CMS For Non-Urbanized Areas – The New Jersey Experience

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ABSTRACT

The South Jersey Transportation Planning Organization (SJTPO) is the federally recognized Metropolitan Planning Organization (MPO) for the southern New Jersey region, serving Atlantic, Cape May, Cumberland, and Salem Counties. Formed in mid – 1993, SJTPO replaced three small existing MPO's and assumed planning and programming responsibility for areas not previously served.

The nature and spatial distribution of SJTPO's urbanized population present special challenges to SJTPO in its CMS operations. On one extreme lies Atlantic City, with its casino gambling industry and rapidly growing suburban areas. Classic congestion treatments for a typical metropolitan area - such as telecommuting, ