements does not involve significant implementation barriers. Nor are there difficulties in specifying designated carpool parking in developer agreements or codes. Localities typically have the authority to regulate parking supplies by way of parking requirements in codes. Thus, only code modification are required, supported by periodic parking demand studies.

Careful assessments must be made to determine levels of parking demand and lender and developer preferences before instituting maximums, minimums or flexible requirements.

Incentives for reduced requirements must be attractive not only to employees but to developers as well. Generally, developers prefer one-time actions or fees rather than long-term operational commitments as incentives for any public benefit action. For example, developers in Chicago routinely take advantage of relaxations in minimum parking requirements in return for physical connections between office developments and transit stations. However, as the Hartford case suggests, developers are much less inclined to operate park-and-ride service over some extended period of time. They probably would prefer to make one-time payments to a fringe or regional park-and-ride lot system.

Tight maximum requirements near transit stations and trunk lines should be implemented only after assessing what the market (developers and lenders) provides and prefers to provide, and what is the current level of parking demand in the vicinity of transit facilities. This approach minimizes the risks of setting maximums above usual levels of demand and/or market preference.
ADVANCED TECHNOLOGIES IN TDM

Module Goals:

- To discuss the evolution of Advanced Technologies (AT) and future direction.
- To identify the functional areas of AT with applications in the TDM field.

Assumptions:

- AT holds the potential for improving the performance of transit and TDM.
- Workshop participants have little experience or exposure to AT and Intelligent Transportation Systems (ITS) (formerly known as Intelligent Vehicle Highway Systems (IVHS)) applications in the TDM environment.
- As congestion grows, so will the interest in congestion pricing.

List some of the Benefits of Advanced Technologies to TDM:

Advanced technologies is a new field which strives to solve transportation problems with technology applications. Many of the product and service providers are corporations that got their problems, this field has become socially and politically accept-

"We must integrate all modes of transportation into a seamless, intermodal system for moving goods and people. The application of IVHS technologies will be crucial to the creation of a truly intermodal National Transportation System."

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"IVHS technologies will be costly and their commercial success is uncertain. Their deployment will require substantial investments by the public sector, private industry, and consumers; deployment costs are expected to exceed $200 billion by the year 2011."

- Barry T. Hill, Associate Director, Transportation Issues, General Accounting Office.

In Japan, two federal government agencies conducted parallel research projects.

RACS is a traffic management system for the Tokyo metropolitan area using vehicle equipped with transmitters as "probes" in the traffic network. When a vehicle equipped with a transmitter passes a roadside communication device, the location of this vehicle is recorded and stored in a central computer. By calculating how long a vehicle took to go from point A to point B, the computer can determine the severity of congestion for that road segment. All information is collected at the Tokyo Expressway Control Center and sent through infrared beacons to vehicles equipped with a receiver. The first test of RACS was in March 1987. The system went fully operational in 1990.

In the AMTICS system, an in-vehicle until displays static data stored on CD-ROM, such as maps, local traffic regulations, location of parking lots, hospitals, gas stations and other useful information. The system's "dynamic" component uses roadside beacons to provide real-time information on traffic conditions, weather and accident warnings and parking space availability.

The problem is that these two projects use entirely different media to communicate between vehicle and roadside. The Ministry of Industrial Trade and Industry (MITI) is trying to integrate the two systems through a program called VICS.

At the same time in Europe, the automotive and electronics industries sponsored Prometheus - an $800 million program designed to enable European companies to pool their IVHS research efforts. (In Europe, IVHS goes by the acronym "RTI" or "Road Transport Informatics"). The final goal of the program is to develop products such as "intelligent vehicles" and "electronic flow detectors." Prometheus will fund "pre-competitive" research up to the point where private firms decide to design new products in competition with each other. Prometheus began in 1986. Integration of the result of the hundred of research projects sponsored by the program is scheduled for 1994.

DRIVE is a European Community program of collaborative research and development program. Like Prometheus, DRIVE supports "pre-competitive" research. A major goal of the DRIVE program, however, is to develop standardized technology which can be used by all EC nations.

The EC sponsored a few studies on driver information systems in 1984. The program was formally commissioned by the EC in 1988 and awarded 60 research grants - Phase I of the project - in 1989. Phase II began in 1992 and involves operational tests of the concepts and technologies developed in Phase I.
SIX FUNCTIONAL AREAS OF ITS:

**Advanced Traffic Management Systems (ATMS).** A surveillance system detects traffic conditions in a metropolitan area and transmits the information to a traffic management center. The traffic management center uses the information to:

- Advise people about current and expected traffic conditions,
- Inform people of the location, severity and expected duration of incidents, and
- Recommend the fastest routes for people to take to reach their destinations.

**Advanced Traveler Information Systems (ATIS).** In-vehicle units inform the driver of current traffic conditions and provide real-time guidance on route decisions. ATIS systems can provide safety warnings to the driver, such as hazardous road or weather conditions as well as in-vehicle Yellow Pages-type information on local businesses.

**Commercial Vehicle Operations (CVO).** A shipping company can use computer technology to improve operating efficiency of its vehicle fleet by tasks such as coordinated dispatching and automated record keeping. CVO technologies can eliminate the need for trucks to stop at weighstations and state borders by passing the information in the trucks' paperwork electronically from station to station.

**Advanced Vehicle Control Systems (AVCS).** Vehicle control systems can take all or part of the driving task away from the driver. AVCS functions are generally divided into "near-term" and "long-term" categories:

- Basic AVCS augment driver performance by detecting the presence of obstacles or other vehicles and warning drivers of impending collisions.
- Second-generation AVCS will implement lateral and longitudinal control in specialized lanes. Vehicles would enter the lanes under manual control, but then would be under full or partial control of the AVCS device. This may allow for increased speed concurrent with improved safety.
Third-generation AVCS would completely automate driving functions on specially equipped freeways.

**Advanced Public Transportation Systems (APTS)**
The major focus of APTS is on improving transportation service information for transit customers and for transit vehicle operators. These improvements will encompass increased accuracy, improved timeliness, and increased ease of accessibility. Transit information will become more accessible to travelers in the home, the workplace, or while in transit. It will use changeable message signs and smart cards.

**Advanced Rural Transportation Systems (ARTS)** With over three times the miles of roads than urban areas, ITS applications in rural areas are another key area. These areas often have limited sight distances and present other safety problems. The applications of ITS in rural areas will focus on systems that alert drivers through on-board communication or by variable warning signs as to local weather conditions, visibility problems, flash flooding, stopped school buses and animals on the road.

**The Impact of ISTEA**

The ISTEA created an ITS program within the Department of Transportation and authorized $660 million from FY92 to FY97 to be spent on research and development of ITS technologies.

The operational tests funded in the first two years of the ISTEA legislation include the following (Project names are followed by their location and FY92 federal funding allocation.):

**Advanced Traffic Management Systems**
- SMART Corridor, Los Angeles, CA, $1 million
- GuideStar, Minneapolis-St. Paul, MN, $10 million
- FAST-TRAC, Troy, MI, $10 million

**Advanced Traveler Information Systems**
- ADVANCE, Chicago, IL, $7.5 million
- TravTek, Orlando, FL, $8 million
- DIRECT, Detroit, MI, $750,000

**Commercial Vehicle Operations**
### Glossary of ITS Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADIS</td>
<td>Advanced Driver Information Systems</td>
</tr>
<tr>
<td>ADVANCE</td>
<td>Advanced Driver and Vehicle Advisory Navigation Concept</td>
</tr>
<tr>
<td>AMTICS</td>
<td>Advanced Mobile Traffic Information and Communication System</td>
</tr>
<tr>
<td>ATIS</td>
<td>Advanced Traveler Information Systems</td>
</tr>
<tr>
<td>ATMS</td>
<td>Advanced Traffic Management Systems</td>
</tr>
<tr>
<td>APTS</td>
<td>Advanced Public Transit Systems</td>
</tr>
<tr>
<td>AVCS</td>
<td>Advanced Vehicle Control Systems</td>
</tr>
<tr>
<td>AVI</td>
<td>Automatic Vehicle Identification</td>
</tr>
<tr>
<td>AVL</td>
<td>Automatic Vehicle Location</td>
</tr>
<tr>
<td>CVO</td>
<td>Commercial Vehicle Operations</td>
</tr>
<tr>
<td>DRIVE</td>
<td>Dedicated Road Infrastructure for Vehicle Safety in Europe</td>
</tr>
<tr>
<td>FAST-TRAC</td>
<td>Forum for Advanced Safe Travel Through Routing and Advanced Control</td>
</tr>
<tr>
<td>ERGS</td>
<td>Electronic Route Guidance System</td>
</tr>
<tr>
<td>HELP</td>
<td>Heavy Vehicle License Plate</td>
</tr>
<tr>
<td>IVHS</td>
<td>Intelligent Vehicle Highway Systems</td>
</tr>
<tr>
<td>PATH</td>
<td>Program on Advanced Technology for the Highway</td>
</tr>
<tr>
<td>Prometheus</td>
<td>Programme for European Traffic with Highest Efficiency and Unprecedented Safety</td>
</tr>
<tr>
<td>RACS</td>
<td>Road-Automotive Communications System</td>
</tr>
<tr>
<td>RTI</td>
<td>Road Transport Informatics</td>
</tr>
<tr>
<td>UTCS</td>
<td>Urban Traffic Control System</td>
</tr>
<tr>
<td>VICS</td>
<td>Vehicle Information and Communication System</td>
</tr>
</tbody>
</table>

How can ITS technologies help reduce travel demand?

---

Managing Our Way Through Congestion
HELP/Crescent, Pacific coastal states plus Arizona, New Mexico and Texas, $17.6 million

Advantage I-75, I-75 highway from Miami, FL to Detroit, MI, $2 million

Advanced Vehicle Control Systems
PATH, Richmond, CA, $1.28 million

THE USDOT’S SERVICE PLAN FOR TDM:
The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) authorized $660 million in federal funding over the next six years for research and development for Intelligent Vehicle Highway Systems (IVHS). President Clinton’s economic plan proposed a $12 million annual increase in funding and predicted that IVHS will “improve traffic control systems, warn drivers of dangerous situations, and make more efficient use of the existing highway infrastructure.” (1) Others, however, are not so enthusiastic. Architectural critic Jane Holtz Kay calls ITS a way of “buying time” for a “lifestyle that is economically costly, environmentally unsound, socially inequitable, culturally disastrous and architecturally ruinous.”

Dynamic Ride Matching and Traveler Information Services.
Transportation Management Associations (TMAs) currently use software to analyze commuters’ home and work locations to find probable matches for carpooling. IVHS technologies take this matching process one step further by matching carpoolers on the day of their journey. TMAs can even use a credit system, incrementing the carpool driver’s account and decrementing the rider’s account. Traffic management centers can also contribute to reducing demand by informing the potential SOV user of current traffic congestion and transit and rideshare alternatives.

Real-Time Ridematching Services use:

Communication Technologies
  Phone to Voice-Mail operating systems
  E-Mail at home/desk/office-lobby kiosk
  Electronic pagers distributed by TDM agencies
  Fax-distribution lists

Other Issues
Security/background checks
Flexible program
Payment to driver per ride
Accessed only within member companies

**HOV Facility Management and Control** Using ITS technologies, HOV lanes can be operated and enforced dynamically, in response to current conditions and situations. For example, auto occupancy requirements for an HOV lane could be increased to respond to pollution alerts or reduced in response to an incident on a parallel roadway. Dynamic HOV lanes would require methods to sense environmental conditions and the severity of congestion, plus variable message signs and other ways to communicate the current HOV requirements to drivers. Advanced technologies can also be used to give priority to car pools, van pools and buses at ramp-meters and signalized intersections. The reduced travel time will make ridesharing and public transit more attractive to SOV drivers.

**Congestion Pricing** Similar to the dynamic HOV requirements, toll rates can be adjusted in response to environmental and congestion-related factors. Collection of fluctuating toll rates are easier if tolls are paid automatically, through a transponder mounted on the vehicle. Transit fares can also be lowered during periods where toll rates are high, to meet the increased number of users changing from driving alone.

Implementation issues for congestion pricing include:
- Effects of varied pricing on travel behavior and emissions
- Assessment of political and institutional barriers (i.e., public vs. private ownership, user privacy, standardization of technology, etc.)
- Conditions for most effective pricing
- Who will pay for the costs of IVHS technologies that would enable automatic congestion pricing
- Willingness of different socioeconomic groups to pay (equity)
- Limited number of surveys and pilot programs to provide guidance

One of the methods for collecting tolls is the use of Electronic Toll Collection technology. This technology consists of:
- A vehicle equipped with a transponder (or electronic license plate)
ETC equipment identifies the vehicle
- It has the capability for two-way communication via radio frequency waves
- ETC can be used to implement time-varying tolls (i.e., congestion pricing)
- ETC can be used to collect traffic data more reliably than inductive loop sensors for surveillance and automated incident detection

**Examples of Congestion Pricing**

Section 1012(b) of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 authorizes the U.S. Secretary of Transportation to create a Congestion Pricing Pilot Program.

- Peak-period tolls on congested facilities in order to charge vehicles for their contribution to congestion.
- Allow single-occupant vehicles to pay a toll to use under-utilized separated HOV lanes during congested periods on parallel general purpose lanes.
- Any existing free Interstate bridge or tunnel may be reconstructed and converted to a toll facility.
- The States will make the decision as to whether tolls are to be collected in both directions or in only one direction.
- Federal funds can be used to reimburse a state for loans of state funds for construction of eligible toll facilities.
- ISTEA has authorized a maximum of $25 million for each of the fiscal years 1992-1997 for the Congestion Pricing Pilot Program, with no more than $15 million to be directed to a single project.

**ADVANCED TECHNOLOGIES HARDWARE**

**First Generation**
- Bar code sticker
  - Windshield placement of sticker
  - Similar to grocery scanner of UPC codes
  - Debits account
- Magnetic strip
  - Multi-mode usage

**Second Generation-Read Only**
- Amtech Toll-tag
  - Velcroed to inside of windshield
Unique codes
Radio-wave communication
Maximum range-30 feet
Programmable
Used in Dallas, New York, New Jersey, and Georgia

3M Automatic Vehicle Identification System
Adhered to windshield
Unique codes
Radio wave communication
Up to 15 feet and 55 miles per hour
Not programmable
Used in Denver

Amtech Intermodal and Rail Tag
Bolted to trucks and rail cars
Unique codes
Radio range-240 feet
Programmable
Used nationally

Third Generation-Read and Write

LCD Display card
Mounted inside windshield
Updates driver at time of debit
Balance available on Demand
Radio-wave communication
Programmable

Future

Smart Cards
Universal debit card for all forms of transit, tolls, and parking

The first operational test under the Congestion Pricing Pilot Program in the United States is the Oakland-San Francisco Bay Toll Bridge. Recognized as one of the most congested roadway facilities in America, this project will raise peak-period tolls to manage demand. Congestion charges will be used to encour-
age driver behavior in a manner that will promote the use of alternative times, routes, modes, or trip patterns to reduce congestion. Low-occupancy vehicles will pay an increased toll to travel during the peak periods on the Bay Bridge. At the same time, improvements will be made in the supporting and parallel transit services and rideshare programs.

In Orange County, California, the Transportation Corridor Agencies are incorporating automatic toll collection into the design of three new toll roads. Enabling legislation for the $2.1 billion project dictated that the latest state-of-the-art toll collection systems be used to provide safe, efficient, and congestion-free toll collection. In addition, the toll system is being designed to provide as flexible operating policy as is possible. Variable or congestion pricing will be used to make patrons pay a premium to travel during rush hours, and debit or credit patron accounts to attract more usage during times of the day when the facilities are under-utilized.

In October 1993, the first segment on the first Orange County tollway (Foothill Tollway) opened ending California’s decades old resistance to toll roads. When completed in 2000, the 30-mile toll road will offer a speedy alternative to the often-congested Interstate 5 where 10-mile commutes can take an hour. An electronic toll collection system will automatically deduct tolls from the patron’s account.

The existing Riverside Freeway, State Road 91, also in Orange County represents another example of congestion pricing. The 8-lane freeway currently handles about 225,000 vehicles a day and this daily traffic is expected to reach 340,000 by 2010. With no relief in sight, financing has now been secured for the first privately-owned, fully-automated (non-stop) toll road in the U.S. to be constructed in the freeway median. The toll road will have two electronic toll lanes, and two free or discounted (depending on real-time freeway congestion levels) lanes for high-occupancy vehicles. The existing 8-lane freeway will continue to operate as a “free” road.

What’s to prevent rush-hour traffic jams from spreading to the Riverside Freeway median toll road? The highway’s managers will use congestion pricing to deter drivers whenever sensors and surveillance cameras along the road detect an impending traffic jam. The developer estimates that rush-hour tolls of $2 should be enough to keep congestion from being transferred to
the toll road. But if that price is too low, the roadway's electronic toll collection system and integrated variable message signs will be capable to go as high as $9.99 for the 10-mile trip. This project is expected to open by the end of 1995.

**Why is it needed?**
- $100 billion travel delay costs in U.S. (1990)
- Travel expected to increase 50% by year 2005
- Continuation of highway-oriented land use patterns and transportation systems

**How does it work?**
- Pricing is used to "balance" available capacity and person-movement demand
- Efficient pricing will result in capacity not being exceeded during periods of peak demand

**Pricing methods can include:**
- Control of parking costs
- Direct tolls to users of limited access or over-capacity facilities
- Reduced tolls to SOV's on under-utilized HOV facilities

**What are some of the implementation issues or barriers?**
- Limited number of surveys and pilot programs to provide guidance
- Effects of varied pricing on travel behavior and emissions
- Conditions for most effective pricing
- Willingness of different socioeconomic groups to pay (equity)
- Public vs. private ownership (who pays for and operates the system?)
- User privacy

**Examples:**
- ISTEA Congestion Pricing Pilot Program
- $25 million for each of six years
- Encourages conversion of free roads to toll roads
- States make some major decisions
- Oakland-San Francisco Bay Bridge likely the first project
Managing Our Way Through Congestion

to be undertaken
- Transportation Corridor Agencies (Orange County, California) ... three new private toll roads
- S.R. 91 (Riverside Freeway-Orange Co. California) - Opening expected 1995
- 4-lane toll road in median of 8-lane freeway
- First privately-owned, fully-automated (non-stop) exclusive toll road in U.S.
- Variable tolls to balance congestion between toll road and freeway
- Foreign (Singapore, Hong Kong, Norway, Sweden, England)

How can it become more acceptable?
- Integration of AVI technology (electronic toll collection) ... provides convenient non-stop collection of tolls (see example of system configuration)
- Use congestion toll revenues toward improving alternatives to the SOV
- Consider perspective of user, operating agency/company, and society

CONCLUSION
As many expanding urban areas continue to remain highway-oriented in their land use patterns and transportation systems, it is becoming more difficult not to justify congestion pricing as a tool for congestion management. Many believe that congestion pricing will help encourage use of alternatives to driving.

The effectiveness of congestion pricing will be greatly influenced by what is done with the congestion toll revenues. If the revenues are invested in such alternatives to the car as public transit, ride sharing, walking and biking (instead of maintaining and expanding road and parking facilities), then congestion pricing will become more acceptable to the motoring public.

WORLD BANK POLICY CONCLUSIONS:
- The benefits of electronic toll collection (ETC) for road pricing outweigh the costs
- Technology advancements in ETC and automatic vehicle identification and location systems will continue to yield large-scale economies.
- Successful road pricing systems must consider three
points of view:
  o The user
  o The operating agency/company
  o Society
  o ETC offers:
    o Simplicity, anonymity and convenience to the user
    o Flexibility, reliability, and enforcement capability to the operating agency.
    o Minimal environmental and construction intrusion
  o Positive revenue to cost values
  o Compatibility with other systems to society.

PARKING MANAGEMENT AND CONTROL Similar to price of travelling on the roadways, the price of parking can also be adjusted in response to dynamic conditions. Collection of the dynamic parking fees would be facilitated if payment was made via magnetic or “smart” cards.

POLLUTION PRICING In a more future term application, toll rates and other costs of driving for individuals can be adjusted according to the amount of pollutants emitted. This TDM strategy would be dependent on sensors which detect the actual emissions from a specific vehicle. Drivers should be informed before leaving home of the higher parking and toll fees that would be in effect.

REMOTE-SENSING FOR EMISSIONS One of the newest theories being investigated is the idea that it may be more cost-effective to address clean-air issues and mandates by targeting the “gross polluters,” the few vehicles responsible for at least half of the pollution emitted. The billions of dollars which have been spent to date on rideshare programs may have been better allocated to initiatives which, through remote sensing, would indicate which vehicles are outside set guidelines. The technology exists to accurately measure the emissions of a car in motion, and in less than six-tenths of a second, the analysis is stored electronically with a video picture of the back of the offending vehicle, and the license plate, having been scanned by the video image, has been compared to department of motor vehicle (DMV) records to store the owner’s data as well.

REMOTE SENSING INFORMATION (Fill-in the blanks)
  o Dirtiest _____% of all cars emit 50% of automobile CO *
  o Cleanest 50% of all cars emit _____% of automobile CO *
  o Infrared beam shone through exhaust plume and ana-
Managing Our Way Through Congestion

- Costs range from $1/2,000 to $100,000. Typical system is $5,000. Cost factors are range and accuracy.
- Max. range is 3,000 feet, less expensive systems monitor 30-50 feet.
- System may have real-time display visible to attendant.
- Offending autos are typically photographed and owners are notified.
- Can be continuously monitored at intersection, ramp, or lot entrance.
- EPA contends that remote sensing is less accurate than dynamometer.


AUTOMOBILE POLLUTION

A small percentage of cars emit most of the carbon monoxide (CO) and hydrocarbons (HC).

Each quintile multiplied by the number of vehicles in that quintile showing its contribution to total fleet emissions. Late model high emitting vehicles dominate the fleet CO and HC contribution. Source: "Remote Sensing of Automobile Emissions," by D.H. Stadem and G.A. Bishop, Y. Zhang, and P.L. Guenther, University of Denver Chemistry Department. Traffic Technology International '94.
References


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Mobility 2000 Presents Intelligent Vehicle Highway Systems: Executive Summary, Texas Transportation Institute, April 1990.


Managing Our Way Through Congestion
TELECOMMUTING

MODULE GOALS

- To be able to identify why telecommuting is becoming popular.
- To identify the benefits of a telecommuting program.
- To be able to develop a telecommuting program.

ASSUMPTIONS

- Selling telecommuting programs to businesses requires knowledge of business concerns.
- Transportation issues are secondary.

Why Flexible Work Arrangements?

- The New American Family
  - Two Incomes
  - Childcare Issues
  - Eldercare

- Housing
  - Rise in Costs
  - Increased distances

- Focus on External Visibility and Customer Satisfaction

What Motivates an Organization to Implement Flexibility?

<table>
<thead>
<tr>
<th>Response to Employee Requests</th>
<th>Support a Corporate Image</th>
<th>Part of a Work-Family Initiative</th>
<th>Give a Recruiting Advantage</th>
<th>Support Work Force Diversity Efforts</th>
<th>Increase Productivity</th>
<th>Prevent Unwanted Turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>80%</td>
<td>70%</td>
<td>60%</td>
<td>50%</td>
<td>40%</td>
<td>30%</td>
</tr>
</tbody>
</table>

"Employees do not feel free to use policies for flexibility as much as they would like to."

(152 employer responses)

Strongly Agree 24%
Agree 45%
Disagree 19%
Neutral 10%
Strongly Disagree 2%


Flexible Work Arrangements - Some Reasons for Resistance to Change:

The Force of Custom and Tradition
  - There is a tendency for people to accept "what has been right" as normal and right.

Perceived Risk
  - Resistance may be a means of reducing risk or uncertainty.

Added Costs
  - Change may cost something extra - money, time, or other resources.

Threatened Positions
  - Change may threaten security in position, prestige, or appear as rejection.

Misunderstanding of Motives
  - The motives of promoters may be misunderstood or questioned.

(SOURCE: Agricultural Extension, Cooperative Communication Forces Yielding Change, Univ. of Wisconsin)
TELECOMMUTING

Working at home or at an alternate location and communicating with the usual place of work using electronic or other means instead of physically traveling to a more distant work site.


WHY TELECOMMUTING?

- Job Portability
  - 1950 - 17% in Service/Information Industries
  - 1980 - 53%
  - 2000 - 75% (Projected)

- Available Technology
  - Fax
  - PCs
  - Electronic Mail
  - Voice Mail

OPTIONS FOR TELECOMMUTING

- Home Offices
  - Involves little or no cash outlay for employers and employees.

- Satellite Offices
  - A group of telecommuters from the same employer work at a satellite office instead of working at home.

- Neighborhood Work Centers
  - Telecommuters from different employers work at a neighborhood work center and share resources, such as clerical help, communications equipment, photo copying and office supplies.

BENEFITS TO EMPLOYER

- Increased Employee Productivity
  - 8.81% of employee’s salary
Managing Our Way Through Congestion

- Decreased Facility Costs
  - Office Space - 5% savings
  - Parking Spaces

- Decreased Absenteeism
  - Reduced Stress
  - Emergencies do not require full day
  - Result - Decreased sick leave of .5% of avg. salary

- Retention of Employees
  - Shorter Commute
  - Greater Flexibility
  - Convalescence

- Recruiting Employees
  - Physically Impaired
  - Geographically Remote
  - Part of Benefit Package

- Natural Disasters

BENEFITS TO EMPLOYEE

- Decreased Commuting Time

- Decreased Travel Stress

- Decreased Personal Expenses
  - Travel
  - Meals
  - Wardrobe

- Autonomy Over Work Space

- Increased Flexibility
  - Schedule
  - Surroundings
  - Process

BENEFITS TO COMMUNITY

- Reduced Air Pollution
- Reduced Auto Congestion
  - Save In Lost Time
  - Save In Infrastructure Expenditures
- Decreased Use of Natural Resources
- Stronger Connection of Workers to Families
- Greater Sense of Community for Employees

### TELECOMMUTING

<table>
<thead>
<tr>
<th>TRANSPORTATION IMPACTS</th>
<th>1992</th>
<th>1997</th>
<th>2002</th>
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<tbody>
<tr>
<td>Saving in Vehicle Miles Travelled (VMT) billions</td>
<td>3.7</td>
<td>10.0 - 12.9</td>
<td>17.6 - 35.1</td>
</tr>
<tr>
<td>Percentage Saving in Total Passenger VMT</td>
<td>0.23%</td>
<td>0.49% - 0.63%</td>
<td>0.7% - 1.4%</td>
</tr>
<tr>
<td>Percentage Saving in Commuting VMT</td>
<td>0.7%</td>
<td>1.6% - 2.0%</td>
<td>2.3% - 4.5%</td>
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<tr>
<td>Saving in Gallons of Gasoline (millions)</td>
<td>178</td>
<td>476-619</td>
<td>840 - 1,679</td>
</tr>
<tr>
<td>Percentage Saving in Gallons</td>
<td>0.25%</td>
<td>0.6% - 0.8%</td>
<td>1.1% - 2.1%</td>
</tr>
<tr>
<td>Value of Gasoline Saved (millions)</td>
<td>$203</td>
<td>$543 - $706</td>
<td>$958-$1,914</td>
</tr>
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</table>

<table>
<thead>
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<tr>
<td>NOx</td>
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<tr>
<td>CO</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Annual Hours Saved for Average Telecommuter</th>
<th>77</th>
<th>93</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Annual Hours Saved (millions)</td>
<td>156</td>
<td>444 - 577</td>
<td>826 - 1,652</td>
</tr>
</tbody>
</table>

Source: U.S. Department of Transportation, Transportation Implications of Telecommuting, April 1993.
Managing Our Way Through Congestion

BENEFITS OF FLEXIBLE WORK ARRANGEMENTS

- Increased Productivity
- Reduced Turnover
- Assisted Recruitment
- Eased Commuting
- Reduced Absenteeism
- Reduced Tardiness
- Raised Morale

Reported by companies

COSTS TO EMPLOYER

- Training
- Equipment
  - Low-Tech $0-50
    - Office Supplies
    - Existing Phone
    - Answering Machine
  - Medium-Tech $1,500-3,000
    - Low-Tech Equipment
    - Computer (low end)
    - Modem
    - Software
    - Printer
  - High-Tech $3,000-8,500
    - Medium-Tech Equipment
    - Second Phone Line
    - Computer (high end)
    - Fax Machine
COSTS TO EMPLOYEE

- Equipment
- Utilities
- Access to Support Staff

COSTS TO COMMUNITY

- Urban Sprawl
- Central Business District

SETTING UP A TELECOMMUTING PROGRAM

- Planning
- Implementing
- Evaluating

SCHEDULE

Policy: 2 weeks - 2 months
Agreement: 2 weeks - 4 weeks
Selling The Idea: 1 month - 2 months
Employee Selection: 1 week - 2 months
Training: 2 weeks - 3 months
Evaluation: Ongoing

Telecommuting Coordinator (Champion)
Steering Committee
Written Policy

TELECOMMUTING SELECTION PROCESS

STEP 1: Select Classifications
STEP 2: Select Positions
STEP 3: Orientation
STEP 4: Employee Survey
STEP 5: Supervisor's Survey

TYPICAL TELECOMMUTING CLASSIFICATIONS

Accountant, Engineer
Administrative Assistant, Financial Analyst
Agent, Journalist
Appraiser, Lawyer
Auditor, Manager
Consultant, Programmer
Contract Monitor, Researcher
Data Entry Clerk, Systems Analyst
Economist, Training Designer
Employment Interviewer, Writer

WHAT TO ASK WHEN SELECTING POSITIONS

- How is information processed?
- What are the physical requirements?
- Is output well defined?
- Are milestones well defined?
- What are the telecommunication needs?
EXAMPLES OF TELECOMMUTING FUNCTIONS/TASKS

- Auditing reports
- Conducting business by phone
- Contract preparation/monitoring
- Data analysis
- Data entry
- Data processing
- Data programming
- Project oriented work
- Thinking, reading, and writing
- Word processing

CHARACTERISTICS OF A SUCCESSFUL TELECOMMUTER

- Volunteer for program
- Self-motivated
- Successful performance evaluations
- History of dependability
- Ability to function independent of direct supervision
- In the position more than a year
- Ability to deal with isolation
- Well-organized with good time management skills
- Has appropriate home worksite that includes privacy and lack of distraction
CHARACTERISTICS OF A SUCCESSFUL TELEMANAGER

- Positive attitude towards and is committed to telecommuting
- Trusts employees
- Well-organized
- Open to new ideas
- Communicates well

ORIENTATION

- Management
- Non-management

TRAINING ISSUES

- Setting the schedule
- Learning to work at home
- Resolving concerns
- Agreeing on deliverables and performance standards
The Telecommuting Agreement

This is an agreement between:

(Employer)

and

(Employee)

This agreement establishes the terms and conditions of telecommuting.

The employee volunteers to participate in the telecommuting program and to follow the applicable guidelines and policies. The employer agrees with the employee's participation.

Duration. This agreement will be valid until cancelled by either party.

Work Hours. Work hours and location are specified as part of this agreement.

Pay and Attendance. All pay, leave and travel entitlement will be based on the employee's official duty station. The employee's time and attendance will be recorded as if performing official duties at the office.

Leave. Employees must obtain supervisory approval before taking leave in accordance with established office procedures. The employee agrees to follow established procedures for requesting and obtaining approval of leave.

Overtime. The employee will continue to work in pay status while working at the home office. An employee working overtime ordered and approved in advance will be compensated in accordance with applicable law and rules. The employee understands that the supervisor will not accept the results of unapproved overtime work. The employee agrees that failing to obtain proper approval for overtime work may result in removal from the telecommuting program or other appropriate action.

Employer-owned equipment. In order to effectively perform their work, employees may use the employer's equipment at the telecommuting location, with the approval of the supervisor. The equipment must be protected against damage and unauthorized use. Employer-owned equipment will be serviced and maintained by the employer. Equipment provided by the employee will be at no cost to the employer, and will be maintained by the employee.

Liability. The employer will not be liable for damages to the employee's property resulting from participation in the telecommuting program.

Cost. The employer will not be responsible for operating costs, home maintenance, or any other incidental costs (e.g. utilities), associated with the use of the employee's residence. The employee does not give up any reimbursement for authorized expenses incurred while conducting business for the employer.

Workers Compensation. The employee is covered by workers' compensation if injured in the course of performing official duties at the telecommuting location.

Work Assignments. The employee will meet with the supervisor to receive assignments and to review completed work.

The employee will complete all assigned work according to procedures mutually agreed upon with the supervisor.

Evaluation. The evaluation of the employee's job performance will be based on established standards.

Performance must remain satisfactory to remain a telecommuter.

Records. The employee will apply approved safeguards to protect records from unauthorized disclosure or damage. All records, papers and correspondence must be safeguarded for their return to the office.

Participation in Evaluation. The employee and supervisor agree to promptly complete and submit telecommuting evaluation materials and to attend periodic group meetings for the telecommuting program.

Curtailment of the Agreement. The employee may stop participating in this program at any time. Management has the right to remove the employee from the program if participation fails to benefit organizational needs.

The employee agrees to work at the office or telecommuting location, and not from another unapproved site. Failure to comply with this provision may result in termination of the agreement, and/or other appropriate disciplinary action.
Managing Our Way Through Congestion

Work Hours and Location. The following are the working hours and locations which are agreed to as a part of the Telecommuting Agreement.

Official Work Location: ____________________________

Telecommuting Location: ____________________________

General Work Hours:

<table>
<thead>
<tr>
<th>Day</th>
<th>Hours</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Day)</td>
<td>(Hours)</td>
<td>(Location)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Office</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Telecommuting</td>
</tr>
</tbody>
</table>

Monday: ___________
Tuesday: ___________
Wednesday: ___________
Thursday: ___________
Friday: ___________
Saturday: ___________
Sunday: ___________

Daily lunch period: ___________

We agree to abide by the terms and conditions of this agreement.

Employee: ____________________________ Date: ____________

Supervisor: ____________________________ Date: ____________

Checklist for the Home Office

This checklist is for use by the telecommuter. The success of the telecommuting arrangement depends on a realistic assessment of the work space, and the ability of the employee to successfully complete their work in this environment. If the work space is not adequate, the telecommuting agreement will not work.

- Does the space seem adequately ventilated?
- Is the space reasonably quiet?
- Are all stairs with 4 or more steps equipped with handrails?
- Are all circuit breakers and/or fuses in the electrical panel labeled as to intended service?
- Do circuit breakers clearly indicate if they are in open or closed position?
- Is all electrical equipment free of recognized hazards that would cause physical harm from frayed wires, bare conductors, loose wires, flexible wires running through walls, exposed wires fixed to the ceiling)?
- Are electrical outlets 3 pronged (grounded)?
- Are aisles, doorways, and corners free of obstructions to permit visibility and movement?
- Are file cabinets and storage closets arranged so drawers and doors do not open into walkways?
- Do chairs appear sturdy?
- Is the space crowded with furniture?
- Are the phone lines, electrical cords, and extension wires secured under a desk or alongside baseboard?
- Is the office space neat and clean?
- Are floor surfaces clean, dry, level, and free of worn or frayed seams?
- Are carpets well secured to the floor, and free of frayed or worn seams?
- Is there a fire extinguisher in the home, easily accessible from the office space?
- Is there a working smoke detector within hearing distance of the work space (this is a good time to test it)?
- Arrange for an energy audit of the home by the local utility company, and fire safety inspection by the local fire department. Try to do this within 30 days of the signing of the agreement. These services are provided free of charge.
KEYS TO SUCCESS

- Communication, communication, communication
- Establish timetable for the completion of tasks
- Evaluate by output not observation (trust)
- Let program evolve
- Establish contingency plan

RATING OF EXISTING TELECOMMUTING PROJECTS

Source: "Existing Telecommuting Projects Highly Successfully, The Urban Transportation Monitor (March 5, 1991); p.1."
CHARACTERISTICS OF 10 TELECOMMUTING PROJECTS

<table>
<thead>
<tr>
<th>ORGANIZ.</th>
<th># PARTICIP. EMPLOYEES</th>
<th>% BY JOB CATEGORY</th>
<th>FREQUENCY DAYS PER WEEK</th>
<th>% TELECOM. WHO NEED EQUIPMENT</th>
<th>% TELECOM. WHO TRAVEL TO WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington State Energy Office, Olympia</td>
<td>28</td>
<td>18%: Managerial 64%: Professional 2%: Clerical</td>
<td>5 days: 7% 4 days: 4% 3 days: 7% 2 days: 21% 1 day: 43% &lt; 1 day: 11%</td>
<td>pc: 93% modem: 57% fax: 0% printers: 50%</td>
<td>N/A*</td>
</tr>
<tr>
<td>CALTRANS San Diego, CA</td>
<td>24</td>
<td>90%: Managerial 10%: Clerical</td>
<td>5 days: 12% 4 days: 4% 3 days: 21% 2 days: 25% 1 day: 17% &lt; 1 day: 21%</td>
<td>pc: 60% modem: 10% fax: 5%</td>
<td>0%</td>
</tr>
<tr>
<td>The Travelers Insurance Company, Hartford, CT</td>
<td>N/A</td>
<td>&lt;10%: Managerial &lt;90%: Professional</td>
<td>4 days: 50% 2 days: 50%</td>
<td>pc: 100% modem: 100% ans. machine: 25%</td>
<td>0%</td>
</tr>
<tr>
<td>South Coast Air Quality Mgmt. District, El Monte, CA</td>
<td>30</td>
<td>60%: Managerial 40%: Clerical</td>
<td>1 day: 100%</td>
<td>pc: 75% modem: 10% fax: 10%</td>
<td>5%</td>
</tr>
<tr>
<td>LA County, Los Angeles, CA</td>
<td>1,000</td>
<td>26%: Managerial 49%: Professional 25%: Clerical</td>
<td>4 days: 7% 3 days: 12% 2 days: 42% 1 day: 39%</td>
<td>pc: 50% modem: 5% fax: 5%</td>
<td>3%</td>
</tr>
<tr>
<td>City of San Diego, San Diego, CA</td>
<td>24</td>
<td>25%: Managerial 65%: Professional 10%: Clerical</td>
<td>4 days: 5% 3 days: 10% 2 days: 25% 1 day: 30% &lt; 1 day: 25%</td>
<td>pc: 58% modem: 45% fax: 5%</td>
<td>0%</td>
</tr>
<tr>
<td>HomeFed Bank, San Diego, CA</td>
<td>13</td>
<td>100% Professional</td>
<td>2 days: 69% 1 day: 8% &lt; 1 day: 23%</td>
<td>pc: 80%</td>
<td>0%</td>
</tr>
<tr>
<td>U.S.G.S.A. Washington, DC</td>
<td>28</td>
<td>15%: Managerial 63%: Professional 22%: Clerical</td>
<td>4 days: 7% 3 days: 67% 2 days: 15% 1 day: 11%</td>
<td>pc: 55% modem: 48% fax: 11% copier: 7%</td>
<td>10%</td>
</tr>
<tr>
<td>Hawaii DOT Honolulu, HI</td>
<td>17</td>
<td>53%: Professional 47%: Clerical</td>
<td>5 days: 81% 4 days: 13% 3 days: 6%</td>
<td>pc: 94% modem: 13% fax: 94% copier: 88%</td>
<td>0%</td>
</tr>
<tr>
<td>Pacific Bell, Los Angeles, CA</td>
<td>100</td>
<td>100% Professional</td>
<td>5 days: 5% 4 days: 5% 3 days: 10% 2 days: 20% 1 day: 60%</td>
<td>pc: 70% modem: 70% fax: 5%</td>
<td>0%</td>
</tr>
</tbody>
</table>

## ADDITIONAL CHARACTERISTICS OF 10 TELECOMMUTING PROJECTS

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>BEST TYPE OF EMPLOYEES</th>
<th>TIME REQUIRED TO PLAN AND IMPLEMENT PROJECT (DAYS)</th>
<th>EFFECT OF PROJECT</th>
<th>GREATEST BENEFITS</th>
<th>ADVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of San Diego, San Diego, CA</td>
<td>Depends on individual</td>
<td>30</td>
<td>Increased productivity; Improved quality of work, job satisfaction</td>
<td>Successful TDM measure; overtime savings; productivity increases; low cost</td>
<td>Expect small problems. Implement carefully; follow up.</td>
</tr>
<tr>
<td>HomeFed Bank, San Diego, CA</td>
<td>Self-starters: good organization and planning skills</td>
<td>20</td>
<td>Increased productivity; Improved job satisfaction, employee retention rate</td>
<td>Increased productivity; happier employees</td>
<td>Have a complete plan before starting</td>
</tr>
<tr>
<td>U.S.G.S.A., Washington, DC</td>
<td>Analytical jobs; seasoned employees</td>
<td>30</td>
<td>Improved quality of work, job satisfaction, employee retention rate</td>
<td>Retention of employees; reduction in project time</td>
<td>“Go for it!”</td>
</tr>
<tr>
<td>Hawaii DOT, Honolulu, HI</td>
<td>N/A</td>
<td>250</td>
<td>Increased productivity; Improved job satisfaction, employee retention rate</td>
<td>Increase in morale &amp; productivity; easier recruitment &amp; retention</td>
<td>Will provide details</td>
</tr>
<tr>
<td>CALTRANS San Diego, CA</td>
<td>Right of way agents</td>
<td>120</td>
<td>Improved Job Satisfaction</td>
<td>Increased morale; traffic reduction</td>
<td>Begin pilot; Top management support; offer training</td>
</tr>
<tr>
<td>The Travelers Insurance Company, Hartford, CT</td>
<td>Proven performance</td>
<td>N/A</td>
<td>Increased productivity; Improved quality of work, job satisfaction, employee retention rate</td>
<td>Employee satisfaction; corporate cost savings, productivity gains; expanded labor pool; employee retention</td>
<td>Thorough planning</td>
</tr>
<tr>
<td>South Coast Air Quality Mgmt. District, El Monte, CA</td>
<td>Most of employees suitable</td>
<td>60</td>
<td>Increased productivity; Improved quality of work, job satisfaction, employee retention rate</td>
<td>Job satisfaction</td>
<td>Research company needs, employee suitability, and monitor closely</td>
</tr>
<tr>
<td>LA County, Los Angeles, CA</td>
<td>Experienced employees with management support</td>
<td>150</td>
<td>Increased productivity; Improved quality of work, job satisfaction, employee retention rate</td>
<td>Productivity increase, happier employees, and reduction in VMT</td>
<td>Plan carefully, market, and monitor</td>
</tr>
<tr>
<td>Pacific Bell, Los Angeles, CA</td>
<td>Information workers</td>
<td>625</td>
<td>Increased productivity; Improved quality of work, job satisfaction, employee retention rate</td>
<td>Employees feel trusted and are more loyal, happier, and productive</td>
<td>“Do it!”</td>
</tr>
<tr>
<td>Washington State Energy Office, Olympia, WA</td>
<td>Mature workers who know their jobs well</td>
<td>150</td>
<td>Increased productivity; Improved quality of work, job satisfaction</td>
<td>Job satisfaction</td>
<td>Considerable start-up effort; top management support essential.</td>
</tr>
</tbody>
</table>

ALTERNATE WORK HOURS

MODULE GOALS

- To introduce participants to the types of alternate work hour strategies.
- To provide guidance on selecting appropriate alternate work hour strategies to meet specific business needs.
- To examine the transportation impacts of alternate work hour programs.
- To provide a framework for developing alternate work hour programs.

ASSUMPTIONS

- Not all alternate work hour programs will help meet traffic reduction goals.
- Peak-period spreading is a good thing.

DESCRIPTION OF STRATEGY

Work hour policies established by employers govern the time period in which employees travel to and from work. Such policies influence not only the volume of employees traveling during peak traffic periods, but employee propensity to consider transit, carpooling and other alternatives to driving alone to work.

There are three types of variable work hours with potential application as demand management tools:

- Staggered hours are staged start work times set by employers. For example, employee start times might be set at 15-minute increments. Staggered work hours can be arranged by:
  - Department
  - Individual Preference
  - Mode
Compressed work weeks allow employees to work more hours in fewer days than the usual eight hour per day schedule. The two most common types of compressed schedules are:

- **Four/Forty**-employees work 40 hours in four ten hour days.
- **Nine/Eighty**-employees complete 80 hours in nine days and have the tenth day off.

Flextime allows employees to set their own arrival and departure time within a band of time. The employee is required to arrive within a two- or three-hour band and generally leave eight hours later. The major types of flex-time are:

- **Gliding schedule**- The employees set their own start time each day and the end time is eight hours later.
- **Flexitour**-Employees pick their own start time, which remains their start time each day until the next option period allows them to select a new one. End time is always eight hours after the start time.
- **Maxiflex**-Employees may work any number of hours within any given 24 hour period and bank any hours over the eight hour day to shorten future workdays.

Employees and employers may find alternative work hours attractive not only to open up new transportation options, but also to improve the fit between work and family responsibilities. Absenteeism, tardiness and turnover may be reduced by variable work hour programs in settings where workers need and want more flexibility in their schedules.

---

**Trends in Flexible Work Arrangements**

![Bar chart showing trends in flexible work arrangements]

BENEFITS OF FLEXIBLE WORK ARRANGEMENTS

- Increased Prod.
- Reduced Turnover
- Assisted Recruitment
- Eased Commuting
- Reduced Absenteeism
- Reduced Tardiness
- Raised Morale

Reported by companies

NATURE OF EFFECTIVENESS

Variable work hours support demand management in two ways:

- Compared to regular employee work hours, e.g., 9 a.m. to 5 p.m., variable work hours spread arrival and departure times and thereby spread peak period traffic.

- Depending on the type of variable work hours implemented, employees are encouraged to consider ridesharing and transit use.

Work hour strategies may not always support ridesharing and transit use. In particular, some experience and research suggests flextime is sometimes associated with less ridesharing, not more. More research is needed to determine why this is the case. Compressed work weeks do not seem to suffer from the same problem. Unfortunately, there is no evidence on how staggered work hours affect ridesharing.

APPLICATION SETTING

Flextime: most applicable to offices and among administrative and information workers; less application to shift workers and assembly lines, or where there is need for continuous communication between workers.
Compressed work weeks: applicable to office and administrative functions, especially governmental agencies; perhaps most applicable to line and piece manufacturing processes.

Staggered hours: applicable to offices and piece manufacturing, but not applicable to line manufacturing where workers are highly independent.

Variable work hours operate where a large number of employees are affected, and where the associated traffic is concentrated rather than spread out. Because one or another variable work hour strategy may be applicable to various industries, variable work hours should not be considered only in urban settings.

More important than location may be supporting services. In particular, the benefits of work hour strategies in encouraging transit and carpool use depend on the availability of transit options and rideshare matching and monitoring.

Important impacts of variable work hours are:
- Time of employee travel. One of the most important potential effects of variable work hours programs is reducing the volume during peak periods.
- Mode of travel. Variable work hour programs could conceivably break up car pools or make transit use more difficult depending on carpool arrangements and transit schedules prior to and after the work hour program was instituted.
- Non-Work Tripmaking. With a shift in work hours, usually to early arrival and departure times, more time is available for non-working trip making. Therefore, the overall impact of variable work hours programs on VMT could be negligible or even opposite to that intended. However, insufficient evidence has been collected to state definitely that variable work hours programs will significantly reduce VMT overall.

The possible results of implementing a variable work hours program are summarized here:
- The most probable effect of a variable work hours program is earlier arrivals and departures of participants, with a flattening in peak period traffic. The magnitude of the peak flattening may be quite substantial. The results of a Denver experiment with compressed work weeks showed a 14 percent decline in the maximum percentage of total arrivals in a half hour period, and a 13 percent decline in the maximum half hour percentage of total departures.
It should be noted that neither flextime nor staggered work hours measures remove vehicle trips or vehicle miles traveled from the daily travel inventory, but generally only shift their timing. This is acceptable for some TDM situations, but not a solution for others, e.g., air quality problems.

Compressed work weeks may reduce vehicle miles of travel, depending on number of commute days and mode of travel. Compressed work weeks appear to reduce not just work trips, but total trips. Case studies suggest VMT reduction is simply the fact that commuters work fewer days per month, and non-work trips do not offset the reductions in work trips.

For flextime and staggered work hours, effects on VMT are not so clear cut. All depends on whether the mode of travel is affected. The evidence suggests flextime may encourage transit use where service is sufficiently frequent and available before peak periods when flextime participants prefer to travel. Good transit service is probably the reason for the boost in transit ridership under a San Francisco flextime experiment. However, where flextime is introduced without good transit service off peak, or where the service is not adjusted to allow for commuters wanting to travel in earlier times, then transit ridership may well decline.

<table>
<thead>
<tr>
<th>Cost Savings from a Variable Work Hour Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Costs</td>
</tr>
<tr>
<td>Initial Staff Time</td>
</tr>
<tr>
<td>Present Value of Utility Cost (30 years @ 10%)</td>
</tr>
<tr>
<td><strong>Total Present Value of Costs</strong></td>
</tr>
<tr>
<td>(2) Savings</td>
</tr>
<tr>
<td>Vehicle Operating Cost Savings (@ $0.30 per mile)</td>
</tr>
<tr>
<td>(3) Break Even Point</td>
</tr>
<tr>
<td>(Present Value of Savings = Present Value Costs @ 10%</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Source: Implementing Effective Travel Demand Management Measures.
### A Case Study of Program Impacts

**TRIPS TAKEN**

<table>
<thead>
<tr>
<th></th>
<th>Workdays</th>
<th>Day Off</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before</strong></td>
<td>3.62</td>
<td>3.63</td>
<td>24.51</td>
</tr>
<tr>
<td><strong>After</strong></td>
<td>3.05</td>
<td>4.01</td>
<td>22.46</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>-15.75%</td>
<td>10.47%</td>
<td>-8.36%</td>
</tr>
</tbody>
</table>

SOURCE: Ho and Stewart, "Impact of the 4/40 Compressed Work Week Program on Trip Reduction, A Case Study: The Los Angeles County Department of Public Works"

**AVERAGE PER TRIP DISTANCE**

<table>
<thead>
<tr>
<th></th>
<th>Workdays</th>
<th>Day Off</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before</strong></td>
<td>14.0</td>
<td>19.2</td>
<td>16.3</td>
</tr>
<tr>
<td><strong>After</strong></td>
<td>14.6</td>
<td>11.2</td>
<td>13.7</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>4.87%</td>
<td>-41.74%</td>
<td>-16.08%</td>
</tr>
</tbody>
</table>

SOURCE: Ho and Stewart, "Impact of the 4/40 Compressed Work Week Program on Trip Reduction, A Case Study: The Los Angeles County Department of Public Works."
### Travel Characteristics of 4/40 Employees

#### Total Travel Distance (Miles)

<table>
<thead>
<tr>
<th></th>
<th>Workdays</th>
<th>Day Off</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>44.2</td>
<td>52.7</td>
<td>317.4</td>
</tr>
<tr>
<td>After</td>
<td>39.2</td>
<td>38.0</td>
<td>270.9</td>
</tr>
<tr>
<td>% Change</td>
<td>-11.23%</td>
<td>-27.85%</td>
<td>-14.63%</td>
</tr>
</tbody>
</table>

SOURCE: Ho and Stewart, "Impact of the 4/40 Compressed Work Week Program on Trip Reduction, A Case Study: The Los Angeles County Department of Public Works."

### Work Schedule Flexibility and Productivity

#### Productivity Level

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Improved</th>
<th>Same</th>
<th>Worsened</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flextime</td>
<td>29.9%</td>
<td>70.1%</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>4 Days - 40 Hours</td>
<td>66.7%</td>
<td>30.3%</td>
<td>3.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>9 Days - 80 Hours</td>
<td>57.1%</td>
<td>41.7%</td>
<td>1.2%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

SOURCE: Freas and Anderson, "The Effects of Variable Work Hour Programs on Ridesharing and Organizational Effectiveness, A Case Study: The County of Ventura."
Managing Our Way Through Congestion

Developing an Alternate Work Hour Program

Careful planning is needed to start any variable work hours program. Steps include assessing managers in various departments, possible conflicts with the need to interact with clients and customers, and needed changes in company policies. As the cost assessment suggests, it also is important to estimate the need for the changes in security coverage and settings in building heating, cooling and lighting. Procedures and costs associated with these changes need to be assessed and compared with benefits in vehicle trip reduction. Finally, an evaluation system should be set up including a monitoring committee and a regular assessment survey of employees and managers.

Variable work hours may involve some implementation hurdles. Sometimes labor union agreements will restrict the hours employees work. Any change may require formal meeting and negotiating. Management may resist flextime believing it reduces flexibility to schedule meetings or inhibits responsiveness to clients and customers.

City, county and state governments also might consider mandatory variable work hour programs for their employees, especially where large government centers contribute to local traffic and congestion problems.

Those obliged to shift to a later arrival time under the staggered work hour program experienced greater travel time compared to their previous situation, leading to considerable resentment and dissatisfaction.

### FLEXIBILITY OF SCHEDULE AND JOB SATISFACTION (%)

<table>
<thead>
<tr>
<th>Level of Job Satisfaction</th>
<th>FLEX-TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved 45.1</td>
<td></td>
</tr>
<tr>
<td>Same 54.9</td>
<td></td>
</tr>
</tbody>
</table>

Almost all private sector managers reported the same or better level of employee morale during the project under their voluntary program. In contrast, city-county managers reported worse or much worse employee morale during their mandatory project. Probably the best approach is to require agencies and departments to devise the best work hour system for their particular functions and public interaction needs. Furthermore, employees probably will prefer compressed work weeks and flextime to staggered work hours.

Finally, state policies and legislation may need revision in some cases to encourage variable work hours. Many states have fair labor acts and standards which limit the maximum number of hours worked without compensation for overtime. Sometimes, the legislation requires work in excess of 40 hours per week to be compen-

sated at some multiple of regular hourly rates. While this is not a barrier to flextime, it could present implementation issues under compressed work week programs allowing more than 40 work hours in certain weeks. Less common is legislation setting maximum requirements on a daily rather than weekly basis. State labor legislation of this kind would have to be changed to allow any form of compressed work week.

As with other TDM strategies, alternate work hour programs require a step-by-step planning process to be successful. Captured below is the process used by several companies that have successfully implemented an alternate work hour program.

**Step One - Select Appropriate Alternate Work Hour Program**

- Identify Objectives
- Match Program to Objective (See next two pages)
- Find best program to fit organizational structure

**Step Two - Work With Appropriate Management Decision Makers**

- Identify and introduce program
- Solicit support
- Develop committee to fully develop program
  - Select representatives from each department

**Step Three - Program Design**

- Steering committee develops program
- Legal counsel reviews laws to determine if labor laws allow alternate work hour arrangements
- Fine tune selected program

In fine tuning the program, several questions should be asked and answered. These are:

- What are official company work hours?
- What are core hours and core days?
- What is adequate coverage for telephones?
- What is adequate coverage for public interaction?
- What will be the employees choice?
  * Type of program
  * Arrival/departure time

(The greater the amount of flexibility, the greater the employee satisfaction. However, more flexibility means more difficulty in managing those employees.)
<table>
<thead>
<tr>
<th>OBJECTIVES</th>
<th>FLEX-TIME</th>
<th>COMPRESSED WORK WEEK</th>
<th>STAGGERED HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase employee morale</td>
<td>Good - Improved relationship between employees and management. Implied recognition of the employee as a trusted and respected staff member.</td>
<td>Good - Increases job satisfaction. Improves relationship between employee and management. Can result in some resentment from non-participants.</td>
<td>Mixed - Depends on whether the program is mandatory or voluntary.</td>
</tr>
<tr>
<td>Increase customer service</td>
<td>Good - A modified sliding schedule permits an organization to maintain longer hours. Under this plan, the organization also establishes selected business hours. Irregular hours can be a problem.</td>
<td>Mixed - Longer hours, but business may be closed on a regular work day.</td>
<td>Good - Results in a longer work day.</td>
</tr>
<tr>
<td>Increase productivity</td>
<td>Good - Less distraction, reduced absenteeism and turnover, fewer interruptions, and increased morale.</td>
<td>Good - Less distraction, reduced absenteeism and turnover, fewer interruptions, and increased morale.</td>
<td>Good - More efficient use of site facilities each day.</td>
</tr>
<tr>
<td>Decrease overtime</td>
<td>No change</td>
<td>Mixed - Depending on legislation and labor union negotiations, some companies must pay overtime to work beyond eight hours a day.</td>
<td>No change</td>
</tr>
<tr>
<td>Improve intra-office work scheduling and communication</td>
<td>Mixed - Unpredictable schedules. May have some difficulty to coordinate.</td>
<td>Mixed - Meetings have to be scheduled around employee's day off.</td>
<td>No change</td>
</tr>
<tr>
<td>Decrease employee turnover</td>
<td>Good - Studies show that these programs improve job satisfaction and reduce turnover.</td>
<td>Good - Studies show that these programs improve job satisfaction and reduce turnover.</td>
<td>Mixed - Depends on if the program is voluntary or mandatory.</td>
</tr>
<tr>
<td>Reduce employee stress</td>
<td>Good - Eliminates the anxiety of being late. Permits flexibility to deal with personal concerns.</td>
<td>Good - Increases leisure time.</td>
<td>Good - Avoids peak traffic congestion.</td>
</tr>
<tr>
<td>Improve tracking of employee hours</td>
<td>Poor - Some employees may resent being put on a time recording system. May involve cost of purchasing a recording system.</td>
<td>Poor - Some employees may resent being put on a time recording system. May involve cost of purchasing a recording system.</td>
<td>No change - Since program is more structured, arrivals and departures can be monitored, but it depends on the flexibility of employee schedules.</td>
</tr>
<tr>
<td>Reduce interruptions on the job</td>
<td>Good - Less start-of-the-day socializing.</td>
<td>Good - Fewer phone and client interruptions during early morning and late afternoon.</td>
<td>Mixed - Depends on the type of program.</td>
</tr>
<tr>
<td>Decrease fuel consumption</td>
<td>Good - Reduces fuel consumption from stop-and-go rush hour traffic.</td>
<td>Good - Reduces fuel consumption from stop-and-go rush hour traffic.</td>
<td>Good - Reduces fuel consumption from stop-and-go rush hour traffic.</td>
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<tr>
<td>OBJECTIVES</td>
<td>FLEX-TIME</td>
<td>COMPRESSED WORK WEEK</td>
<td>STAGGERED HOURS</td>
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<td>----------------------------------</td>
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<td>----------------------------------------------------------------------------------------</td>
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<tr>
<td>Reduce commute time</td>
<td>Good - Permits employees to travel during off-peak hours. However, peak hours are now so long in many urban areas that flex-time can no longer avoid rush hour peaks.</td>
<td>Good - Employees can arrive before and leave after peak commuter periods, and can reduce one day’s commute weekly or bi-weekly.</td>
<td>Good - Spreads out arrival and departure times. Effective when coordinated on a larger scale, e.g., employment center-wide.</td>
</tr>
<tr>
<td>Increase the average number of occupants per vehicle</td>
<td>Good - Can help facilitate ridesharing arrangements.</td>
<td>Mixed - Can either facilitate or disrupt rideshare arrangements depending on the size and uniformity of the program.</td>
<td>Mixed - Can either facilitate or disrupt rideshare arrangements depending on the size and uniformity of the program.</td>
</tr>
<tr>
<td>Reduce the number of vehicle trips to the worksite (to comply with local regulations/ordinances)</td>
<td>Good - Can indirectly reduce vehicle trips by better facilitating ridesharing arrangements.</td>
<td>Good - Removes vehicle trip to worksites one day each week or bi-weekly.</td>
<td>Mixed - Can either facilitate or disrupt rideshare arrangements depending on the size and uniformity of the program.</td>
</tr>
<tr>
<td>Increase commute mode choice</td>
<td>Good - Can help facilitate ridesharing arrangements.</td>
<td>Mixed - Husband/wife carpools will be disrupted if not on the same hours, less convenient/safe, transit early/late could decrease use. In some cases, it enhances ridesharing since longer days are more conducive to regular hours.</td>
<td>Fair - Depends on the size of the program.</td>
</tr>
<tr>
<td>Decrease absenteeism</td>
<td>Good - Noticeable decreases in one-day absences. Flexibility allows employees to coordinate personal and work schedules.</td>
<td>Good - Personal appointments are scheduled on employee’s day off and not during work time.</td>
<td>No change</td>
</tr>
<tr>
<td>Increase job satisfaction</td>
<td>Good - Permits employee to coordinate personal and work schedules. Reduces fear of tardiness.</td>
<td>Good - Provides employee with additional day off each weekly or bi-weekly period.</td>
<td>Mixed - Depends on the amount of employee choice allowed in the program.</td>
</tr>
<tr>
<td>Reduce tardiness</td>
<td>Good - Flexible working hours practically eliminates tardiness (unless the employee arrives after the start of the core period). Fewer requests to arrive late or leave early.</td>
<td>Fair - Employee may avoid peak congestion.</td>
<td>Good - Reduces congestion in parking lots and elevators.</td>
</tr>
<tr>
<td>Create a recruitment benefit</td>
<td>Good - Flex-time gives parents the flexibility of dropping off/picking up children at day care centers and school. Employees generally like flex-time schedules. It facilitates needs more adequately than conventional schedules.</td>
<td>Mixed - Good in the case of manufacturing, when the company can shut down one day per week. The longer days may increase costs slightly.</td>
<td>Poor - Slight increase, although staggered hours can increase the length of the work day. Most organizations note no appreciable increase in cost.</td>
</tr>
<tr>
<td>Improve phone coverage</td>
<td>Good - Longer hours and earlier starting times are especially good for companies with business in different time zones.</td>
<td>Fair - Extends business hours, but arrangements must be made to cover for employees on their day off.</td>
<td>Good - Longer hours and earlier starting times are especially good for companies with business in different time zones.</td>
</tr>
</tbody>
</table>
How will employees be held accountable for:
* Meeting program guidelines?
* Personal performance?
* What is supervisor's control level?

Step Four - Formalize Program

- Draft alternate work hour proposal describing rules and procedures
- Work with accountants to set up policy for payroll, vacation, overtime, etc
- Anticipate obstacles and reservations

Step Five - Identify Needs of Departments and Employees

- Determine what work functions in each department do not qualify for alternate work hour programs
- Identify employees who could operate in program
  - work with employees to ease apprehension's/misconceptions with program
- Survey all eligible employees to determine interest
  - do they want to participate
  - what program do they prefer

Employee Preference for Flexible vs. Inflexible Working Hours.

- 78% for flexible hours (slower, family oriented track)
- 22% for inflexible hours (faster track)


Step Six - Finalize Program

- Post available scheduling options
- Solicit all employee preferences
- Establish arbitration panel
Managing Our Way Through Congestion

**Step Seven - Implement Program**

- Develop new employee schedules
- Notify employees of new schedule
- Announce start date

**Step Eight - Monitor Program**

- Conduct employee attitude survey
- Conduct supervisor survey
- If desired, develop report
  - include supervisor and employee satisfaction
  - productivity changes
  - absenteeism rates
- Make necessary adjustments
INSTITUTIONAL ARRANGEMENTS

MODULE GOALS

- To provide insight on commuter assistance program delivery methods.
- To provide an understanding of TMAs and their development.
- To explain the TDM program design process.
- To provide an understanding of the institutional arrangements involved in commuter service delivery and their relationship to commuter behavior.

ASSUMPTIONS

- Participants are familiar with TDM institutions.
- Understanding commuter behavior facilitates program design.
- TDM institutions should work together and provide value-added services.

SIX PHASES OF COMMUTER BEHAVIOR

1. Inform me - Increase awareness
2. What's in it for me - Foster interest
3. How do I start? - Facilitate arrangement
4. Encourage me - Promote trial use
5. Reinforce me - Make follow-up contacts
6. I am sold - Turn customers into goodwill ambassadors

COMMUTER ASSISTANCE PROGRAM OPTIONS:

- Government program or agency
- Within Transit agency
- Contracted to private sector firm
- Private, non-profit organization
### CRITERIA TO CONSIDER WHEN DESIGNING A CAP:

- Ease of Implementation
- Costs
- Effectiveness
- Equity
- Private Sector Comfort

### Program Advantages:

<table>
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<tr>
<th>Government agency</th>
<th>Program Disadvantages</th>
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<th>Private sector firm</th>
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<th>Private non-profit</th>
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</table>
IMPORTANT THINGS TO CONSIDER

Transit
- Identical service area (Destination)
- CAP relationship within organization
- Performance criteria
- Contracting issues

Private sector firm
- Performance criteria
- Potential services
- Contract issues

Private non-profit
- Private/Public board
- Board roles
- Funding issues
- Performance and expectations
- Activities

TRANSPORTATION MANAGEMENT ASSOCIATIONS (TMAs):

IRS STATUS OF TMAs
- 501(C)(3) - Charitable tax deduction
- 501(C)(4) - Civic association
- 501(C)(6) - Business league
501(c)3- Designates the TMA as a non-profit charitable organization that provides services to the general public and can accept tax deductible contributions. The commute management effort must serve the general public wishing to use the services of the TMA. Thus, any and all employers in the service area must be provided services upon request.

Lobbying efforts are strictly limited under this status. Lobbying is defined as contacting the public or legislators in an effort to gain support for or opposition to legislation. While specific limits have not been set, case law reveals that not more than 5% of expenditures from the total budget can go to lobbying efforts.

Indirect lobbying, which does not count towards lobbying efforts are:
- making available results of non-partisan studies, analysis, or research
- providing technical advice or assistance to a governmental body or committee in response to that body's written request
- appearances before legislative bodies when the decision of that body affects the existence of the organization, its powers and duties, its tax-exempt status, or deduction of contributions to the organization
- communication with government officials that are not members of legislative bodies

501(c)4-Designates the TMA as a non-profit civic association. This type of organization is open to membership and can collect dues. The services offered by the TMA must be shown to benefit the social welfare of the community. For member companies, the dues can be considered a business expense. Lobbying is allowed, however, the organization cannot directly or indirectly participate or intervene in political campaigns on behalf of or in opposition to any candidate for political office.

501(c)6-Designates the TMA as a non-profit business league. These organizations can promote their own business interests through such activities as promotion of improved standards, attempting to influence legislation, and facilitating discussion on its own industries problems. While these organizations will necessarily be involved in educational activities, contributions to the organization are not tax deductible. Membership dues can be deducted as a business expense provided that the dues are not used on grassroots lobbying.
TMA Development Factors

- A concentration of employment within a well-defined geographical area.
- A sense that existing or anticipated traffic congestion is or will be intolerable.
- A member of the private sector who leads the effort.
- A group of individuals, legislators, merchants, developers, or private citizens that perceive direct benefits.
- A regulatory environment that requires or rewards participation.

TMA BENEFITS TO EMPLOYERS

- Access to information
- Less tardiness and absenteeism
- Cost savings
- Individual assistance

TMA BENEFITS TO DEVELOPERS

- Assistance for on-site problems
- Cost savings
- Access to local government
- Advocacy
- Marketing tool to attract tenants

TMA Organizational tasks

- Determine geographic boundaries scope of TMA.
- Solicit appropriate supporters (Chamber, local governments, etc.).
- Conduct meeting to determine collaborative process.
- Develop mission statement/goals and objectives.
Managing Our Way Through Congestion

- Develop annual work plan/implementation schedule
- Develop and adopt a budget.
- Examine various funding sources such as federal, state, and local grant monies; membership fees, etc.
- Determine membership fees, if applicable.
- Develop membership agreements.
- Secure financial commitments from public and private sector members.
- If appropriate, take necessary steps to apply for public sector seed funding available for TMAs.
- Prepare Article of Incorporation, By Laws.
- IRS status - 1024, SS4.
- Recruit and hire TMA director and administrative support.
- Secure office space and office equipment schedule.
- Acquire services of an accountant.
- Open bank account/post office box.
- Develop identify, logo, stationery.
- Identify support activities to be provided by transportation providers and others.

TMA Functional tasks

- Identify target travel markets and develop transportation management strategies that address market needs.
- Conduct transportation survey to identify employee commute patterns, attitudes and needs. Use survey assessment to design TMA services.
- Identify specific TDM program and actions to serve member companies (Example: rideshare matching, guaranteed ride home, telecommuting, etc.).
- Develop measurable/quantifiable targets which might include:
a. increasing average vehicle occupancy by percent;
b. reducing the number of vehicles commuting to the
   area by ______ percent.
c. forming ______ number of vanpools, carpools;
d. increasing transit ridership by ______ percent; and
e. target number of employers, public sector and develop-
   opers in the area that will be members of the TMA.

- Determine implementation schedule.
- Design and distribute marketing materials.
- Determine evaluation criteria.

WHAT TMAs DO:

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>ACT (1993)</th>
<th>CATMA (1990)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advocacy</td>
<td>96%</td>
<td>47%</td>
</tr>
<tr>
<td>Ridesharing promotion at employer sites</td>
<td>90</td>
<td>53</td>
</tr>
<tr>
<td>Periodicals/Printed materials</td>
<td>84</td>
<td>NA</td>
</tr>
<tr>
<td>Vanpool formation assistance</td>
<td>78</td>
<td>42</td>
</tr>
<tr>
<td>Ridematching</td>
<td>73</td>
<td>42</td>
</tr>
<tr>
<td>Trip reduction plan preparation</td>
<td>69</td>
<td>39</td>
</tr>
<tr>
<td>Guaranteed ride home</td>
<td>67</td>
<td>36</td>
</tr>
<tr>
<td>Develop/Process employee surveys</td>
<td>67</td>
<td>39</td>
</tr>
<tr>
<td>ETC Training</td>
<td>61</td>
<td>47</td>
</tr>
<tr>
<td>Parking management assistance</td>
<td>41</td>
<td>34</td>
</tr>
<tr>
<td>Transit pass sales</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>Shuttle service</td>
<td>31</td>
<td>39</td>
</tr>
<tr>
<td>Vanpool subsidy programs</td>
<td>24</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>29</td>
<td>NA</td>
</tr>
<tr>
<td>Member information services</td>
<td>NA</td>
<td>55</td>
</tr>
<tr>
<td>Input to local planning process</td>
<td>NA</td>
<td>42</td>
</tr>
<tr>
<td>Vanpool formation/leasing</td>
<td>NA</td>
<td>34</td>
</tr>
</tbody>
</table>
AVERAGE TMA
- Is 3-4 years old and fully operational
- Has 46 members and 33 ETCs
- Has 1-3 full time and 1-3 part-time employees
- Gets 45% of their funding from member dues
- Has an annual budget of $203,000
- Spends 50% of the budget on operational activities

TRANSIT STORES
- Retail environment
- Customer service emphasis
- Links to CAPs, TMAs, and transit agencies
- Commute mobile

Transit store services
1. Transit trip planning
2. Transit information
3. Sale of transit passes and vouchers
4. Ridematch application processing
5. Personalized commute consultation
6. Vanpool formation assistance
7. HOV Lane information
8. Commuter information
9. Traffic reporting

WHO IS RESPONSIBLE FOR EACH PHASE?
1. Inform me -
2. What’s in it for me -
3. How do I start -
4. Encourage me -
5. Reinforce me -
6. I am sold -
TMA EVALUATION PROGRAM

Prepared For:
Florida Department of Transportation
Public Transit Office
Tallahassee, Florida

Prepared By:
Center for Urban Transportation Research
College of Engineering
University of South Florida
Tampa, Florida

February 15, 1995
# TMA EVALUATION PROGRAM

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TMA EVALUATION PROGRAM

I. INTRODUCTION

A. BACKGROUND

The support of transportation management associations (TMA), also commonly referred to as transportation management organizations (TMO), by the Florida Department of Transportation (FDOT) is part of the Florida strategic plan to reduce traffic congestion, improve air quality, and protect the environment.

State funding from FDOT may be provided to the TMAs organized as private non-profit corporations, in cooperation with local government[s] or regional commuter assistance programs, that are established according to local comprehensive plans or regional commuter assistance program goals. State start-up funds may be granted to TMAs in the following ratio: 50% - first year, 40% - second year, and 30% - third year. After the third year, "TMAs will be eligible for continued funding at the lesser of $20,000 or 25% of their total budget, provided they are meeting the performance criteria outlined in their existing JPA [joint participation agreement]. Board member in-kind contributions may count toward local match requirements. Variations from these levels is permitted with prior consultation with the Central Office."

To be eligible for state funding, a TMA must provide the Department with a detailed Agency Annual Work Plan, articles of incorporation and bylaws, geographic boundaries, trip management goals, a financing plan, an institutional structure, and potential membership estimates. In addition to providing this information and as part of the condition for funding, the TMA "shall utilize the Department's TMA Self Evaluation program on an annual basis. Results of the evaluation will be reported to the District office annually."

The following represents the TMA Self Evaluation Program. Please refer to the FDOT Commuter Assistance Program Description Topic No.: 725-030-008C for more detailed information about TMA funding support and requirements.

B. CRITERIA PURPOSES

The TMA Performance Criteria are the basis for assessing TMA performance and for giving feedback to the TMA and FDOT. In addition, the Criteria have many
important roles in strengthening TDM effectiveness in Florida:

1. Designing the TDM evaluation requires the TMA to examine the clarity of its objectives, the ease with which they can be measured, and the possibility of their being achieved.
2. Redirecting efforts when it is determined elements of the program have or do not have desired results.
3. Showing evidence to other agencies and the public of the diligence and sincerity of the TMA.
4. Supplying powerful factual information for public relations campaigns.
5. Helping other TMAs to anticipate problems in implementing similar programs and provide yardsticks against which others may measure their success.

C. TMA PERFORMANCE GOALS

The Criteria are designed to help TMAs enhance their performance through focus on dual, results-oriented goals:

1. delivery of ever-improving value to customers, resulting in greater use of alternatives to the single occupant vehicle by commuters; and
2. improvement of overall TMA operational performance (e.g., lower cost per person served).

D. OVERVIEW OF CRITERIA

It is helpful to review, as a whole, the complete set of 7 Criteria responses. An eighth category, "Other", is provided to allow the TMA to provide any additional basis for evaluation. These Criteria are:

1. Corporate Leadership and Involvement
2. Suitability of Goals and Objectives
3. Development and Deployment of Strategic Plan
4. Financial Management Systems
5. Degree of External Visibility
6. Effectiveness of Programs
7. Measure of Commuter and Member Satisfaction

There are three main considerations in this review: (1) emphasis on the TMA's mission, goals, and objectives throughout the set of responses; (2) criteria that address factors particularly important to the TMA's operations should receive relatively more emphasis; and, (3) responses should be
checked to ensure that responses to related Criteria are consistent, and that there is appropriate cross-referencing to minimize duplication.

E. **KEY CHARACTERISTICS OF THE CRITERIA**

1. **The Criteria are directed toward results.** The Criteria focus principally on six key areas of TMA performance, given below. Results are a composite of:
   a. corporate leadership and involvement
   b. strategic planning
   c. customer satisfaction/retention
   d. cost effectiveness
   e. financial stability
   f. communications

   Improvements in these six results areas contribute significantly to TMA performance. The results indicators also recognize the importance of contributions to improving other transportation operators or suppliers.

2. **The Criteria are nonprescriptive.** The Criteria's focus is on requirements that produce results, not on dictating procedures or imposing organizational structures. Through this approach, TMAs are encouraged to develop and demonstrate creative, adaptive and flexible approaches to meeting basic requirements. The nonprescriptive nature of the requirements thus fosters incremental and major ("breakthrough") improvement.

3. **The Criteria are flexible.** The selection of techniques, systems and organizational structure usually depends upon many factors such as TMA size, service area, the TMA's stage of development, and employee capabilities. The TMA, in cooperation with their FDOT District office and/or regional commuter assistance program, selects which data items, processes, and performance measures best describe its mission and accomplishments.

4. **The Criteria are comprehensive.** The Criteria address all internal and external requirements of the TMA, including those related to fulfilling its public responsibilities. New or changing strategies or directions of the TMA may be readily adapted within the same set of Criteria requirements.

5. **The Criteria are part of a feedback system.** The Criteria are a set of
7 basic, interrelated, results-oriented requirements. An assessment thus provides a profile of strengths and areas for improvement relative to the 7 areas. In this way, the assessment directs attention to processes and actions that contribute to the desired results.

F. INSTRUCTIONS

1. Read the entire booklet before you begin.

The main sections of the booklet provide an overall orientation to the Criteria and how to gather what your TMA is asked to provide.

2. Anticipate assessment and feedback.

A well-written response is one that anticipates reviewer questions. A response should give clear information on how (approach) and on the implementation (deployment) of the approach. Anecdotal information should not be given as it is usually not possible to provide meaningful feedback. Examples are, of course, helpful but they often do not convey a picture of why the TMA is involved in such an activity or how it is carried out. If examples are used, make certain that they illustrate a more complete response than already presented.


Responses should provide as complete a picture as possible to enable meaningful evaluation and feedback. Responses should outline key process details such as methods, measures, implementation, and evaluation factors. However, the TMA should not use lengthy narratives or inclusion of information not directly responsive to Criteria requirements. For this reason, TMAs are urged to make all responses concise and factual. Statements should be supported with data whenever appropriate.

4. Understand the difference between measures and indicators.

All Criteria calling for results require data using key measures and/or indicators. Measures and indicators both involve measurement related to performance. When the performance can be measured directly, such as number of persons placed into carpools and carpool formation rate, the term "measure" is used. When the overall performance may not be evaluated in terms of one type of measurement, and two or more measurements are used to provide ("indicate") a more complete picture, the term "indicator" is used.
For example, "creativity" is not easily described in terms of a single measurement. Awards for marketing materials and increased awareness provide two indicators of creativity. However, the effectiveness of this creativity on travel behavior would require measuring changes to market share gain from introduction of these creative products or services to measure success.

5. Select relevant/important information.

Focus on information that is both directly responsive to the Criteria requirements and to meeting TMA goals and objectives contained in the TMA Overview (described below). Information and data included should be relevant and important to meeting the Criteria and improving the TMA's performance.

6. Cross-reference when appropriate.

Although TMAs should seek to make individual responses self-contained, there may be instances when responses to different Criteria are mutually reinforcing. In such cases it is appropriate to reference responses to other Criteria, rather than to repeat information presented elsewhere.

7. Review each response.

The TMA shall be required to respond to each of the 7 criteria. Each response should be reviewed to make certain that it addresses the Criteria requirements and is consistent with the TMA's mission, goals, and objectives contained in the TMA Overview.
II. TMA PERFORMANCE CRITERIA

A. TMA OVERVIEW

The overview is a summary of the TMA, addressing what is most important to the TMA and the key factors that influence how the TMA operates. It should help the reviewer understand why the TMA exists, who is involved, what are the TMA's products and services, and what resources are being brought to bear on the problems. The TMA Overview should describe:

1. the nature of the TMA's operation: products and services
2. principal customers (e.g., commuters, employers, etc.) and their special requirements.
3. a description of the TMA's service area (activity center or corridor)
4. key customer requirements (for example, prompt response or accurate information) for products and services. Briefly note significant differences in requirements among customer groups or markets, if any.
5. the TMA's relationship to other transportation providers (e.g., transit agency) or organizations (e.g., MPO).
6. the TMA's staff composition, including: number, type, educational level, etc.
7. major equipment, facilities, and technologies used
8. types and numbers of suppliers of goods and services (e.g., third party vanpool operators, taxi operators for the guaranteed ride home program). Indicate the importance of suppliers, and other TMA's, and any limitations or special relationships that may exist in dealing with such suppliers.
9. the regulatory environment within which the TMA operates, including non-profit status, contractual arrangements, concurrency requirement, etc.
10. other factors important to the TMA, such as major new directions for the TMA, major changes taking place in the industry, new alliances, etc.

The TMA Overview should be limited to four pages.

B. CORPORATE LEADERSHIP AND INVOLVEMENT

The leadership category examines the TMA's Board of Directors or advisory committee and executive director's or program manager's personal leadership and involvement in creating and sustaining a customer focus, clear and visible values, and high expectations.
Reinforcement of the values and expectations requires substantial personal commitment and involvement. The leaders must take part in the creation of strategies, systems, and methods for achieving excellence. The systems and methods need to guide all activities and decisions of the TMA. Through their regular personal involvement in visible activities, such as planning, communications, review of TMA performance, and recognizing employees for quality achievement, the Board members serve as role models for staff.

1. **Board of Directors and Executive Director Leadership**

   a. Describe the Board of Directors/Advisory Committee and executive director's/program manager roles and responsibilities in developing goals and objectives.

   b. Identify Board/Advisory Committee activities for leading and/or receiving Board/Advisory Committee training and communicating with TMA employees.

   c. Describe financial and operational performance monitoring systems including types, frequency, content, and use of reviews and who conducts them. Attach the most recent progress and financial report provided by the executive director to the Board.

   d. Describe the process of identifying and selecting new board members including identifying the skills and characteristics that are important to the TMA and comparing the strengths and weaknesses of the existing Board.

   e. Provide a list of TMA committees including mission, names of committee members, affiliations, and types (private/public).

   f. Reveal how the Board/Advisory Committee evaluates and improves the executive director's/program manager's effectiveness. Attach a copy of the Board's most recent performance review form used for evaluating the executive director/program manager as his or her duties relate to the performance of the TMA.

2. **Board of Directors Community Involvement**

   a. Provide a summary or listing of the Board interactions with local and business community leaders on TMA issues. Also
include such communications with national, state, trade associations, other TMAs, and professional organizations. It should be recognized that the amount of time Board members can dedicate to the TMA is limited. At the TMA's option, include a listing of Executive Director interactions with local and business community leaders on TMA issues.

C. SUITABILITY OF GOALS AND OBJECTIVES

This Category examines the process of setting goals and objectives. Major emphasis is placed understanding why the TMA chooses its mission, goals, objectives, and activities.

1. **Scope and Management of Performance Data and Information.**
   
   a. List and define the data and information that is used to measure the TMA's performance in achieving the TMA's goals and objectives. Briefly describe each.

2. **Benchmarking**

   This Criteria addresses data and information related to other TMAs and to best practices. The two major premises underlying this Criteria are: (1) For their key programs or services, TMAs need to "know where they stand" relative to other TMAs or commuter assistance programs and what are the "best practices" for similar activities among other TMAs or commuter assistance programs; and, (2) comparative and benchmarking information provides impetus for significant (sometimes "breakthrough") improvement, and alerts TMAs to new practices. The Criteria addresses the key issues in management of benchmarking. It is anticipated that the existence of benchmark information for many of the TMA programs or services may not be readily available. TMAs may request the assistance of the TDM Clearinghouse in seeking benchmark information.

   a. Describe the criteria for selecting benchmarks.

   b. Describe the process used by the TMA for obtaining and using comparative information. Information might include:

      (1) information obtained from other organizations;

      (2) information obtained from a review of the literature;
and,

(3) evaluation by independent organizations.

c. Describe how this benchmarking information is used to set goals and objectives and improve performance.

3. Analysis and Uses of Data to Develop Goals and Objectives and Products and Services.

Management by fact is a core concept in the Criteria. The Criteria call for a wide variety of data—nonfinancial and financial—to guide a TMA's courses of action toward beneficial results. Despite their importance, however, individual facts do not usually provide a sound basis for action or priorities.

Action depends upon understanding cause and effect and between processes and results. Process actions may have many resource implications; results may have many cost and revenue implications as well.

a. Describe the key steps in the processes for delivering services and how performance at each step is tracked and maintained. For example, the TMA may re-evaluate how it delivers its guaranteed ride home program. The old method may have required the commuter to pre-register with the TMA, receive prior approval to use the program from the Employee Transportation Coordinator, pay taxi fare and get reimbursed, and have to wait 1 hour for the only approved taxi cab provider. After evaluating the customer's experience, the TMA might arrange to have several taxi cab providers accept vouchers for payment directly by the TMA.

b. Describe how processes are improved to achieve better quality, response time, and operational performance. Describe how each of the following is used or considered:
   (1) process simplification (e.g., data entry and mailing sent by same person);
   (2) benchmarking information (e.g., how long it takes other TMAs to fill requests);
   (3) research and testing;
   (4) use of alternative technology (e.g., voice mail access to commute information); and
   (5) information from customers of the processes—within and outside the TMA.
c. Describe how the TMA receives and uses planning input from others such as the regional commuter assistance program, MPO, etc.

d. Describe how new and/or modified products and services are designed and introduced to meet both commuter needs and performance requirements. Factors that might need to be considered in design include: cost, privacy concerns, convenience, third-party capabilities; and support for Employee Transportation Coordinators.

e. Describe how the TMA's products and services are designed and managed so that current employer and member requirements are met and continuously improved (e.g., surveys of employers determined they want real-time access to a transportation advisory system for major reconstruction projects). TMA services also might include providing information to employers on transportation issues such as parking, bus pass sales, etc.

D. DEVELOPMENT AND DEPLOYMENT OF STRATEGIC PLAN

The Strategic Planning Category examines the TMA's long-range (e.g., 3 years) planning process and how the goals and objectives and annual work plans are integrated into the overall strategic plan. Include how this process integrates commuter, member and employer requirements and how plans are carried out. Also discuss how progress is shared with key stakeholders such as the MPO and transit agency.

1. Strategic Plan Development

a. Describe the process used to examine the TMA's strengths and weaknesses as well as opportunities for and threats to the TMA.

b. Attach a copy of the TMA's strategic plan.

2. Implementation of Strategic Plan
a. Describe how the budget, staff, and volunteer resources are allocated to carry out the plan.

b. Describe how the TMA relates current year work program to strategic plan.

3. Coordination with Regional Transportation Organizations

a. Describe how it ensures alignment of TMA plans and activities with area long range transportation plans.

b. Describe how the TMA communicates its plans and reporting progress to the TMA Board, FDOT, RCAP, MPO, and other stakeholders.

4. Local Transportation Service Supplier Quality and Support

a. Describe how the TMA's quality requirements are defined and communicated to the TMA's suppliers (e.g., regional commuter assistance program's ridematching services, taxi cab providers for guaranteed ride home programs) or suppliers to its customers (e.g., third-party vanpool provider).

b. Describe how the TMA determines whether or not its quality requirements are met by transportation providers. Describe how performance information is fed back to suppliers.

E. FINANCIAL MANAGEMENT SYSTEMS

This Category examines the TMA's financial management systems. This information supplements the audit required by the joint participation agreement. The Criteria address financial performance via two major avenues: (1) emphasis on improved productivity, and lower overall operating costs; and (2) support for TMA strategy development, TMA decisions, and innovation.

For technical, fairness, and procedural reasons, care should be exercised when comparing the financial performance between TMAs. These reasons are: (1) short-term improvements in efficiency may be affected by factors such as accounting practices (2) Some TMAs historically have higher measures of efficiency levels than others as a nature of their market (e.g., high density, bedroom communities 30 miles from a downtown and partially served by high
occupancy vehicle lanes are fertile areas for carpool and vanpool formation. Therefore, vehicle miles of travel reduced could be expected to be significantly higher than a TMA near the center city.) (3) The time interval between quality improvement and overall financial improvement depends upon many factors. This interval is not likely to be the same from TMA to TMA. (4) The Criteria measure performance relative to rigorous, customer-oriented, TMA performance criteria. Though improved quality and productivity are likely to improve a TMA's overall effectiveness and efficiency, its financial performance depends also on environmental factors and public policies--which the TMA Performance process cannot measure directly. The inclusion of aggregate financial indicators in evaluations would thus place at a disadvantage programs in the areas without trip reduction ordinances or parking problems. Such programs may have the most to offer from the point of view of sharing management strategies. (5) Efficiency depends upon many external factors, such as local, national, and international economic conditions and business cycles. Such conditions and cycles do not have the same impact on all types of programs or on individual TMAs.

1. **Budget Preparation and Monitoring**
   a. Describe how budgets are prepared and monitored.
   b. Describe how plans consider cash flow requirements.
   c. Attach a copy of the most recent income statement, balance sheet, and statement of cash flows.
   d. Attach a copy of the TMA's internal control procedures.
   e. Attach a copy of the audited financial statements and management letter from the auditor. Describe what actions have been taken to correct deficiencies, if any, identified by the auditor. Attach copies of minutes reflecting the acceptance of the auditor's report and subsequent actions.
   f. Provide information on trends of membership levels, new member recruitment, retention, and, revenue and inkind contributions from members.
   g. Attach a copy of the dues structure and number of members per category.

**F. DEGREE OF EXTERNAL VISIBILITY**

The external visibility category examines the TMA's advocacy, educational,
and outreach efforts and how these relate to enhancing the customer service focus of the organization. Also examined is the potential reach of promotional efforts and their impact in convincing customers to consider alternative commute modes.

1. Promotional Efforts

a. Describe the process used to determine how the promotions will fulfill the TMA's goals and objectives.

b. Include information on the direct costs and in-kind contributions of promotional efforts.

2. Education Opportunities

a. Identify opportunities for professional development including training and conferences for TMA staff and members of the Board.

b. Describe the variety and types of educational opportunities provided to TMA members and their employees. These may include:
   (1) Employee transportation coordinator training programs.
   (2) Seminars, workshops, and courses offered by the TMA at employer worksites
   (3) Employer site visits
   (4) Transportation Days

c. Explain how the TMA communicates its goals, objectives, mission statement and product offerings to the commuters in the TMA's service area. Describe how the TMA uses these opportunities to enhance its appearance as an advocate of commute alternatives. These may include:
   (1) News articles written about the TMA
   (2) Presentations at public meetings and/or hearings
   (3) The use of public service announcements and community television channels
   (4) Other outreach activities

3. Results of External Visibility Efforts.

a. Describe how the effects of promotion, educational outreach and advocacy are measured. Include what impacts are
measured, what process was used to determine which effects should be measured, and how the analysis of these impacts are used to refine and enhance promotional, advocacy, educational and outreach efforts.

b. Identify local government policies and programs that support the TMA and/or transportation demand management strategies. These may include: trip reduction ordinances, congestion management plan includes an active role for the TMA, etc.

G. EFFECTIVENESS OF PROGRAMS

This Category examines the TMA's operational performance. A successful evaluation will use procedures that determine one or more of the following: (1) the extent to which the program has achieved its stated objectives (e.g., increases in Average Vehicle Occupancy); (2) the extent to which the accomplishment of the objectives can be attributed to the program (direct and indirect effects). (3) the degree of consistency of program implementation to plan (relationship of planned activities to actual activities). and, (4) the relationship of different tasks to the effectiveness of the program (productivity). In areas with a regional commuter assistance program, some performance measurements may be included as part of the RCAP evaluation. The TMA should coordinate efforts with the RCAP.

1. Evaluation Methods

a. Describe the methods for collecting the data for evaluation purposes. Some of the most commonly used methods involve: employee surveys; program participation documentation (e.g., registrations for preferential parking, applications for subsidies); vehicle counts; and time sheets or activity logs. The evaluation method and data collection requirements depend on the measures of effectiveness being used.

b. Attach copies of surveys (if applicable) and findings.

2. Product and Service Results

a. Summarize trends and current levels for all key product and service features described in the TMA Overview (e.g., vanpools in operation, customers served, employee transportation coordinators) features; compare current levels
with appropriate benchmarks. These measures, taken together, best represent the most important factors that predict achievement of desired end results described in the TMA Overview.

b. Report data which are objective measures of product and service and may be routinely collected by other organizations or on behalf of the TMA (e.g., regional commuter assistance programs may provide information to the TMA regarding demand for ridematching in the TMA's service area).

c. Determine cost effectiveness for the key results by allocating the expenditures for the period costs to the measures of effectiveness (e.g., cost per person served, cost per vehicle miles of travel reduced, etc.).

H. MEASURE OF COMMUTER AND MEMBER SATISFACTION

The Satisfaction Category examines the TMA's relationships with customers (i.e., commuters and members), and its knowledge of customer requirements. Also examined are the TMA's thresholds to determine customer satisfaction, current trends and levels of customer satisfaction and retention, and these results relative to other TMAs.


   a. Describe how the TMA determines near-term and longer-term requirements and expectations of customers.

   b. Describe how the relative importance of specific product and service features is determined for customer groups.

   c. Identify how other key information and data such as complaints, gains and losses of customers, and product/service performance are used to support the determination.

   d. Provide information on how the TMA addresses future requirements and expectations of customers.

2. Commitment to Customers
a. Describe the TMA's commitments to customers regarding its products/services and how these commitments are evaluated and improved. Examples of commitments are product and service guarantees, such as the response time for a guaranteed ride home program or how personal information confidentiality is maintained.

b. Describe how these commitments:
   (1) address the principal concerns of customers;
   (2) are free from conditions that might weaken customers' trust and confidence; and
   (3) are communicated to customers clearly and simply.

c. Summarize how the TMA evaluates and improves its commitments, and the customers' and members' understanding of them, to avoid gaps between customer and member expectations and TMA performance. Include:
   (1) how information/feedback from customers is used; and
   (2) how product/service performance improvement data are used.

3. Customer Satisfaction

a. Describe how the TMA determines customer satisfaction and customer intentions to use the TMA's services again. Include a brief description of processes and measurement scales used; the frequency of determination; and how objectivity and validity are assured. Indicate significant differences, if any, in processes and measurement scales for different customer groups or segments.

b. Describe how customer satisfaction measurements capture key information that reflects customers' likely future market behavior, such as intentions to use the TMA's services again or positive referrals.

c. The TMA's products and services might be provided via employee transportation coordinators (ETCs). Thus, "customers" should take into account these ETCs as well as the commuter.

d. Identify customer dissatisfaction indicators including number and type of complaints received.
4. Customer Satisfaction Results

a. Summarize trends in the TMA's customer satisfaction and trends in key indicators of customer dissatisfaction.

b. Report trends in measures and/or indicators of customer dissatisfaction. Address the most relevant and important indicators for the TMA's products/services.

I. OTHER

Other factors important to the TMA, such as major new directions for the TMA or additional qualitative information, that are not reflected in the above Criteria. Please describe the approach, implementation processes, and results for these factors.
MARKETING TDM

Module Goals

0 To examine the importance of customer service.
0 To identify the components of a marketing plan.
0 To provide guidance in developing a marketing plan for TDM.

Assumptions

0 Marketing is an essential component of TDM.
0 For many TDM programs, the challenges are similar to operating a small business.
0 Marketing plans need to be developed for each TDM program. What works in one area may not work in another.

WHAT IS MARKETING?

"The process of planning and executing conception, pricing, promotion and distribution of ideas, goods and services to create exchanges that satisfy individual and organizational objectives."

- American Marketing Association

The Importance of Customer Service

Many of the federal, state and local efforts to evaluate the effectiveness of TDM focus on the type of strategies used, the location of the site, and the resources allocated to the program. Not to be overlooked is the role that customer service has played in contributing to the success of the program.

The primary purposes of public transportation and transportation demand management (TDM) promotional campaigns are to in-
crease awareness, foster interest and facilitate inquiry. The near term goal is to get the commuter to come in the front door. After that, promotion alone can't do anything more; customer service must drive the organization.

Quality customer service focuses on:

- what commuters want and need,
- helps them to select the options that are best for them, and
- reinforces their decision.

The objectives of quality customer service are:

1. __________________________
2. __________________________
3. __________________________

In short, customer service can be defined as __________________________

**Implications of Customer Service**

- According to the Technical Assistance Research Program Institute, a leading research organization in the service field, customers who have a **good** experience tell an average of _____ other people.

- Customers who have a **bad** service experience tell an average of _____ other people.

- A study for Coca Cola found that customers to be at least _____ as likely to complain about negative experiences as opposed to positive experiences.

- An A.C. Nielsen Co. study found only 1 in 50 dissatisfied customers.

- 95% will buy again if the complaint is resolved quickly.
The cost of obtaining a new customer is ___ times the cost of keeping an existing customer.

**Implications of Customer Loyalty**

- Your local supermarket expects at least $4,400 to $22,000 from each consumer during the five years that market research shows that the customer lives in the same neighborhood.

- In banking, the average customer represents $80 a year or more in profit.

- Auto industry studies have found that a brand-loyal new car dealer’s customer represents average revenue of at least $140,000 over the customer’s lifetime.

**What Can TDM Programs Do?**

TDM programs can easily fall in the trap of having a product orientation rather than a customer focus. The following summarizes several of the conditions suggesting the TDM program has a customer orientation rather than a product focus.

**A Customer Driven TDM Program..**

*Does not see the TDM products as inherently desirable.* TDM program directors seldom entertain the possibility that potential members or commuters may not share their enthusiasm about their products and services. They can not see why, given a clear description of their organization and what it provides, commuters would not respond enthusiastically. Committed program directors may find it hard to believe that right-thinking people wouldn’t want to reduce their transportation costs and community-minded employers wouldn’t want to reduce traffic congestion and air pollution.

*Dismisses the notion of commuter ignorance.* TDM program directors tend to attribute any lack of interest to the fact that commuters don’t fully appreciate the nature of the service. Or if commuters do understand, TDM program directors haven’t found the right incentive (i.e., magic bullet) to motivate them. The conventional wisdom assumes commuters do not appreciate the true value of their...
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estimated savings.

Surveys reveal that existing customers overwhelmingly agree that ridesharing can save them a lot of money. Harping on the cost savings to this group would seem to be less effective in motivating them to action. In Virginia, over 50% of the people receiving a matchlist try to form a pool by contacting someone on their list. However, ridesharing programs find between 10% to 30% of their customers ultimately form a carpool or join a vanpool as a direct result of the matchlist.

Commuters who were unable to form a pool report finding the persons on the list unwilling to form a pool or had moved or changed work locations or schedules. It was concluded that what commuters needed was a set of clear-cut techniques for forming a ridesharing arrangement, an aggressive updating effort, and a sense of hope that they might succeed. The orientation of the program swung away from information to action.

Places less emphasis on promotion. Many TDM programs place too much stock in advertising and public relations. These programs seek to increase their success by increasing the size of their customer database by adding new customers rather than improving the service to those existing and former customers. They are convinced that the TDM program should concentrate on spreading the message and packaging it well. Too often the message TDM programs usually have in mind is the story they want to tell, not what the commuter or employer needs.

Again, the conventional practice for TDM programs to encourage pool formation is to distribute survey forms once a year through the member companies and tell customers about the money they can save or the public benefits that will accrue. They believe that people do not return a survey form because they don't appreciate the offer.

While this promotion effort works for some, important segments respond to different messages. For example, existing market research indicates that cost savings are one of the primary advantages of ridesharing cited by commuters. However, there is a distinct reluctance to ride with people they do not know. Strategies such as "Meet Your Match" social events are designed to erode this barrier.
Makes consumer research a high priority. If one "knows" that the problem lies with the commuter and that better promotion is the key to success, the principal role for research is merely to confirm beliefs. Yet, as most private sector marketers will attest, research can challenge some managers' most fundamental assumptions about their customers.

Adheres to the belief that there isn't one best marketing strategy. Unlike many transportation professionals, the TDM program director is often in close touch with the market and is less likely to view it as monolithic or at least as having a few crudely defined market segments. Subtle distinctions can be played up.

TDM ridematching programs use factors such as work schedule, home and work locations to match potential carpool partners. This computerized process ignores the interpersonal factors which may ultimately determine whether a pool is created.

As a consequence of the TDM program's limited product line, most TDM programs tend to develop a single approach, aim it at the most obvious market segments, and then run with them. This climate of managerial focus on the existing product line precludes experimentation either with alternative strategies or with variations of the product to serve different market segments. Yet the opportunities for careful experimentation abound. Matching by degree of interest or demographic preferences could enhance the probability of a successful match. Some segments of the population might want and need more "hand holding" through the formation process. Others may wish to delegate the responsibility of calling those on the list to find potentially suitable matches.

Does not ignore generic competition. While many nonprofit organizations consciously compete for attention and funds, many organizations don't have clear competitors because their services or products are intangible or emphasize behavioral changes such as ridesharing. The competitors for TDM services are not immediately apparent. So it is not surprising that TDM programs ignore competition at either the product or generic level.

At the the product level, TDM programs such as transportation management associations or organizations compete with other membership organizations for employer dues and in-kind services. TDM programs rarely plan strategies to compete at the product level because they lack a consumer perspective. They need to
demonstrate the value added to the employer for its services -- how it helped meet the needs of its employees, how the TDM program contributes to the employer's bottom line, or how collective action by employers made a difference for some transportation improvement.

Inertia can be a powerful force, but enthusiastic program directors tend to ignore it. When they peddle changes in behavior or new ideas, most non-profits de-emphasize competition from the status quo.

*Hires marketing staff based on marketing skills rather than TDM knowledge.* In a modern marketing organization, staff members are selected on the basis of their knowledge of customer markets and or marketing research and management techniques. One can learn the key characteristics of a product in a few weeks, but market awareness and marketing expertise take years to master. Once gained, this expertise can be applied to many product or market contexts.

For some Board of Directors or Advisory Committees, knowledge of transportation and TDM counts most in the hiring of an executive director. This preference for TDM experience prevails because of three factors:

1. Since TDM and marketing are unfamiliar to the Board whose composition is primarily human resource directors, transportation engineers, local planners, and elected officials, they don't know how to evaluate marketing skills.

2. In the case of TDM program directors who are hiring additional staff, most directors have accumulated most of their experience using knowledge of TDM and so are more comfortable working with people who have that orientation.

3. Any field can be subject to networking where the person with transportation experience is given the edge simply because of product knowledge. The fact that many newly hired TDM program directors are expected to immediately begin operation without a formalized training program or the existence of additional personnel to carry on the program to replace the predecessor contributes to this factor.
What Should TDM Programs Do?

One step to assess the agency’s responsiveness to customer needs is to prepare a “Report Card”. This assessment will help identify the products and features that are important to those customers and evaluate how the TDM program is performing in those areas. Areas given a high priority such as turnaround time or accuracy that are rated low represent the TDM program’s challenges to improve on. Conversely, those areas where customers rated very low in importance and performance could be considered inconsequential to that market and should not consume resources.

<table>
<thead>
<tr>
<th>High Priority</th>
<th>OPPORTUNITIES</th>
<th>STRENGTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Poor</strong></td>
<td>NO ONE CARES</td>
<td>NICE TO HAVE</td>
</tr>
<tr>
<td><strong>Excellent</strong></td>
<td></td>
<td></td>
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</tbody>
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Low Priority

The Marketing Plan: A Roadmap for Success

No single marketing plan is appropriate for every circumstance. Each organization faces different problems, and has a different set of parameters affecting its progress. But successful organizations tend to hold certain planning and management principles in common. These principles focus on the customer and total involvement of every team member in achieving organizational goals and objectives. It is a process whereby companies or organizations continually strive for better ways to serve their customers. The objective is not only to be better internally, but also to be better than the competition.

The primary principles are to focus on the customer, manage with facts, work as a team, show mutual respect, emphasize training and professional development, and follow the “Plan-Do-Check-Act” process. The underlying tenets of the process are to strive for total
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customer satisfaction, and to never assume that the job is done. Other principles include commitment to the process by top managers and policy makers, total involvement of every team member, and methods of evaluating quality and improving progress.

Simply stated marketing means developing better ways to satisfy commuter needs. All commuters are potential customers of TDM programs. But who is the competition? The primary competition for TDM programs is the alternative that attracts commuters away from TDM - the single occupant vehicle. Envisioning single occupant vehicles as the competition may seem unusual, but if TDM programs fail to convince commuters to use a TDM alternative, then they cannot be claimed as customers. And if they are not customers of TDM, then they have decided that SOV travel is their best solution. They have been lost to the competition.

Attracting commuters as TDM customers requires knowledge of their needs and products or services that target those needs. The process for getting there is can be described as “Plan-Do-Check-Act” (PDCA) cycle. In simple terms, a TDM agency would prepare a Plan for getting customers into alternate modes, Do or carry out the plan, Check to assure that the plan is working, and Act by standardizing the successful program, then starting the cycle over again with new information. Even if the decision is made to standardize, the key is to never assume that the job is done. Instead, accept that change is inevitable and constantly examine new and better ways to meet customer needs. The following describes how to incorporate the “Plan-Do-Check-Act” cycle into TDM.

SAMPLE STRATEGIC PLAN

PROGRAM STRATEGY
Program Goals

Program Description

Scope. The types of solutions to commute problems offered or to be offered are:

- Ridematching
  - Batch matching
  - Personalized matching
  - "Ride Wanted" Posters
- Vanpooling
  - Third-party provider
  - Owner-operator
  - Transit agency
- Transit
  - Route information
  - Ticket/pass sales
- Guaranteed Ride Home
  - Taxi
  - Rental Cars
  - Fleet cars
- Alternate Work Programs
  - Flextime workshops
- Employee Transportation Coordinator training
- Parking Information
- Telecommuting

Segments

Differentiation from Competition

- Our program name does/does not help us to increase ridesharing awareness among our target markets.
- Our promotional theme does/does not help us to increase awareness.

Program Objectives:

- Market Share - "Increase carpoolers placed from ____ or ____% of the potential carpool market to ____ or ____% of the market by the end of the fiscal year."
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- Customer growth rate - "Increase the total number of customers receiving assistance by _____ or _____% more than the _____ customers who received assistance last year."

- Average Vehicle Ridership - "Increase the average vehicle ridership from 1.xx to 1.xy or ____% by the end of 199X.

As part of the program's strategic process, the TDM agency will need to identify the markets and services to be offered. The strategic direction will shape the services and tactics to be developed in the marketing plan. When viewed in terms of current markets and services and new markets and services, the organization can take one or more strategic directions. It can seek to penetrate current markets with existing services. The organization may develop new services to meet the needs of these same customers. It can development new markets for current services through tactics like expansion. Finally, the organization could diversify its services to attract new markets.

**STRATEGIC DIRECTION GRID**

<table>
<thead>
<tr>
<th></th>
<th>CURRENT SERVICES</th>
<th>NEW SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURRENT MARKETS</td>
<td>Market Penetration</td>
<td>Service Development</td>
</tr>
<tr>
<td>NEW MARKETS</td>
<td>Market Development</td>
<td>Diversification</td>
</tr>
</tbody>
</table>

**FOUR COMPONENTS OF MARKETING**

- ______________________________

- ______________________________

- ______________________________

- ______________________________
PRODUCT STRATEGY ALTERNATIVES

The following list the type of strategies that could be used for each of the above products and services.

- No Product/Service Change
- Product/Service repositioning
- Product/Service improvement
  - Changes in attributes
  - Changes in packaging
- Eliminate the product/service
- Develop a new product/service
  - Closely related product/service
  - Provide a product or service you previously purchased
  - Unrelated product or service that will expand the scope of the program

When evaluating the product strategy begin by listing each of the products and services separately. Describe each of the features or physical characteristics. Identify how each of these features is used or valued by the commuter for his or her own benefit.

<table>
<thead>
<tr>
<th>List and Describe One of Your Current Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product: ____________________________________</td>
</tr>
<tr>
<td>Description: ________________________________</td>
</tr>
<tr>
<td>Attributes/Features: __________________________</td>
</tr>
<tr>
<td>Product Benefits: ____________________________</td>
</tr>
</tbody>
</table>
# PRICING STRATEGY ALTERNATIVES

## PRICING APPROACH

<table>
<thead>
<tr>
<th>Pricing Approach</th>
<th>How It Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bundling or unbundling</td>
<td>Sell products or services together as packages or break them apart and price accordingly. Example: Allow employers to buy a subscription guaranteed ride home as part of the transit pass subsidy program.</td>
</tr>
<tr>
<td>2. Time-period pricing</td>
<td>Adjust price, up or down, during specific times to spur or acknowledge changes in demand. Example: Early bird specials at parking lots.</td>
</tr>
<tr>
<td>3. Trial pricing</td>
<td>Make it easy and lower the risk for a customer to try the product or service. Example: Van subsidies for new starts.</td>
</tr>
<tr>
<td>4. Accounting-system pricing</td>
<td>Structure price to make it more salable within a customers’ buying constraints. Example: Payroll deduction for transit passes.</td>
</tr>
<tr>
<td>5. Value-added packages</td>
<td>Include free “value-added” services to appeal to bargain shoppers, without lowering prices. Example: Arrange for discounts at local service stations for vanpool maintenance.</td>
</tr>
<tr>
<td>6. Pay-one-price</td>
<td>Unlimited use or unlimited amount of a service or product, for one set fee. Example: Vanpool driver given unlimited free personal use of vanpool.</td>
</tr>
<tr>
<td>7. Constant promo pricing</td>
<td>Although a “regular” price exists, no one ever pays it. Example: Buy one pass - get another for half-price.</td>
</tr>
<tr>
<td>8. Price = performance</td>
<td>Amount customers pay is determined by the performance or value they receive. Example: Offering a map of downtown parking for $10 and allowing commuters to ask for any amount refunded after use.</td>
</tr>
<tr>
<td>9. Change the standard</td>
<td>Rather than adjust the price, adjust the standard to make your price seem different (and better). Vanpool’s selling a $80 per month seat for “four weekly payments of $20”.</td>
</tr>
<tr>
<td>10. Shift costs to the Customer</td>
<td>Pass an ancillary costs directly to your customer and do not include those in your price. Example: Provide a “free ride home” but require the commuter to tip the driver.</td>
</tr>
<tr>
<td>11. Variable pricing tied to a creative variable</td>
<td>Set up a “price per” pricing schedule tied to a related variable. Discount the unit cost employers pay to register all employees for a guaranteed ride home program.</td>
</tr>
<tr>
<td>12. Different names for different price segments.</td>
<td>Sell essentially the same services, under different names, to appeal to different price segments. Establish TMO membership categories (e.g., Gold, Silver, and Bronze) with different dues requirements.</td>
</tr>
<tr>
<td>13. Product-line pricing</td>
<td>Establish a range of price points within the product line. Structure the prices to encourage customers to buy your highest-profit product or service. Offer additional services to TMO members depending on membership class (e.g., 4 tickets to the fund-raising golf-tournament).</td>
</tr>
<tr>
<td>14. Differential pricing</td>
<td>Charge each customer or each customer segment what each will pay. Charge each employer for participation in the guaranteed ride home program based on employee distribution and existing bus service.</td>
</tr>
<tr>
<td>15. Quality discount</td>
<td>Set up a standard pricing practice, which can be done several ways.” Example: Discounts for transit passes bought by employers above a certain level.</td>
</tr>
<tr>
<td>16. Fixed, then variable</td>
<td>Institute a “just-to-get-started” charge, followed by a variable charge. Example: Taxi fares; congestion pricing schemes based on usage.</td>
</tr>
<tr>
<td>17. “Don’t break that price point!”</td>
<td>Price just below important thresholds for the buyer, to give a perception of lower price. Example: Charging $59 per month for a parking space.</td>
</tr>
</tbody>
</table>
This table was adapted from an article in INC. Magazine, “Naming Your Price”, July 1992

**DISTRIBUTION STRATEGY ALTERNATIVES**

The following options help determine how the products and services will be distributed to the market

- **Commute Information**
  - Media Outreach
  - Employer Outreach
  - Area-wide agency solicits commuter inquiry
  - Self-standing kiosks
  - Other locations (e.g., malls, libraries)

- **Commuter Networking**
  - Worksite contacts (e.g., Chamber of Commerce)
  - Home-end contacts (e.g., homeowner associations, civic associations)
  - Board member contacts

- **Commute Vehicles**
  - TDM program directs delivery to:
    - Driver/operator
    - Employer owner/leasee
  - Third-party lessor
  - Employer owner/lessee delivery to driver
  - Driver pickup at lessor place of business or vehicle dealership

<table>
<thead>
<tr>
<th>List Distribution Strategies Used by Your Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
Managing Our Way Through Congestion

PROMOTIONAL STRATEGY ALTERNATIVES

The following lists the promotional and advertising strategies that can be used for each of the products and services as well as the organization itself.

**o Types**
- Generic advertising
- Mode advertising (e.g., vanpooling or transit)
- Channel (distribution) support ("Trade" promotion to distributors, e.g., employers)

**o Objectives**
1. Increase awareness
2. Increase rate of inquiry
3. Increase product trial
4. Reinforce regular use

**o Copy Strategy**
- Segment for different user groups
- Differentiate from competition
- Correct misperceptions

**o Media Strategy**
- Broad reach
- Largest market segments
- Prime prospects

**o Timing Strategy**
- Steady
- Pulse (seasonal or periodic)
- Start-up Pulse

**o Budget Strategy**
- Percentage of total budget
- Based on costs of specific tasks

**o Public Relations**
- Create image for:
  Program or agency
  Ridesharing generically
  Selected mode (e.g., carpooling)
  Communicate sponsor or agency philosophy
  Correct negative or faulty image
Personal Selling
- Organization:
  Geographic
  Market Oriented
- Outreach method:
  Program's own personnel
  Employee Transportation Coordinators
  Outsourcing
- Personnel Selection
  Experienced
  Educational Background
  Training needs
  Compensation package
SAMPLE MARKETING PLAN FORMAT

EXECUTIVE SUMMARY

INTRODUCTION

Purpose: The purpose of this marketing plan is to provide a guide for all marketing activities during 199X. Specifically, this document will:

1. Review the TDM program's marketing situation.
2. Define the TDM program's challenges and opportunities.
3. Outline a marketing program, including goals, objectives, and strategies.

SITUATION REVIEW

Market for TDM services

1. Trends
   a. Population
   b. Workforce
   c. Customer base

2. The Product Line
   a. Ridematching
      (1) Batch matching
      (2) Personalized matching
      (3) "Ride Wanted" Posters
   b. Vanpooling
      (1) Third-party provider
      (2) Owner-operator
      (3) Transit agency
   c. Transit
      (1) Route information
      (2) Ticket/pass sales
   d. Guaranteed Ride Home
      (1) Taxi
      (2) Rental Cars
      (3) Fleet cars
   e. Alternate Work Programs
      (1) Flextime workshops
      (2) How-to guide for employers
   f. Employee Transportation Coordinator training
   g. Parking Information
      (1) Location Map and Price sheet
      (2) Preferential parking: How-to for employers
h. Telecommuting
   (1) Workshop
   (2) Advisory Committee
   (3) Assistance to employers

3. The Competition
   a. TDM program's competition is wide ranging.
   b. Single occupant vehicles hold a share of ___.
   c. Parking discounts and subsidies
   d. Non-profits & business organizations for dues
   e. Competitive advertising is found in all major media (television, newspapers, radio, magazines, and outdoor).

4. The Prime Prospect
   a. Demographics
   b. Psychographics/Benefits. In selecting a mode, commuters consistently discriminate on the basis of the following characteristics
      (1) Convenience
      (2) Reliability
      (3) Cost
      (4) Time
      (5) Awareness of options

5. The Buying Process
   a. A proportion of commuters change mode when:
      (1) Residential location
      (2) Work location
      (3) Work schedule
      (4) Out-of-pocket prices rise
   b. The most motivating attributes in selecting a non-SOV mode are related to:
      (1) (List attributes in rank order of importance among current customers).

6. Results of Prior Programs
   a. Advertising Campaign
   b. Employer Outreach
   c. Guaranteed Ride Home program
   d. etc.

CHALLENGES AND OPPORTUNITIES

Results of the current campaign are ____. The TDM program has
Managing Our Way Through Congestion

awareness in the absolute and relative to other alternatives.

Strategic Implication: The TDM program’s greatest strength is _______.

MARKETING PROGRAM
1. Goals/Objectives/Rationale
   a. Awareness
      (1) **Goal**: To increase top-of-mind (unaided) awareness of the TDM program.

      (2) **Objective**: To increase unaided awareness of the TDM program in its marketing area by a statistically significant amount versus the level measure in _____.

      (3) **Rationale**: Before commuters will use the services, they need to know what services are offered, how to access those services, and what are the costs and benefits associated with the services.

   b. Image
      (1) **Goal**: To create an image of the TDM program among potential customers that is _____.

      (2) **Objective**: To increase ratings of the TDM program in its marketing area by a statistically significant amount versus the level measure in _____.

      (3) **Rationale**: The differences between SOV and alternative modes are significant to commuters.

      The TDM program needs to establish a strong umbrella image to support the various alternatives (carpool, vanpool, bus, etc.) as well as the various vendors (transit system, van leasing company, etc.)
c. Cost Efficiency
   (1) **Goal:** To improve the cost efficiency of the TDM program by:
       (a) increasing the number of customers using the services
       (b) increasing the rate of customers altering their mode
       (c) increasing the part-time use of modes
   (2) **Objective:** To be determined
   (3) **Rationale:** A key objective of a publicly funded program is to increase the effectiveness of the services it delivers. To help accomplish this, the goal of the TDM program marketing should be to increase the number of customers, formation rate, and part-time use of modes.

2. Advertising Strategy
   a. **Objective:** The prospect should initiate or renew an account relationship with the TDM program.
      
      (1) **Target Audience:**
          (a) Demographics
              o Adults
              o Employed
          (b) Psychographics
              o Seeking an alternative to driving alone
              o Finds commute to be stressful
   b. **Creative Strategy**
      (1) **Image:** The prospect should feel that the TDM program is a leader in commuting options within the community.
      (2) **Key Thought:** The prospect should know that the TDM program is a provider of commuter information and assistance.
Managing Our Way Through Congestion

(3) **Mandatory**
   (a) Advertising should build an emotional bond with the TDM program.
   (b) Visual media should include logo.

c. **Media Strategies**
   (1) Use ___ as the most efficient medium for generating high reach of the target audience, which is ________.

d. **Public Relations Strategy**
   (1) Use public relations at major employment centers as a basis to reinforce the TDM program's image and increase inquiries.
   (2) The public relations program will consist of the following:
      (a) Employer outreach
      (b) Transportation Days/National Transportation Week
      (c) Crisis response package

e. **Additional Key Strategies**
   (1) Establish an aggressive and enthusiastic staff through training.
   (2) Use targeted marketing programs to cross-sell existing and former customers:
      (3) Direct mail
      (4) Point-of-prompt materials
      (5) Use targeted marketing programs to build business for vanpooling and non-motorized travel.
Key Terms in Advertising

**Gross Impressions:** The sum of the estimated number of persons who listened to a station for a minimum of five minutes within a quarter hour for all spots in a given schedule.

For example, if one person hears a spot three times and two other persons hear the spot once each then there has been a total of five gross impressions made.

**Reach:** The estimated number of different persons who are listening at least once to a given schedule. (unduplicated audience).

**Frequency:** The number of times a person is exposed to an advertisement.

**Cost per thousand impressions:** The average cost delivering 1,000 gross impressions.
### Example

#### EVALUATION OF RADIO CAMPAIGN

*For adults between 25 and 54 years old (354,300 people in market segment)*

<table>
<thead>
<tr>
<th>Station</th>
<th>Gross Impressions</th>
<th>Reach</th>
<th>% Reach</th>
<th>Frequency</th>
<th>Cost/1000 Impressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEZS</td>
<td>1,115,200</td>
<td>93,771</td>
<td>26.5%</td>
<td>11.9</td>
<td>$6.46</td>
</tr>
<tr>
<td>WTVR</td>
<td>676,200</td>
<td>53,777</td>
<td>15.2%</td>
<td>12.6</td>
<td>$4.59</td>
</tr>
<tr>
<td>WRVA</td>
<td>603,600</td>
<td>84,132</td>
<td>23.7%</td>
<td>7.2</td>
<td>$3.38</td>
</tr>
<tr>
<td>WRVQ</td>
<td>581,400</td>
<td>91,308</td>
<td>25.8%</td>
<td>6.4</td>
<td>$4.64</td>
</tr>
<tr>
<td>WPLZ</td>
<td>464,000</td>
<td>66,443</td>
<td>18.8%</td>
<td>7.0</td>
<td>$3.49</td>
</tr>
<tr>
<td>WRXL</td>
<td>396,000</td>
<td>56,347</td>
<td>15.9%</td>
<td>7.0</td>
<td>$4.58</td>
</tr>
<tr>
<td>WKHK</td>
<td>84,000</td>
<td>18,046</td>
<td>5.1%</td>
<td>4.7</td>
<td>$5.00</td>
</tr>
<tr>
<td>WQSF</td>
<td>36,000</td>
<td>11,272</td>
<td>3.2%</td>
<td>3.2</td>
<td>$22.22</td>
</tr>
<tr>
<td>WRJY</td>
<td>19,200</td>
<td>2,793</td>
<td>0.8%</td>
<td>6.9</td>
<td>$0.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,975,600</td>
<td>438,793</td>
<td>100%</td>
<td>7.4</td>
<td>$6.04</td>
</tr>
</tbody>
</table>

**Objective 1:** To increase the number of customer inquiries directly from the general public by 33% by the end of June.

**Interim Result:** Telephone calls increased by 38% during the 6 months the radio ads were running.

**Objective 2:** To increase the level of awareness of the TDM program’s services by 25% over a two year period ending June 30, 1986.

**Interim Result:** Level of awareness in June, 1984 was 36%. Level of awareness for the primary market rose to over 60%.

**Objective 3:** Obtain $15,800 in documented in-kind contributions by June 30, 1986.

**Interim Result:** Ridefinders paid $27,000 for 555 spots and received 464 spots valued at over $21,000.
TDM IN THE AGE OF DIVERSITY

MODULE GOALS

- To examine the impact of TDM policies on subsegments of the population.
- To provide guidance for establishing a TDM program responsive to the needs of specific markets.

ASSUMPTIONS

- Participants have a basic understanding that the workforce is becoming increasingly diverse demographically.
- Market segmentation can improve the marketing and delivery of TDM services and products.
- Failure to recognize the implications of TDM on various segments of the population can damage the TDM program's credibility.

What is the effect of TDM measures on:

- Women?
- Organized Labor?
- Minorities?
- How can TDM programs be designed to better accommodate these groups?

Understanding diversity means recognizing the differences, and in some cases the similarities, of the different groups of people who comprise a program's target market. Although the demographic gaps between these groups are narrowing, it is important to recognize differences along gender, cultural and racial lines to more efficiently deliver a message, meet peoples' needs, and benefit society as a whole. A program manager must be cautious to avoid stereotyping and generalizing. By assuming that a person will act in a particular manner because of gender or heritage is ludicrous. Conversely, without some sensitivity to the obstacles
and needs of single parents in the workplace, an employer risks losing a valuable employee to a competitor who offers more attractive, and necessary benefits.

**GENDER DIFFERENCES IN TRAVEL BEHAVIOR**

Statistical research shows:

- Working women depend more on the car than men who are in the same economic class and family situation.

- Working women rely on the car to combine work trips with family obligations: childcare, grocery shopping, etc.

- Low-income women travel farther to work than low-income men and high-income workers of either gender.

- Single mothers in the labor force depend more on the car than any other group.

**Edge Cities**

**Women in the Workforce**

- 1975-1979 eight million non-wage-earning women found jobs.

- 1978 was the "spike" year for women entering the American workforce.

- In 1978, developers started putting up large office buildings outside the male-dominated downtowns.

- From 1970 to 1978, the number of cars in America more than doubled.

### List Barriers to Women's Participation in TDM programs

**Problems working women face in switching to alternative modes:**

1) 
2) 
3) 
4) 
5) 

---

### RECOMMENDATIONS

**TDM programs should:**

- Allow flexible work schedules
- Encourage telecommuting
- Provide childcare and eldercare services in convenient locations
- Compensate workers for the childcare and eldercare costs of using slower alternative modes
- Provide meaningful security for women using alternative modes at night
- Offer mid-day transportation to grocery stores, dry-cleaners, banks, post office, etc.
- Offer comprehensive, well-advertised guaranteed ride home programs
Just as working mothers, single-parents, and primary care-givers have special needs in today's workplace which demand considerations and changes in the way managers approach TDM, another distinct group is the body of union workers. Union workers have specific regulations which delineate work regulations arrived at under negotiation, and agreed to by union representatives and management. These men and women generally hold the blue-collar jobs with strict work-hour guidelines that would cause them to be considered prime candidates for many ridesharing arrangements. Before the program manager may approach these commuters, however, it is imperative that he/she becomes familiar with the collective bargaining contract under which these people work. Once the contract has been reviewed, if no conflicts are present, the manager may proceed with a TDM program. If there is any doubt about the legality or propriety of typical TDM initiatives, the wisest course of action for the TDM manager is to approach management and union representatives simultaneously to reach consensus and make a determination about the possibilities of a TDM program. If this requires changes to the collective bargaining agreement, the union representative is the best resource for learning the method to change this contract, as well as the vehicle for the change(s).

ORGANIZED LABOR

An Unfair Labor Practice (UFLP) occurs when:

an employer dictates terms of employment covered by a collective bargaining agreement without negotiating with the designated union representative.

Examples of TDM measures which can change work rules:

- Cash incentives for employees who opt for alternative modes
- Alternative work hours
- Management-by-results review of employee performance necessary for telecommuting

How to Avoid an UFLP:

- Include a person selected by the union in the design of the TDM program
Renegotiate the contract to include TDM measures, if necessary

List two advantages of implementing TDM in a unionized workplace:

1. 
2. 

As white collar workers left the city, and moved to the suburbs, blue-collar and unskilled, manual-labor jobs were created in and near the new suburban neighborhoods. The people who moved to these more-expensive neighborhoods continue to work in the central business district to afford their lifestyles. The people who live in the inner-city by choice or for financial reasons make up the unemployed and under-employed population who have no access to the new markets in the suburbs, and may burden the financial infrastructure of their city. If provisions were made to transport the men and women who cannot afford private transportation, and are not offered public transit, two obstacles will be overcome by this "reverse commute." The people will have jobs, and the open jobs will be filled.

REVERSE COMMUTING


- Population growth in the suburbs
- Job creation in the suburbs
- Whites fled to the suburbs; minorities stayed in the cities
- Lack of alternative mode infrastructure in the suburbs

Catch-22 for urban residents:

- Need a car to get to the job
- Need a job to afford the car

Reverse Commute programs:

provide transportation for urban residents to reach suburban job sites.
Programs can be sponsored by:

- public housing tenants' association (Chicago)
- urban neighborhood community center
- urban non-profit association (Chicago, Detroit)
- municipal transit agency (Detroit)
- regional transit agency (Philadelphia)
- state department of transportation (Milwaukee)
- suburban employers
- suburban business park developers

Program Example:

Hartford, CT
City of Hartford Employment Transportation Service
Reverse Commute Vanpool Program.

- Cooperative effort between public agency and 1-3 employers

- Specific Program guidelines:
  - Income level considerations
  - For under employed and unemployed urban residents
  - Only for commute routes not served by transit
  - Must have minimum of four riders to start program

- To initiate vanpool, company pays half of cost after subsidy, if any

- Employee pays other half of costs
  - Employee's share is comparable to transit costs
  - Door-to-Door $1.50-1.75 each way
  - Central Pickup $0.75-1.25 each way
  - Free van ride to interviews, testing, training... for new job
  - Employee does not contribute fare for two weeks, until first paycheck.
  - After approximately 6 months, company stops subsidy, and employee assumes costs (payroll deduction is an option)

Additional information:

Reverse commute programs can enable people to hold a job who would otherwise be unemployed.

TDM strategies based on financial penalties (i.e. parking fees) will have a disproportionate effect on low-wage earners.

Reverse commute programs are only a short-term solution.
Providing reverse commute transportation services is, at best, a short-term solution. The long-term problem is the job-housing imbalance which creates the need for reverse commuting. Transportation planners must address this problem with long-term solutions which encourage job creation in the urban area and affordable housing in the suburbs.

From the following tables, a trend has been established which demonstrates how the commute patterns of minority communities are becoming more similar to those of the "white" community. Although one study is gained from survey information in one city, the other is from a national survey, and they both indicate similar findings over about a decade. It is important to note that although

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Total Commuters</td>
<td>Number</td>
<td>2924</td>
<td>186</td>
<td>7168</td>
</tr>
<tr>
<td>City&gt;CITY</td>
<td>Number</td>
<td>477</td>
<td>133</td>
<td>890</td>
</tr>
<tr>
<td>Percent</td>
<td>16.3%</td>
<td>7.1%</td>
<td>12.4%</td>
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<tr>
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<tr>
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<td>18.3%</td>
<td>7.4%</td>
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<td>26.1 min</td>
<td>19.2 min</td>
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<td>Percent</td>
<td>24.5%</td>
<td>6.5%</td>
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<td>6.9</td>
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<td>Time</td>
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<td>14.9 min</td>
<td>18.1 min</td>
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the trend is toward sameness, the two groups have some differences which the effective manager will understand and use to serve the communities better independently, and, in turn, the combined, larger community, society, better.

<table>
<thead>
<tr>
<th>RACIAL DIVERSITY AND TDM COMMUTER TRENDS</th>
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<tbody>
<tr>
<td>Variable</td>
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<tr>
<td>Person Trips</td>
</tr>
<tr>
<td>Person Miles of travel</td>
</tr>
<tr>
<td>Vehicle Trips</td>
</tr>
<tr>
<td>Vehicle Miles of Travel</td>
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What programs or approaches would be best suited for Asians?

African Americans?

Hispanics?

Whites?
### CULTURAL DIFFERENCES AMONG LOS ANGELES COMMUTERS

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>African-American</th>
<th>Asian</th>
<th>Hispanic</th>
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<tr>
<td>% at worksites with &gt;100 employees</td>
<td>65</td>
<td>50</td>
<td>62</td>
<td>70</td>
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<tr>
<td>% with Household income&gt;$65,000</td>
<td>36</td>
<td>20</td>
<td>31</td>
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<td>Average number of months at worksite</td>
<td>65</td>
<td>54</td>
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<tr>
<td>% always have a car available to commute</td>
<td>94</td>
<td>85</td>
<td>90</td>
<td>79</td>
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<tr>
<td>% Drive alone 3+ days per week</td>
<td>84</td>
<td>73</td>
<td>86</td>
<td>65</td>
</tr>
<tr>
<td>Average number of people per carpool</td>
<td>2.50</td>
<td>2.98</td>
<td>2.56</td>
<td>2.89</td>
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<tr>
<td>Average number of months in a carpool</td>
<td>29</td>
<td>27</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td>Most common carpool partner</td>
<td>Household member</td>
<td>Co-worker</td>
<td>Household member</td>
<td>Household member</td>
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<tr>
<td>% would try car-pooling 1-2 days/wk.</td>
<td>16</td>
<td>22</td>
<td>25</td>
<td>20</td>
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<tr>
<td>% of 20+ mile commuters would try vanpooling</td>
<td>18</td>
<td>11</td>
<td>20</td>
<td>14</td>
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<td>% would try riding the bus</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>9</td>
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References

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MANAGEMENT ISSUES IN TDM

Module Goals

- To review the roles of the executive director and Board of Directors.
- To examine the question of liability in regards to government, agency, and business participation in TDM programs.

Assumptions

- Board-staff relationships can help or hinder progress.
- Accountability is a must.

Board-Staff Relationships

Developing a strategic plan that reflects the TDM program's focus on customer-oriented emphasis begins at the top with the Board of Directors or Advisory Committee. How well the organization implements the plan is a function of the relationship of the Board and the staff.

Two of the more commonly heard complaints from TDM program managers or executive directors focus on challenges encountered by many non-profits - the level of activity or inactivity of the Board of Directors. The board's degree of involvement may be the result of the lack of clarity about who is responsible for what and who has the authority for what actions and under what circumstances. The challenge is to direct the Board's and the executive director's energy and talents, not to control it.

“Our board does too much”

Executive directors of TDM programs complain when the Board of Directors strays from its policymaking role and meddles in day-to-day operations. Boards of this type seem to expect to see and approve program designs and materials, prepare budgets, and
handle staff complaints in addition to its policy role.

What executive directors may overlook is that these people may be the same group who founded the program to address a particular transportation problem or to fill a mobility need. By virtue of their current and past involvement, they have proven their commitment and gained intimate knowledge of operations.

Also, the Board members may have an investment to protect. Often the private sector members of the Board are likely to be dues paying members as well as clients of the TDM program's services and they demand value for their company's investment. The public sector members on the Board frequently are some of the largest significant contributors with the responsibility entrusted in them to spend taxpayers dollars prudently. Some of these individuals may have even run the organization while the executive director was being recruited.

The issue is not the level of interference, but how the Board energies are effectively channeled. There is a fine line between interference by board members and adherence to the board's fiduciary responsibilities. Even with directors and officers liability insurance, if the Board is to err, it should be on the latter side. However, this situation could be improved if the roles and responsibilities between the Board of Directors and its executive director are established and well understood. This role definition is best accomplished concurrent with the selection process of the executive director. This can help determine the type of individual the Board is looking for.

The hiring of a full-time executive director is a key turning point for the organization. He or she becomes the organization's expert in all areas of transportation demand management, operations, administration and personnel. Once the executive director is hired, the board should begin to transition its focus from day-to-day operations to setting policy.

Problems occur when the relationship is not well-defined, the Board continues to micro-manage the organization, and the executive director feels compelled due to inexperience or other reasons to invite Board input on operational issues. Some problems may be brought upon by the executive director who has a lot of TDM product knowledge but little non-profit or small business management experience or vice versa.
The executive director can respond in two ways: resisting or complying with the Board's interference. The former approach breeds distrust between the executive director and the Board and invites even more interference by the Board. The latter approach threatens the ability of the Board to function, undercuts the authority of the executive director to deal with "external customers" such as Metropolitan Planning Organizations and "internal customers" such as staff. The end result is the same. The executive director moves on due to dissatisfaction on the part of the executive director or the board.

**Board of Directors' Responsibilities include:**

- Hiring the executive director,
- Developing a strategic plan that reflects the organization's mission,
- Monitoring and evaluating the performance of the organization, the executive director, and the finances, and
- Serving as a goodwill ambassador for the organization.

"Our board never does anything"

For other executive directors, the opposite seems true - the board seems ineffectual in leading the organization. The board explicitly or implicitly rests all authority with the executive director; creating the opportunity for abuse and repercussions in the future when the executive director does go too far in the minds of some board members.

What executive directors may lose sight of once in a while is the fact that most members of the Board hold fulltime jobs that require the vast majority of their attention, energy, and creativity. Executive directors have a responsibility to fashion a meaningful, well-defined role for the Board members. These roles can be tailored, within generally acceptable parameters, to the individual Board members' skills and interests. It can also serve to identify needs for representation on the Board.

Common pitfalls made by executive directors that foster leadership
voids include:

- holding meetings when no Board action is required,
- swamping the board members with reams of confusing information, and
- not clearly enunciating the actions being requested by the Board.

At the same time, the executive director must respect the roles of the Board and not seek to co-op them to expedite a decision. The risks include losing Board members who feel they have made no special contribution and alienating the same individuals that helped pull the organization together in the first place.

The relationship between the policy role of the Board and the operational role of the staff can be illustrated by the following examples.

- The board is responsible for fashioning the organization's strategic plan, but the executive director makes recommendations and implements the plan once it's adopted.

- The executive director writes the grant proposal but must seek prior Board approval to submit the grant.

- The board approves the budget, formulates policies for financial management and adopts internal control systems. The executive director drafts the budget, assures adherence to financial management policies and systems.

- The board hires legal counsel, auditor and consultants. The executive director obtains bids for legal, auditing, and consulting services.

Often the differences between policy versus operational issues are neither obvious nor clear cut. The challenge between the Board and the executive director is to decide the process for handling certain situations. In some cases, the Board may delineate those items clearly within the complete authority of the executive director with prior approval and those items that require notification to the Board after the fact by the executive director.
The responsibility for the hiring, training, managing, evaluating, and disciplining other employees rests solely with the executive director. Usurping the executive director's responsibilities will only serve to set a precedent that breeds distrusts, diminishes accountability, and wastes a Board's best resource - the executive director.

One useful method for clarifying the roles and responsibilities of Board and the executive director would begin by listing general types of decisions and collectively deciding which party has the decisionmaking authority, which items require prior approval and which decisions need made by the executive director require notice after the fact. In addition to treating the executive directors as the sole employee of the Board, the Board could adopt guiding principles for Board-only decisions.

### Four Guiding Principles for a Board of Directors

- The Board shall govern, not manage.
- The Board shall act on all items required by law or regulation.
- Unless requested by the executive director, the Board shall restrict its policies to those that affect the whole organization.
- The Board shall maintain the financial integrity of the organization.

The types of performance data and financial information reported can contribute to the effective oversight and management of the program. What types of data, how frequently should management information be provided? If the details don't get you, the generalities can. Acting on the information provided by the executive director is the Board's responsibility - and the executive director's challenge. The executive director must balance the appropriate level of information with the frequency and distribution. The Board members can be confused by a mass of performance data (e.g., cost per vehicle miles of travel reduced per 1,000 applicants). Board members can glaze over performance realities (e.g., the total number of individuals assisted over the last quarter) or financial realities (e.g., total expenses to date) without any indication of
trends (e.g., last four quarters worth of demand or expenses budgeted for same period).

The degree of sophistication of the TDM program's performance and financial reporting systems can go along way to improving the organization's management and holding the executive director accountable.

In summary, TDM programs often are partnerships between the public and private sectors to address transportation needs. At another level, the TDM organization is a team of Board of Directors and the executive director. To make the partnership work, each member of the team must have a defined role and be ready, when called upon, to respect its role and adhere to it.

PERFORMANCE RATIOS ASSOCIATED WITH SERVICES

Number of customer complaints
Number of requests filled

Number of customers
Number of employees

Project planned cost
Project actual cost

Number of persons placed
Project actual cost

Number of requests filled
Number of requests received
The following material was excerpted from a Transit Cooperative Research Program project Sponsored by the Federal Transit Administration. This report on risk management as it relates to TDM was prepared under TCRP Project J-5, "Aspects of Transit and Intermodal Transportation Programs," for which the Transportation Research Board is the agency conducting the research.

Successful Risk Management for Rideshare and Carpool-Matching Programs

The Problem and Its Solution

In reauthorizing federal assistance for surface transportation programs through the 1990s, the Intermodal Surface Transportation Efficiency Act calls for the adaptation of new concepts and techniques in planning, funding, constructing, and operating these programs. These changes will affect the institutional framework--laws and administrative processes--as well as engineering and operational elements of these programs. The nation's transit agencies need to have access to a program that can provide authoritatively researched, specific, limited scope studies of legal issues and problems having national significance and application to their businesses. The TCRP Project J-5 is designed to provide insight into the operating practices and legal elements of specific problems in transportation agencies.

The intermodal approach to surface transportation requires a partnership between transit and highways, and in some instances, waterways. To make the partnership work well, attorneys for each mode need to be familiar with the legal framework and processes of the other modes. Research studies in areas of common concern will be needed to determine what adaptations are necessary to carry on successful intermodal programs.

Transit attorneys have noted that they share common interests (and responsibilities) with highway and water transport agencies in several areas of transportation law, including

- Environmental standards and requirements
- Construction and procurement contract procedures and administration;
- Civil rights and labor standards; and
- Tort liability, risk management, and system safety.
In other areas of the law, transit programs may involve legal problems and issues that are not shared with other modes; as, for example, compliance with transit-equipment and operations guidelines, FTA financing initiatives, private sector programs, and labor or environmental standards relating to transit operations. Emphasis would be on research of current importance and applicability to transit and intermodal operations and programs.

Applications of Research

The foregoing research should prove helpful to transit providers, governors, state air quality agencies, state departments of transportation, Metropolitan Planning Organizations, regional authorities, and those organizing rideshare programs.

Under the present Air Quality Program, states must submit revised State Implementation Plans (SIPs) to improve air quality. States with nonattainment areas—areas that fail to meet air quality standards—must include transportation control measures in the SIP. Rideshare and carpool matching programs, high-occupancy vehicle lanes, and transit-use incentives are several of the most frequently used transportation control measures.

There are a multitude of state, public, and private rideshare and carpool-matching organizations nationwide. Given their concerns for tort liability exposure, local governments and grantee organizations need an assessment of potential tort liability for an organization either offering or promoting such services.

Successful Risk Management for Rideshare and Carpool-Matching Programs

A. INTRODUCTION

1. Background

In 1979, prompted by the fuel shortages of the 1970s, the National Task Force on Ridesharing was charged with the following objectives: to promote ridesharing among business and government leaders, to assist in removing institutional barriers to ridesharing, to provide a continuing dialogue between private and public sectors, and to make specific recommendations to increase the use and
effectiveness of ridesharing.

Ten years later, ridesharing was again the subject of federal legislation, this time under the heading of environmental legislation. One element of the 1990 amendments to the Clean Air Act’s traffic mitigation program is the promotion of carpooling and ridesharing to reduce automobile pollution. The Clean Air Act’s requirements have spawned state and regional legislation that, in turn, have required employers to reduce the vehicle miles traveled by commuting employees. As a result, countless programs that give commuters travel options have been created to reduce traffic congestion.

A broad spectrum of programs currently exists, including workplace programs designed to encourage carpools among coworkers; ridematching programs organized by employers, public organizations, and private organizations; and vanpool programs in which a single entity, private or public, owns the vehicles, provides matching services, and handles administrative support.

Ridematching, carpooling, and vanpooling seem tailor-made for achieving traffic mitigation objectives. However, the potential legal liability of those administering such programs is still uncertain. If, through the promotion and encouragement of ridesharing, an individual is persuaded to participate in a carpool or rideshare program and is then injured by riding in an unsafe vehicle or with an unsafe driver, what liability exists for the organization that makes the rideshare match or facilitates the pooling arrangement?

This report compares several public and private rideshare programs and identifies the common elements in each. Liability risks faced by publicly administered rideshare programs, which are usually self-insured, are contrasted with those of private operators. Insurance risk factors are also identified, along with the different types and levels of insurance available. Finally, potential areas of legal liability are examined, and methods for minimizing exposure to such liability are recommended.

2. Rideshare Models

Rideshare programs may be grouped into four basic models:

1. Owner-operated carpools and vanpools
2. Third-party vanpools in which an organization, either private or public, leases commute vehicles to individuals

3. Employer-sponsored pools in which the employer either retains title to or leases the vehicle used by employees in a pooling arrangement

4. Ridematching programs in which employers or third-party organization facilitate carpools or vanpools by matching interested riders with willing drivers

From these basic formats spring a multitude of variations and combinations. For example, an employer may encourage pooling arrangements among its employees by helping to match riders with drivers. Alternatively, an employer may bring in a third-party provider to organize employees into pools, provide vans, and administer the program. The third-party provider may be either publicly or privately funded.

3. Risk Management Concepts

Liability issues inevitably turn on program elements such as the following:

- The type of organization administering the program (public or private)
- The scope of service provided
- Ownership of vehicles (where appropriate)
- Driver screening (where appropriate)
- Driver training (where appropriate)

Other factors relevant to a discussion of potential liability include the following:

- The type of insurance held by the organizing entity
- State laws regarding sovereign immunity
- State laws limiting liability
The interplay between state tort and workers' compensation laws

Tort liability arises under and varies according to the laws of each state. Therefore, any discussion of potential tort liability must necessarily be broad and thematic. For example, two issues central to a discussion of tort liability are:

- a state's rules regarding sovereign immunity and
- workers' compensation.

Because a detailed discussion of the law of all 50 states and the District of Columbia is beyond the scope of this report, only a few examples will be used to illustrate potential tort liability issues.

This report identifies rideshare programs that incorporate as many of the existing formats as possible. The programs included are both publicly and privately run and range from facilitator-type programs, where the primary service provided is matching, to privately run vanpool companies. The programs discussed are representative and do not include every possible variation of the basic rideshare program models.

B. LEGAL LIABILITY

There are three primary sources of possible legal liability stemming from the organization or promotion of rideshare programs. They are

- liability of rideshare promoters or organizers (including employers and third-party providers) for injuries sustained by participants,
- vicarious liability of employers engaged in promoting or organizing rideshare programs for injuries incurred by third parties, and
- workers' compensation liability of employers that promote or organize rideshare programs.

1. Liability for Injury to Employees/Participants

Common law negligence actions must be based on the violation of a duty of care owed to the plaintiff. As a general rule, absent some
heightened duty of care defined by statute, such as with common carriers, private individuals owe only a duty to exercise ordinary care to avoid reasonably foreseeable injury to others. Thus, questions of tort liability turn on whether an employer or rideshare organizer has a legal duty to protect employees and riders against the reasonably foreseeable risks incident to the operation of a rideshare program. The scope of such a duty will necessarily depend on the organizer’s role in running the program.

On a continuum of possible involvement, the more involved an organizer becomes in administering the program, the greater the potential for liability.

For example, if an employer does not own or operate a vanpool, but merely encourages (without requiring) the employee to use an alternative mode of transportation, the employer should be insulated from claims of negligence asserted by employees or riders injured in accidents involving the vehicle. Under this scenario, it is difficult to identify any duty owed riders or employees by the employer.

However, the more involved an organizer becomes in administering a rideshare program or in encouraging use of a particular rideshare program, the closer it comes to the kind of control that may give rise to a duty. A company might, for example, provide some matching services for its employees whereby employees with similar commute routes and times are given one another’s names and encouraged to commute together. If the employer does not maintain or repair the vans, makes no representations as to the skill or competence of the drivers, and does not require an employee to participate, it still will probably not meet the threshold level of control necessary to impose liability.

By the same token, quasi-public rideshare organizations, such as Bay Area Commuter Services (BACS) and Gold Coast Commuter Services (GCCS), do not provide transportation; they provide information. Contacting such organizations creates no obligation on an individual’s part to participate in a pooling arrangement. It is up to the individual to contact the people included on a match list. Likewise, neither organization vouches for the participants or examines their driving records. Because participation and choice of driver is absolutely voluntary, organizations such as BACS and
GCCS do not appear to have assumed any duty with regard to participants.

Involvement in the maintenance of vehicles and screening of participants could create greater potential exposure to liability. An employer that provides a matching service and attempts in any way to screen participants’ medical or driving records assumes a duty to do so with reasonable care. A driver with a suspended license who slips through the screening could give rise to liability if a rider is injured as a result of the driver’s negligence, although questions of causation would still present a hurdle for a plaintiff in this type of action.

Employers that mandate the use of certain modes of transportation among employees are even more exposed to liability. Employees that actually become involved in the day-to-day operation of the vehicles used in a ridesharing program are similarly exposed. In this situation, it is conceivable that motor carrier regulations might apply to a rideshare operator or driver, thus imposing the higher duty of care owed by common carriers. For example, in California, except where a passenger is carried gratuitously, a carrier of passengers for hire is held to the highest degree of care.

Many states have addressed the application of motor carrier regulations to rideshare arrangements by statute. Some states specifically exempt rideshare arrangements from laws imposing a higher standard of care on motor carriers, some provide that, by definition, those engaged in rideshare arrangements are not common carriers, and some simply state that rideshare operators and drivers shall be held only to a reasonable and ordinary standard of care.

Of course, in those states that specifically exempt rideshare arrangements from motor carrier regulation, the definition of “ridesharing arrangement” is crucial. Pennsylvania, for example, defines “ridesharing arrangement” broadly, so as to include conventional carpools, employer-sponsored vanpools, and vanpools operated by public agencies or by nonprofit organizations for programs sponsored by public agencies.

Utah, on the other hand, exempts only carpools from the higher standard of care owed by drivers or owners of commercial vehicles. Thus, Pennsylvania’s exemption includes vanpools owned and operated by employers, whereas Utah’s exemption extends only to the conventional owner-operated carpool.
Because the "currency" of ridematching organizations is information about individuals, such organizations must inform themselves about, and take appropriate steps to avoid, potential liability for breaching state privacy laws. For example, Minnesota law requires that any state agency that asks individuals to supply private or confidential data inform the individual of the intended use of the data and the persons authorized to receive the data.

Accordingly, organizations such as Minnesota Rideshare provide ridematch applicants with a detailed disclosure, known as a "Tennessean Warning," regarding information collected in connection with the program. State agencies that violate Minnesota's disclosure laws can become "liable to a person...who suffers any damage as a result of the violation, and the person damaged...may bring an action against the political subdivisions, responsible authority, statewide system or state agency to cover any damages sustained, plus costs and reasonable attorney fees."

In at least one jurisdiction, any organization that collects personal information concerning an individual for the purpose of implementing rideshare programs can incur criminal liability for improperly disclosing such information without the individual's written consent.

2. Vicarious Liability for Injuries to Third Parties

The legal doctrine of vicarious liability holds an employer liable for the wrongful acts of its employees acting within the course and scope of their employment. Typically, an employee's travel time to and from work is not regarded as "within the scope" of his or her employment, and employers are thus not vicariously liable for injuries to third parties caused by commuting employees. However, there are several exceptions to this "going-and-coming" rule of nonliability. For example, if an employee's trip involves some incidental benefit to the employer, the commute is treated as within the scope of employment, and liability for the wrongful acts of the employee may attach to the employer. Likewise, if an employee is engaged in some special errand at the request of the employer, the trip may be considered within the scope of employment. Generally, most vicarious liability cases turn on whether the employee had express or implied authority to use his or her own automobile in the course of business.
Although there are no published cases holding rideshare programs organized or encouraged by an employer as coming within the incidental benefit or special errand exception to the going-and-coming rule, the potential exists for employer liability for injuries to third parties. If participation in the program was mandated, the commute could be considered part of the employee's work day.

Moreover, because an employee’s participation in a rideshare program, even if optional, may help an employer comply with some statutory requirement, such as those found in the Clear Air Act, it could be argued that some incidental benefit inures to the employer, bringing the commute within the scope of employment. Thus, although employers may see the creation of ridesharing, ridematching, and incentive programs as nothing more than encouragement, it is possible that a court could find sufficient involvement to give rise to a duty of care, and thus impose liability. It must be stressed that the benefit to the employer in such a case would appear remote at best and that it seems a considerable stretch to define mere statutory compliance as creating a benefit to the employer. Nevertheless, until there is some case law or legislation on this subject, the possibility of employer liability remains an open question.

3. Workers’ Compensation Liability

Where employers are involved in ridematching or the organization and administration of rideshare programs, the interplay of workers’ compensation laws in potential ridematching liability must be considered. In this area, the most important general rule of workers’ compensation is the “exclusive remedy rule,” which shields employers from civil liability for work-related injuries sustained by employees. Generally stated, the rule is that the compensation remedy is exclusive of all other remedies by an employee against the employer and insurance carrier for injuries falling within the coverage formula of a state’s workers’ compensation act. For example, California Labor Code section 3602 provides that where the conditions for compensation under the act are met, “the right to recover such compensation is...the sole and exclusive remedy of the employee.” Under such exclusive remedy provisions, properly insured employers will be shielded from damages for pain and suffering or punitive damages available in civil actions.

Thus, the question becomes whether or not an employee’s participation in a rideshare program is covered by workers’ compensa-
tion. As discussed earlier in relation to the doctrine of vicarious liability, injuries sustained by an employee in transit to and from work are generally considered to have been sustained outside the scope of employment, and therefore are not compensable under workers' compensation laws. However, exceptions to the going-and-coming rule exist in situations where an employee's journey to and from work is considered part of the employee's service to his or her employer. For example, courts have held that the rule does not apply where an employee receives compensation from his or her employer for travel time. Similarly, the special errand and incidental benefit exceptions discussed earlier apply in a workers' compensation setting as well.

Many states have resolved the question of workers' compensation coverage by statute. For example, Missouri law provides that its workers' compensation laws "shall not apply to a person injured while participating in a ride-sharing arrangement between his place of residence and place of employment or terminal near such places unless the employer owns, leases or contracts for the motor vehicle used in such arrangement." Furthermore, "transportation to and from work in an employer-sponsored ride-sharing arrangement shall not constitute any part of the employee's work hours unless otherwise agreed to by the employer.

Several other states have dealt with workers' compensation questions in a similar manner, while others have simply provided that, for the purposes of ridesharing, an employee's work day is deemed to commence upon arrival at the place of business and terminate on departure. Some states, like Nebraska, do not grant the exemption in cases where an employer "owns, leases, or contracts for the motor vehicle used in [a ridesharing] arrangement, pays for the time spent in travel, or pays the expenses of travel." Other states, such as Pennsylvania, explicitly extend the exemption to riders in employer owned and operated vanpools.

Statutes such as Missouri's clarify the interplay of employer-sponsored rideshare arrangements and workers' compensation liability. However, a majority of states do not legislatively exempt rideshare arrangements from workers' compensation coverage. For example, California has no statute exempting ridesharing arrangements from workers' compensation coverage. Because workers' compensation rules in California, as elsewhere, are normally interpreted in favor of compensating the employee as a matter of public policy, it is possible that in these jurisdictions, any employer-sponsored
rideshare program that takes a commuter out of the ordinary, local commute that marks the daily transit of the mass of workers to and from their jobs may result in liability under a state’s compensation laws.

Moreover, it is also possible that incentives paid to an employee to encourage participation in rideshare programs might be considered compensation, thus bringing the commute within the scope of an employee’s work day. Again, some states have addressed this question through legislation that specifically provides that employers shall not be liable for injuries to passengers and others because the employer provides encouragement, including “incentives,” for employees to participate in rideshare programs. However, most states do not provide such immunity, and the ultimate effect of cash incentives remains uncertain.

C. STATUTORY LIMITATIONS ON LIABILITY

Another important factor in analyzing potential liability of ridesharing or matching programs is the nature of the entity involved. Rideshare organizations run and administered through local or state government agencies may be protected by statutory limitations on the liability of government entities. Likewise, some states have attempted to encourage employer participation in rideshare programs by limiting their liability for such activities.

1. Sovereign Immunity

A detailed discussion of the liability of government entities in all 50 states and the District of Columbia is beyond the scope of this report. However, there are certain common themes in state regulation that are important in analyzing a state run program’s potential liability for ridesharing and matching services.

Historically, states and their political subdivisions were immune from tort liability for the acts of government officials or employees. However, the trend over the past 40 years has been to abrogate, or at least qualify, government immunities. Today, most jurisdictions condition immunity on whether the act in question was “discretionary” or “ministerial.” Most commonly, a government unit is immune from tort liability for discretionary acts, while some liability—possibly limited or qualified exists for ministerial acts. Thus, the decision whether or not to offer a particular class at a school may be discretionary, and therefore immune from liability, but the supervision of
such a class is ministerial and subject to liability if negligently performed.

By analogy, in most states a state or local government agency would be immune from liability for its decision to offer or not to offer certain types of rideshare programs. However, under the laws of most states, the government agency would not be immune from liability for the negligent administration of such programs. Thus, in most states, government agencies offering matching services and maintaining vehicles used in ridesharing arrangements find themselves exposed to liability for negligence.

Moreover, where government employees participate in government-run rideshare arrangements, some states expressly waive tort immunity. For example, Oregon Revised Statutes, Section 30.265, provides that:

Every public body is subject to action or suit for its torts and those of its officer, employees [sic] and agents acting within the scope of their employment or duties, whether arising out of a governmental or proprietary function or while operating a motor vehicle in a ridesharing arrangement authorized under ORS 276.598.

Oregon Revised Statute Section 276.598 provides that any government department may establish carpool or vanpool programs in which state-owned vehicles are used by state employees as commute vehicles provided a fee is paid to the state adequate to reimburse it for use of the vehicle.

Interestingly, despite the statutory waiver of immunity, it is the opinion of the Oregon Attorney General that the state would not be liable for the negligent operation of a vehicle furnished under the provisions of section 276.598 because (1) the state employees are essentially hiring the vehicle for carpool use, (2) participation in a carpool is neither a condition nor an inducement to state employment, and (3) the carpool program provides transportation where none existed before.

2. Other Statutory Limitations on Liability

In an attempt to encourage employer participation in rideshare programs, some states have passed legislation specifically limiting the liability of the employer. For example, Illinois law provides that

[an] employer shall not be liable for injuries to passengers and other persons resulting from the operation or use of a passenger car or commuter van in a ridesharing arrangement which is not owned, leased, contracted for or driven by the employer, and for which the employer has
not paid wages to an employee for services rendered in driving the vehicle.

The rule further provides that an employer shall not be liable “for injuries to passengers and other persons because he provides information, incentives or otherwise encourages his employees to participate in ridesharing arrangements.” At least 14 other states have passed legislation similar in form or intent to that in Illinois.

The Illinois law does not do a great deal to alter the liability that would exist for an employer under a conventional negligence analysis; employers who do not own, lease, contract for, or operate the vehicles involved in ridesharing arrangements would not normally be considered to owe a duty to the riders of such vehicles. However, the Illinois statute does insulate employers from liability for the simple act of dispensing rideshare information or incentives.

In other jurisdictions, the effect of incentives offered employees is much less certain. For example, if an employer provides a cash incentive for employees who participate in ridesharing arrangements, the incentive could arguably give rise to employer liability by bringing the employee’s commute within the scope of his or her work day.

D. INSURANCE

The type of insurance available to individual carpoolers and organizations involved in promoting ridesharing depends largely on the type of entity involved and on the type of vehicle for which coverage is sought.

1. Individual Owner/Operator Pools

Where the vehicle used in a rideshare arrangement is owned by one of the riders, insurance is usually left to the individual. This type of arrangement includes both the conventional carpool where riders take turns driving their own vehicles, as well as the vanpool organized by an individual who uses a personally owned van for the purpose of ridesharing.

In the case of the typical carpool driver, the standard family automobile liability policy provides that the policy does not cover liability arising out of the ownership or operation of a vehicle “while it is being used to carry persons or property for a fee.” This exclusion
does not normally apply to a share-the-expenses carpool. Courts have held that the sharing of expenses does not violate policy provisions, which exclude coverage when the insured vehicle is leased or rented to another. Some states have even codified this position with statutes providing: "[p]rovisions in an insurance policy which deny coverage for any motor vehicle used for commercial purposes or as public or livery conveyance shall not apply to a vehicle used in a ridesharing arrangement."

There may even be a marginal savings available to commuters who use their cars in rotating-driver carpools. Some insurers offer a discount based on the decreased use of a car (either in terms of miles traveled or days in use). For example, a driver who formerly drove his own car to work every day and who joins a carpool in which he is responsible for driving only one week per month may be eligible for a reduced rate. However, not all insurers offer such discounts, and among those that do, the amount of the discount and terms on which it is given vary. Moreover, any potential savings to an individual driver may be illusory if he or she increases his or her liability coverage to reflect the higher vehicle occupancy.

For the owner-operated vanpool, matters are slightly more complicated due, in large part, to confusion regarding the nature of the vanpool itself. The confusion centers on whether the appropriate means of insuring a vanpool is the conventional family automobile policy or the more expensive commercial automobile policy. Some state regulatory agencies say the proper form of insurance is the commercial policy, and the Insurance Services Office takes the same position. Other state statutes, on the other hand, specifically sanction the use of family policies for vanpools.

In any event, it is possible to obtain family policy coverage for a van used in a vanpool. Many agents for multiline insurers are unsure how to classify vanpools. Likewise, underwriters are not always aware from the information submitted in an application that the policy applicant intends to use a vehicle for a vanpool. It is at least arguable that standard language in a family policy would require coverage for losses incurred by a vanpool operation. Moreover, several jurisdictions specifically exempt vanpools from commercial regulation, suggesting that personal coverage is the appropriate route. Applicants should inform prospective insurers of the intended use of the vehicle so that the policy is issued with full knowledge of the risks involved.
There are insurers that specialize in policies covering vanpools. They can issue commercial policies specifically tailored to vanpooling. Although the individual owner/operator may have to spend some additional time locating an insurer with this specialty, the insurer’s heightened awareness of risk factors involved in vanpooling should reduce the policy rate.

Typically, insurers offer coverage for bodily injury and property damage liability, minimum statutory limits for uninsured or underinsured motorists, and no-fault coverage (where applicable) with limits from $100,000 to $1 million per occurrence. Given the concentration of wage-earners in a vanpool, a minimum of $500,000 coverage is recommended, but $1 million coverage is considered preferable by some.

Generally, risk factors considered by insurers include the following:

- The types and amounts of coverage sought
- The daily mileage driven and uses besides commuting
- Whether or not the vehicle is garaged
- Type of maintenance program applied to the vehicle
- The territory in which the vehicle is driven
- The driving records of proposed drivers and backups

2. Third-Party Providers

Companies or individuals that lease a van from a third party can usually obtain insurance coverage through the lessor. VPSI, for example, offers comprehensive coverage with no deductible as an optional part of its package to lessees. Thus, the monthly cost to riders in a VPSI vanpool includes the cost of insuring the vehicle. VPSI screens potential drivers’ records, and rather than charging a higher rate for drivers who appear to be bad risks, VPSI simply will not approve such individuals to drive.

The portion of the total lease cost attributable exclusively to insurance costs is difficult to determine. However, given the volume of insurance underwritten for Chrysler, it is likely that VPSI obtains coverage for its vans at a discounted rate.
In this regard, any large company with an existing fleet policy will likely be able to obtain insurance for leased or owned vanpools at rates below what would normally be paid for a commercial policy.

3. Employer-Sponsored Pools

There are many levels of employer involvement in rideshare programs, and the type of coverage needed necessarily depends on the scope of employer involvement. For employer-facilitated programs in which an employer encourages the formation of carpools and vanpools by providing nominal incentives and the means for employees to locate fellow poolers, liability exposure should be remote. Insurers do not normally provide policies specifically covering this type of activity, and many employers feel that their comprehensive general liability policies should provide adequate coverage.

On the other hand, for companies that own, lease, operate, and maintain vanpools for their employees, fleet insurance is essential. For especially large companies, a group of vanpools may compose a small part of an overall fleet insurance program. Coverage should be less expensive in this case. Insurance companies will consider factors such as those listed previously.

Insurers may also examine the following factors:

- Who administers the program
- The types of screening and/or risk management programs they have in place
- The company's previous loss experience with such programs

4. Ridematching Programs

Public or quasi-public agencies that provide ridematching services do not face significant liability exposure. None of the organizations polled in connection with this report had obtained special insurance policies specifically for coverage of ridematching activities. This is not to say, however, that they are uninsured.

For example, MetroPool is a nonprofit corporation and maintains a directors' and officers' liability policy. MetroPool also has a private
comprehensive general liability policy in which it is named as a co-insured entity with the State of Connecticut. No special riders apply specifically to ridematching services. It should be noted that even insurers that issue fleet insurance do not issue policies specifically covering ridematching activities.

In the dozens of interviews conducted in connection with this report, many in-house coordinators and program administrators acknowledged that they had considered the possibility of liability arising from ridematching, but none had any firsthand knowledge of suits in which a program organizer or administrator was named on a theory of negligence in connection with ridematching. Moreover, all of the ridematch programs examined for the purposes of this report, whether promoted by employers, by public or quasi-public organizations, or by private, for-profit corporations, are based on the voluntary participation of the riders and drivers.

Most program administrators feel that if there is no mandatory preselection of riders or drivers, then matching programs are insulated from liability. This assumption seems based in part on the argument that as a mere facilitator, the ridematching organization owes no special duty to participating individuals. Given the lack of case law defining the duty owed by a ridematching organization, it seems fair to describe the potential for liability as remote.

The reality is that organizations that own vehicles and perform ridematching services feel that their fleet insurance adequately protects them from losses arising from operating the vehicles. Organizations (and employers) that perform only ridematching services do not see themselves facing significant liability exposure, believing that the typical commercial general insurance policy provides adequate coverage. This belief should not go unexamined.

Ridematching organizations that believe their comprehensive general liability policy provides adequate coverage should have their legal counsel carefully review the policy terms. If any doubt exists regarding the scope of coverage for ridematching activities, clarification should be sought from the insurer, and if necessary, additional policy riders specifically covering matching services should be obtained. Similarly, rideshare organizations with separate vanpool and ridematching programs should not assume that a fleet policy will cover claims related specifically to ridematching operations. Again, a careful review of policy language is essential.
E. STRATEGIES TO MINIMIZE POTENTIAL TORT LIABILITY

1. Administrative

A comprehensive risk management program is an effective way for ridematching and ridesharing organizers and promoters to minimize the potential for liability. Several of the organizations studied have developed detailed and highly sophisticated risk management systems. Program organizers should consider the following recommendations when implementing each program.

a. Ridematching Activities

(i) Written Agreements.--Several rideshare organizers and promoters require participants in their ridematching programs to fill out a written application. Others make matches over the telephone based on information given by the caller. Computer databases enable ridematchers to provide nearly instantaneous matches, and phone matching is certainly quicker and easier for the caller. However, the written application has several advantages.

On a practical level, the written application provides greater accuracy of information. More important, because many jurisdictions now have privacy statutes that restrict the dissemination of certain kinds of information, a written application allows the ridematching organization to obtain a written waiver from the applicant for dissemination of personal information. Although this may not be a concern in all jurisdictions, in those states that do restrict the gathering and dissemination of personal information, a written waiver in compliance with such rules is essential.

(ii) Advise Potential Poolers to Meet.--Most rideshare programs give interested applicants a list of potential matches along with phone numbers and some brief information regarding route and time requirements. It is then left to the applicant to contact whomever he or she chooses. Many also encourage potential matches to meet one another to discuss issues such as rules, routes, and times. This is an essential step that should be emphasized by promoters. Rideshare arrangements succeed or fail based largely on the willingness of poolers to work with and accommodate one another. The more minor issues can be ironed out in advance, the
greater likelihood of a long, sustained pool. Riders can perform their own risk management evaluation by assuring themselves that proposed drivers are adequately insured and licensed.

(iii) **Newsletters**—Many ridematching organizations publish newsletters for participants. Newsletters often contain regular features, such as "riders wanted" sections, columns with safety tips, and articles regarding trends in ridesharing and changes in the law affecting ridesharing. Newsletters serve a vital function by keeping program participants informed and involved. Moreover, articles on such issues as safety may help reduce the number of accidents or incidents giving rise to claims.

**b. Employer-Sponsored Programs**

Many employers offer something more than ridematching, but provide something less than employer-owned or leased vehicles. These employers might consider the following elements for their programs.

(i) **Variety**—Employers with transportation demand management departments engaged in ridematching and ridesharing arrangements often find themselves walking a fine line. On one hand, they are often required by state or local law to develop detailed plans for employee trip reduction. On the other hand, the more involved they become in administering alternative commute programs, the more they find themselves exposed to liability for employees injured during a commute. Apple Computer Company's approach provides one solution.

Apple provides its employees with a wide array of commute options, but does not mandate employee participation in any one program. An approach such as this, which provides numerous options, should ensure maximum participation with minimum coercion. Employers must steer clear of any suggestion that employee participation in commute alternative programs is in any way required. This helps maintain the separation of commuting activities from the scope of employment, which can entangle the employer in workers' compensation and vicarious liability issues.

(ii) **Contracting with Third-Party Providers**—A trend among
employers is to have third parties organize ridematching and ridesharing arrangements. At the lowest level, a company may do nothing more than contact an organization, such as Bay Area Rides, to help set up a matching program. At another level, an employer may have a third-party provider, such as VPSI, promote and facilitate vanpools within the company. Finally, an employer could contract with a private provider to provide specific transportation services.

The advantage of these approaches is that they shift a large administrative burden from employers to organizations specializing in such programs. An additional advantage, at least in the context of contracts with third-party providers, is the insulation it may provide from liability.

Insofar as a general rule can be stated, employers are not liable for the torts of an independent contractor as opposed to those of an employee.

Of course there are many exceptions to this rule. Most exceptions are based either on the negligence of the employer in selecting the contractor or on the employer’s attempt to shift a nondelegable duty to the contractor. Nothing in the contracting of transit services to a competent independent contractor would seem to trigger either exception, and employers should be protected from civil liability arising from the acts of a contractor. As a practical matter, any agreement with such a third party should include an indemnification clause, as well as requirements that the provider maintain adequate insurance naming the employer as an additional insured party under the policy.

c. Third-Party Providers and Employer-Owned or Leased Fleets

Most of the recommendations discussed thus far in relation to ridematching organizers and employer-sponsored programs apply equally to third-party providers and to employers with their own fleets of commute vehicles. However, third-party providers and employer/owners must take extra steps to ensure the safety of their programs.

(i) Driver Screening and Selection.—Perhaps the most important element in any program where an organization allows vehicles
it owns to be driven by commuters is driver screening and selection. A detailed selection program, such as the one used by Seattle Metro, focuses not only on a potential driver's driving qualifications, but on other factors that indicate a high degree of responsibility. This helps not only to minimize the risk of liability but also to ensure individual vanpools are run in a smooth and cost-effective manner. Factors most closely related to liability issues are as follows:

1. *The driver's age.*--Drivers should be 21 years old or older. Insurance rates may be lower if drivers are at least 25.

2. *Employment.*--Potential drivers should be able to establish stable employment for some period of time.

3. *Valid license.*--Potential drivers must have a valid, unrestricted driver's license, with no recent revocations or suspensions.

4. *Insurance history.*--Any potential driver who has had his or her auto insurance canceled in the past 5 years for reasons related to driving behavior should be rejected. Additionally, an alternate or back-up driver should be chosen subject to the same requirements.

Finally, a written agreement between vanpool organizers and drivers is necessary. The written agreement should spell out the responsibilities of drivers and organizers. Pace, for example, requires that drivers and back-up drivers sign a six-page agreement that contains operating guidelines, grounds for termination of the agreement, age requirements, choice of law provisions, and a listing of Pace's responsibilities, as well as a limited "hold-harmless" clause.

(ii) **Safety Orientations.**--Drivers and back-ups should be required to participate in a mandatory orientation and safety program. Many drivers may not be immediately comfortable driving a large vehicle, such as a van. Organizers should do their utmost to ensure drivers are familiar with the controls of the van and have had some practice driving and parking the vehicle before they are given a regular route with riders. Periodic safety workshops or brush-up courses are also a good idea.

(iii) **Preventive Maintenance Programs.**--Keeping vans in good
working order is essential to the safe operation of a vanpool. There are many ways to ensure a van receives its scheduled maintenance. Pace assigns its drivers a credit card on which to charge gas and minor maintenance expenses. Drivers are given a toll-free number to call for authorization of major repair work. Pace drivers also have access to 24-hour roadside assistance in the event of emergencies.

(iv) Operations Manuals.—Organizers should provide van drivers with as structured a program as possible, including detailed written materials. Drivers should be required to acknowledge in writing that they have received and reviewed these materials.

Pace supplies all drivers and back-ups with a detailed Vanpool Operations Manual. The manual provides practical information for the new vanpooler, with sections titled “Getting Started,” “Knowing Your Van,” “Running a Successful Vanpool” and “Defensive Driving.” In addition to the start-up materials, the manual provides materials intended to keep the vanpool operating smoothly and safely. For example, drivers are supplied with monthly report forms that require basic information, such as miles driven, revenue collected, and expenditures. Drivers are also required to make their own, regularly scheduled inspection of the van and to fill out an inspection checklist. Thus, in addition to scheduled maintenance, Pace requires van drivers to report any known mechanical or safety problems.

2. Legislation

Nearly everyone agrees that ridesharing is worth encouraging. Clean air legislation has provided even more impetus for the formation of such programs, and recent events, such as the earthquakes in California, have again demonstrated the absolute necessity of reducing the volume of traffic on urban highways. Several states have “ridesharing acts” that were, for the most part, passed in the early 1980s in response to the oil shortages of the 1970s. With the renewed federal mandate for the creation of rideshare programs, it is worth examining what works and what does not in the state legislation. To illustrate this, West Virginia’s ridesharing chapter will be compared with that of Pennsylvania.

a. Ridesharing Defined

Among those states with statutes devoted specifically to
ridesharing, West Virginia is fairly typical. The chapter first defines a "ridesharing arrangement" as

...the transportation of persons in a motor vehicle where such transportation is incidental to another purpose of the driver and is not for profit, or is by nonprofit community organizations and nonprofit corporations for senior citizens or handicapped persons. The term shall include but not be limited to ridesharing arrangements known as carpool, vanpools and buspools.

Although West Virginia's definition of "ridesharing arrangement" is fairly broad, its language is of concern. For example, the requirement that the ridesharing arrangement be "not for profit" raises a troublesome ambiguity. Is a carpool or vanpool driver who collects more from riders in one month than he or she spends on gas, maintenance, repairs, and insurance within the definition?

Rather than anchoring its definition of ridesharing arrangements on the non-profit requirement, Pennsylvania's definition focuses on transportation of passengers that is "incidental to another purpose of the driver who is not engaged in transportation as a business." Pennsylvania thus brings within the scope of its laws the carpool operator who may make a small profit for his or her troubles. If such a nominal profit serves as an incentive to individuals, there is no reason to exclude such individuals from the law's protection.

Pennsylvania goes an extra step by including within the definition of "ridesharing arrangement" the transportation of employees to and from work in a "vehicle owned or operated by their employer," as well as the transportation of individuals in vehicles "owned or operated by a public agency or nonprofit organization for that agency's clientele or for a program sponsored by that agency." Thus, the only rideshare entities excluded from the Pennsylvania Act are commercial, for-profit providers. Again, if the broader definition encourages participation of employers and state agencies, it is worthy of consideration.

b. Motor Carrier Regulations

West Virginia's ridesharing act addresses the issue of common carrier liability for ridesharing arrangements. Sections 17C-22-2(a) and (c) provide that code sections pertaining to the regulation of common carriers and "[l]aws imposing a greater standard of care on common carriers or commercial vehicles than imposed on other drivers or owners of motor vehicles" do not apply to ridesharing
The advantage of West Virginia's approach is that it clearly exempts rideshare arrangements from the regulatory standard applied to commercial vehicles, as well as the higher standard of care applied to common carriers. Again, the application of the exemption is somewhat muddied by the preceding section's definition of "ridesharing arrangement," but the exemption itself can do nothing but encourage ridesharing arrangements.

c. Application of Workers' Compensation Law

Section 17C-22-3 of the West Virginia Code provides that workers' compensation benefits shall not apply to those injured while participating in a ridesharing arrangement unless the employer "owns, leases or contracts for the motor vehicle used in such an arrangement." By contrast, Section 695.3 of Pennsylvania's title 55 provides that the workers' compensation act "shall not apply to a passenger injured while participating in a ridesharing arrangement," but "shall apply to the driver of a company owned or leased vehicle used in a ridesharing arrangement."

The Pennsylvania statute seems more in keeping with the purpose of workers' compensation schemes: to provide quick recovery for workers injured in the service of their employer. Why the passenger who opts to ride in a company-owned vehicle should be likewise compensated is not clear. West Virginia's extension of workers' compensation benefits to passengers in vehicles for which an employer 'contracts' is likewise questionable. If an employer contracts with a competent, independent third party for transportation services, unless there is some joint enterprise between employer and vendor or some independent act of negligence on the part of the employer, the vendor should bear the responsibility for injuries resulting from its own negligence.

d. Liability of Employer

West Virginia's and Pennsylvania's laws regarding employer liability are identical. They provide first that an employer will not be liable for injuries to passengers and other persons resulting from the operation or use of a motor vehicle, not owned, leased, or contracted for by the employer, in a ridesharing arrangement. They further provide that an employer will not be liable for injuries to passengers and others "because he provides information, incen-
tives or otherwise encourages his employees to participate in ridesharing arrangements."

Statutes such as these provide employers with the knowledge that mere encouragement of ridesharing will not expose them to liability. As case law develops in this area, courts will undoubtedly have to consider when an incentive, such as cash, becomes compensation, thus bringing an employee's commute within the workday for the purposes of liability. No such case law yet exists, but future statutory revisions could delineate between nominal incentives and compensation.

F. CONCLUSIONS

Rideshare and matching programs are valuable tools for achieving important traffic mitigation objectives and clean air goals. However, questions remain regarding the potential legal liability of those entities, both public and private, that administer such programs. As long as this uncertainty continues, and until case law develops in each jurisdiction defining the duty of care owed by ridematching organizations, providers of such services should adopt comprehensive risk management strategies to minimize their liability exposure.

At the core of successful risk management strategies should be a recognition that the level of involvement of the entity in promoting and administering the services it provides correlates to the level of its liability exposure. Common elements of effective risk management systems typically include, depending on the nature of the provider and the services it undertakes to perform, some combination of administrative oversight, contractual indemnification and insurance, and other prophylactic measures designed to safeguard against reasonably foreseeable risks inherent in such operations.
Ridesharing Liability Sections of the Florida Code

119.07 Inspection, examination, and duplication of records; exemptions

(3)(f) Any information provided to an agency of state government or to an agency of a political subdivision of the state for the purpose of forming ridesharing arrangements, which information reveals the identity of an individual who has provided his name for ridesharing, as defined in s. 341.031, is exempt from the provisions of subsection (1).

[subsection (1) permits “Every person who has custody of a public record shall permit the record to be inspected and examined by any person desiring to do so, at any reasonable time, under reasonable conditions, and under supervision by the custodian of the public record or his designee.” Other parts of this subsection describe fees for copying and, if necessary, services.]

341.031 Definitions

(9)(a) “Ridesharing,” which means an arrangement between persons with a common destination, or destinations, within the same proximity, to share the use of a motor vehicle on a recurring basis for round-trip transportation to and from their place of employment or other common destination. For purposes of ridesharing, employment shall be deemed to commence when an employee arrives at the employer’s place of employment to report for work and shall be deemed to terminate when the employee leaves the employer’s place of employment, excluding areas not under the control of the employer. However, an employee shall be deemed to be within the course of employment when the duties assigned or directed by the employer, or acting in the furtherance of the business of the employer, irrespective of location.

768.091 Employer liability limits; ridesharing

(1) No employer shall be liable for injuries or damages sustained by operators, passengers, or other persons resulting from the operation of a motor vehicle while being used in a ridesharing arrangement between a place of residence and a place of employment of termini near such places; nor shall such employer be liable for injuries or damages sustained to operators, passengers, or other persons because such employer provides information or incentives to, or otherwise encourages, employees to participate in ridesharing arrangements. However, this section does not apply to motor vehicles owned or leased by an employer nor to acts by an employee within the scope of his employment as defined in subsection (2).

(2) For purposes of ridesharing, employment shall be deemed to commence when an employee arrives at the employer’s place of employment to report for work and to terminate when the employee leaves the employer’s place of employment, excluding areas not under the control of the employer. However, an employee shall be deemed within the course of employment when the employee is engaged in the performance of duties assigned or directed by the employer, or acting in the furtherance of the business of the employer, irrespective of location.
EMPLOYER TRIP REDUCTION ORDINANCES

MODULE GOALS

- To provide guidance on developing trip reduction ordinances.
- To introduce the Employee Commute Options legislation.
- Examine the effectiveness of these ordinances in meeting trip reduction goals.

ASSUMPTIONS

- Participants may be asked to help employers understand the requirements of these ordinances.
- That trip reduction ordinances are a good thing (sometimes).

TRIP REDUCTION ORDINANCES

Introduction

TDM measures are an effective way for local jurisdictions to reduce traffic congestion and improve mobility. However, while local governments may have the desire to reduce traffic volumes or improve roadway levels of service, the success of such programs depends on private sector participation. Prior to the 1980's, local governments relied on the voluntary cooperation of the private sector for the success of TDM initiatives. In areas where traffic congestion was an easily-perceived problem, voluntary cooperation was achieved at a fairly satisfactory level. In areas where traffic problems were not as readily apparent, it was difficult to generate voluntary cooperation and the success of TDM measures was marginal.

In the 1980s, the climate for TDM changed. Localities identified increased demand for new roadways. However, economic constraints often left localities unable to fund additional infrastructure; as a result, they began to explore alternative ways to manage demand. Trip reduction ordinances (TROs) are government mandates which require that traffic congestion be reduced in certain areas through a series of TDM measures. Generally, a TRO will require a certain group or individual, usually a major employer or a
developer of a large business complex, to devise and implement measures aimed at reducing the number of SOV trips generated to and from a given location.

In 1984, the first two TROs appeared in California—one in Los Angeles and the other in Pleasanton. While only the Pleasanton ordinance remains, it was the initial success of these two initiatives that brought TROs into the transportation limelight. Today, over 50 TROs are in effect across the country. Most were developed to address traffic in municipalities; however, county-wide and regional ordinances have also been developed. While each has its own unique attributes, all share many common elements which are useful in the development of new ordinances. As discussed earlier, a step-by-step planning process helps to ensure an ordinance addresses the needs of the affected area and has the necessary support from community and business leaders, thereby increasing its potential for success.

**State Support of Trip Reduction Ordinances**

California and Arizona are the only states to have drafted legislation which allows or requires local governments to enact TROs. While California has adopted the most stringent State codes to address traffic congestion, it should be noted that most of the TROs in California were adopted prior to the enactment of the State legislation. States interested in adopting TRO legislation generally require that metropolitan areas over a certain size develop TROs. This varies from earlier legislation whereby local governments were given the power to enact such ordinances only if they chose to do so.

For example, California's legislation requires all counties with 50,000 or more inhabitants to develop and implement a congestion management plan. In New Jersey, proposed legislation requires the State DOT to develop a traffic management program which applies to employers of 100 or more and counties designated as having highly congested roadway conditions.

Localities in Florida have no such a mandate. Under Florida law, TROs can be enacted if the locality so chooses. The City of Orlando has developed such an ordinance, using a zoning overlay district to mitigate traffic congestion in its downtown area. Because it is up to the local government to determine whether a TRO is appropriate, a discussion of TRO feasibility is unnecessary. The focus of this section, therefore, will be on how a TRO should be constructed to better ensure its success in addressing local transportation needs.
Developing a Trip Reduction Ordinance

TROs are usually developed in one of two ways:

- They may be one of several strategies developed as a part of the TDM planning process
- They may be developed through the political process as the result of a local or State legislative mandate. If the ordinance is developed through the political process, there must be assurance that the ordinance addresses the problem at hand.

Regardless of the reasons for drafting a TRO, basic decisions are required prior to developing an effective mandate. While each step in the process outlined below may not be completed in the order given, it is nonetheless important that all be considered.

**Step 1: Initiation and Development of the Ordinance**

For a community, having in-house employees develop an ordinance without soliciting input from business leaders or developers, may be the easiest way to get the job done; however, it is also likely to ensure it will not succeed. The most effective TROs are generally those which involve business leaders and developers in the process, since they are often the ones expected to implement the ordinance. The organizational framework for drafting the legislation usually takes one of three forms:

- With the jurisdictional approach, the locality develops the ordinance but elicits input from employers and developers to ensure goals and strategies are realistic for the area.

- The second approach involves a task force, wherein a government body appoints a certain number of local officials, representatives of major employers and representatives of the development community to sit on the task force. The task force, working as a unit, then drafts the ordinance.

- The third approach utilizes major private sector employers and developers to draft the ordinance, with input from local jurisdiction representatives. In some cases, these types of ordinances are drafted through a TMA, by representatives of their private sector client base.

Determining the optimal organizational framework for a given area depends on the unique circumstances within the area, and care must be taken to ensure all affected groups have an opportunity to provide input during the development phase. Without such input, it may be difficult to achieve acceptance of the ordinance, both from a political and operational standpoint.
Managing Our Way Through Congestion

Step 2: Ordinance Coverage and Affected Parties

Most TROs are developed to mitigate traffic congestion for a defined geographic area. As part of the initial decision-making process, it is necessary to delineate the specific geographic area to be encompassed by the ordinance. In some cases, the ordinance covers the central business district (CBD), while in others, it may be a one-mile wide strip along a major urban corridor. Generally, the TRO covers only those areas suffering from traffic congestion; however, it may also include areas in which significant new development is expected to occur.

As noted earlier, a decision must be made as to which groups will have to conform to the provisions of the ordinance. There are two primary groups most often asked to implement TDM measures:
- major employers
- developers

The definition of major employers varies by ordinance, though in most instances a firm with 200 or more workers is considered a major employer.

Developers are usually limited to individuals building an office, industrial or business park which will employ a certain number of people or will exceed a certain square footage. For example, the City of Pasadena TRO applies to all new developments over a certain square footage threshold and any new development employing 100 or more people.

The decision regarding which groups will be subject to the ordinance is determined in part by the objective of the ordinance. If the objective is to reduce the traffic impacts of new development, then only developers will be targeted. If the objective is to maintain existing traffic conditions, then new development traffic will have to be offset by a reduction in vehicle trips from existing developments. If the objective is to improve traffic conditions, the ordinance must apply to both new and existing employers.

Step 3: Participation Requirements

Participation in TROs generally takes one of three forms:

- Voluntary programs ask major employers and/or developers to participate in and/or implement TDM measures. No requirements are set forth to ensure compliance; rather, it is assumed each party in the affected area will make a good faith effort to implement specific strategies. With this approach, developers or employers are offered incentives to bring them into compliance.
Mandatory programs require an employer or developer to comply with the requirements of the ordinance. When the mandatory approach is used, it is a fairly common practice for the jurisdiction requiring compliance to provide some form of technical assistance regarding TDM measures.

Voluntary/Mandatory participation programs are a combination of the first two approaches. Generally, the TRO sets a particular standard to be achieved on a voluntary basis by the affected parties. If the standard is not met within a specified timeframe, participation in the requirements of the ordinance becomes mandatory. For example, a locality may determine the goal of the TRO is to reduce peak period SOV trips by 25%. Each employer would then have the chance to voluntarily implement TDM measures designed to reach that goal. If the 25% reduction is not achieved, then all employers are required to develop TDM programs aimed at attaining the goal.

**Step 4: Ordinance Goals**

TROs, as the name implies, are developed to reduce traffic congestion. Goals of the ordinance are usually stated in terms of a specific target strategy. Goals can be fairly general, like the City of Concord TRO which has a stated goal of reducing use of SOVs during peak hours; or the goal can be very specific, like the City of Cypress TRO which has a goal of attaining an AVR ratio of 1.5 persons per vehicle. Whether the goal is general or specific, the TRO attempts to reduce traffic congestion by targeting a particular standard which can be quantified through a fairly simple visual or written survey technique.

The goals contained in TROs vary by ordinance; however, most have as their basis one of two basic standards:

- **Trip/Traffic Reduction**: There are two types of trip reduction-based strategies contained in most ordinances.

- **Setting a percentage goal for actual reduction in vehicle trips**: This approach requires establishing a baseline of pre-program vehicle trips by which actual reductions can be measured.
This is usually done in one of two ways.

- calculate the number of vehicle trips taken, assuming a worst-case scenario, that all commuters drove to work alone. For example, if an area targeted for a TRO has 50,000 employees within its boundaries, then it is assumed that 50,000 single-occupant vehicle trips are taken to get to work.

- develop a survey that enables calculation of the actual number of vehicle trips being taken. For example, an employee survey reveals that 15% of employees within the area utilize car and van pools to get to work and another 5% use mass transit, there are 40,000 single occupant vehicle trips taken to get to work.

The actual vehicle trip reduction rate varies according to the methodology used to determine baseline vehicle trips. If the worst case scenario assumption is made, that all commuters traveled to work alone prior to the program, then reduction rates will be fairly high (25-40%). If the actual number of commuters driving alone is determined, then the reduction rates are likely to be fairly low (5-15%).

- Level of Service: Goals based on level of service criteria are developed to maintain a desired traffic condition or to prevent roadway traffic flow from deteriorating below a certain level. As discussed earlier, level of service (LOS) refers to the traffic condition of a roadway in terms of safety, speed, freedom to maneuver, etc. and the better the level of service the better the driving conditions. "LOS A" indicates the road is operating under good driving conditions, while "LOS F" indicates major delays can be expected and traffic will not flow smoothly. Using LOS criteria in a TRO requires that a traffic monitoring program be developed to monitor progress.

LOS ratings can be developed either for roadways or intersections. Generally, a roadway will suffer from poor traffic conditions because of the problems associated with a poorly functioning intersection or heavy traffic volumes. Thus, the TRO using LOS criteria develops standards to address the portion of the road network causing the poor conditions.

**Step 5: Length of Time Needed to Achieve Compliance**

Although most TROs require each employer or developer to meet the program guidelines within the first year and then maintain that level for the duration of the ordinance, other TROs phase guidelines so the final standard is achieved after a period of time. In developing a TRO, the need for phasing is dependent on the sever-
ity of the reduction goal. If the strategy is to reduce drive-alone commutes by 5%, phasing is inappropriate. If, however, a 50% reduction in drive-alone commutes is the ultimate goal, phasing will probably be the only way the standard can be met. Similarly, if improving level of service ratings on a severely congested roadway is the goal (from LOS F to LOS D), phasing will be necessary. If maintaining a level of service on a roadway is the goal, phasing would not be necessary.

Step 6: Ordinance Requirements

Each TRO requires that an employer and/or developer take certain actions in order to help mitigate traffic congestion. While the mandated actions vary from ordinance to ordinance, most require one or more of the following four components:

- the designation of a transportation coordinator to assist commuters in selecting alternative transportation modes,
- information dissemination in which employers are required to make alternative transportation information available to their employees or are required to distribute such information,
- data collection in which the employer is required to maintain information on how their employees are getting to work, (usually an ordinance that requires employers to collect data will mandate that employee surveys be conducted on an annual basis or that driveway counts be completed), and
- TDM measures in which employers must develop specific programs such as preferential parking.

Some TROs, such as the one in the City of San Marcos, require that each employer appoint an on-site employee transportation coordinator (ETC). The ETC is usually responsible for implementing the remaining requirements of the ordinance and for developing whatever employer-based TDM programs may be necessary.

One of the roles of the ETC is to disseminate information about TDM measures offered by the employer or by some other local service provider. Generally, carpool and vanpool information is a primary focus, although mass transit options and employer-based programs are also important. Generally, the information is in written form, with information brochures provided by the jurisdiction, rideshare service, or transit agency. Commute alternative information is provided on an annual basis to all employees and is given to new employees on their first or second day of employment. Ordinances which do not require an ETC but do require that rideshare information be made available leave the distribution method up to
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Another requirement of most TROs is the collection of data, usually by employers, to ensure goals are being met. This is generally done through an employer survey. Each employer is asked to conduct an annual survey of their employees to collect information about their commuting habits, transportation alternative used and, in some cases, their opinions of TDM measures. In cases where surveys are not required, employers are usually asked to submit a yearly report detailing their TDM activities over the past 12 months.

Ordinances may also require that each employer or developer plan and implement its own TDM program. While some ordinances require that specific measures be used, in general, most ordinances provide a list of potential TDM measures and then require the employer/developer to select options from the list. The latter approach is preferred, since not all TDM approaches are appropriate in every case. By providing flexibility, employers are more likely to accept and work within the provisions of the ordinance. Once the plan is developed, the jurisdiction or other management group reviews and approves the plan. Once the plan is approved, it is up to the employer/developer to implement the measures.

Step 7: Ordinance Management

There are two primary ways in which TROs can be managed:

- **A public/private task force** made up of municipal representatives and representatives of major employers and developers, usually the transportation coordinator. While responsibility for the ordinance program lies with the jurisdiction, the task force serves as an advisory board, establishes implementation guidelines, reviews TDM programs, monitors performance and serves as a hearing appeals board. The role of the task force is therefore one of a technical advisory committee which assists in coordinating ordinance provisions with those responsible for attaining the ordinance goal and local municipal officials.

- **More powerful jurisdictional responsibility.** A jurisdiction can hire a program manager to oversee the ordinance or can dedicate a portion of an existing staff member’s time to manage the ordinance. Under most circumstances, the jurisdiction employee develops technical support programs, reviews and approves TDM plans, monitors compliance, serves as advisor on ordinance revision to municipal boards and can train ETCs. Under this form of management, jurisdictions can more easily provide assistance to employers and better ensure ordinance provisions are being met.
Step 8: Ordinance Funding

Most local ordinances are funded through a general fund budget appropriation. However, more and more localities are looking to fund ordinance programs through fees and available transportation grants. In some instances, local ordinances that require a TDM plan charge a submission fee to cover the cost of review and first year program costs, and then have an annual program renewal fee.

For ordinances that focus on new development only, TRO funding can come from filing fees and/or permit fees. Filing fees are identical to submission fees; when the developer submits the TDM plan for the new development, he or she pays a charge to cover program costs. A permit fee is a charge associated with approval of a TDM program. In this case, a development may not be constructed or occupied until a TDM permit or certificate is issued. When the permit or certificate is granted, usually after a TDM plan has been approved, a permit fee is assessed. Depending on specific program goals of government agencies, grant funding may be obtained as part of a pilot program or experimental project.

Step 9: Ordinance Enforcement

While a TRO may set specific goals for a defined area, it is difficult and unfair to penalize individual affected parties for failing to attain area-wide goals. In most cases, enforcement is limited to ensuring that ordinance requirements for individual companies are being met, and if not, penalties are incurred. Two types of penalties are enforced, one targeted at existing employers and the other at new developments.

Penalties targeted at existing employers usually take the form of fines or the requirement of more stringent TDM measures. In this case, fines are the result of civil penalties and may be as much as $250 per day for each day the employer remains in violation. In lieu of fines, localities may require that an employer resubmit his/her TDM plan and include implementation of additional TDM measures of the employers choice from a list of several strategies developed by the enforcement agency. The employer may also be asked to implement specific TDM measures to ensure that compliance standards are met.

Development enforcement is usually tied to the permit process. Failure to submit a TDM plan or to implement the approved TDM plan can lead to the denial of a building or occupancy permit or having those permits revoked.
Summary

TROs can be an effective way for local and regional governments to implement trip reduction measures. However, a TRO may not be appropriate in all areas. First, the effectiveness of a TRO is dependent on the attractiveness of the business climate within the community. To date, most ordinances have been limited to high growth areas of the United States, places where many businesses want to locate. A community which is in the midst of an economic downturn and enacts a TRO may find major employers relocating to other areas where no such ordinance exists. In high growth areas, localities should have a TRO or development may shift to an adjacent community.

Funding TROs can be expensive for smaller communities. Given budget constraints, enforcement and management may be beyond the financial capabilities of a locality. Zoning and development code provisions requiring high numbers of parking spaces run counterproductive to TROs and place developers in “Catch-22” situations. Such local codes should be reviewed prior to enacting a TRO, and such reviews require investment of both money and staff time.

EMPLOYEE COMMUTE OPTION (ECO) PROGRAM

The Clean Air Act Amendments of 1990 requires that the State Implementation Plan (SIP) must be revised to include provisions that require large employers in severe and extreme non-attainment areas to implement programs to reduce work-related vehicle travel by employees. The programs are referred to as employee commute option programs (ECO) or employee trip reduction programs (ETR).

Affected Areas

- Los Angeles
- San Bernardino Valley
- Houston-Galveston-Brazoria
- New York-New Jersey-Long Island-Connecticut
- Baltimore
- Chicago-Gary-Lake County
- San Diego
- Philadelphia-Wilmington-Trenton
- Milwaukee-Racine
- Ventura County

Applicability

The regulation applies to all employers with 100 or more employees located within these affected areas. These employers must...
develop trip reduction plans that convincingly demonstrate compliance with the trip reduction compliance requirement for the non-attainment area. The requirement calls for a 25% increase in the average passenger occupancy (APO) of commuter vehicles. The increase is to be measured from a baseline Average vehicle occupancy (AVO) established for the entire non-attainment area. Thus, the law calls for a 25% reduction in the number of employee cars arriving at the work site during the morning rush hour.

**Employer Requirements**

In their compliance plans, employers must describe the actions they propose to implement to achieve the reduction and convincingly demonstrate that these actions will enable them to reach the APO target. Employers must also document through annual surveys the progress they make toward the achievement of the target APO.

The law does not prescribe specific actions that must be taken to comply, instead allowing employers to tailor programs to the needs of their employees and with transportation services that are available at the work site. Measures that could be implemented include:

- Sponsoring rideshare matching programs
- Providing company-owned or company-leased vanpool or carpool fleets
- Initiating flexible work schedules
- Offering financial incentives to employees who use commute alternatives
- Charging for parking or eliminating subsidies for employees who drive alone to work

In November of 1994, employer compliance plans were expected to be due. However, because statute language stated that compliance plans were due two years after the revised SIP, only five of the required SIP revisions were submitted by the November 1992 due date. Therefore, not all employers have been required to submit their trip reduction program plan.

To determine if a submitted employer plan will meet the convincingly demonstrate compliance requirement, the state should implement one of four options.

- State Review Agency- Employers will have to convince the review agency that the plan will achieve compliance.
The state can prescribe a minimum set of measures that all employers must implement.

A provision that all employers who fail to comply will have to implement a regulation-specific multi-measure contingency plan.

The state can impose significant financial penalties for failure to comply.

Once plans are submitted, the employer has two years to achieve compliance. The regulations do not specify what will happen in two years if an employer achieves compliance. Thus maintaining target APO has yet to be addressed.

**Averaging, Banking, and Trading APO Credits**

Employers with more than one work site within a non-attainment area can average their APO across all affected work sites within the non-attainment area. If the non-attainment area is divided into zones, then the employer can only average those work sites within a specific zone.

Employers may also bank APO credits. If an employer exceeds the APO target, they may take a credit and bank it and apply it later in the year.

Finally, employers who exceed the APO target can trade them to an employer who has failed to meet the target. However, few affected jurisdictions have developed a process or agency to keep track of banked credits or trading of credits.

**Zones and Targets**

Where important differences exist in commute patterns, land use, transit availability or AVO, states may establish different zones for calculation of AVO. If zones are used, then different targets for APO will be established. However, collectively, the effect would have to equal an area wide 25% reduction.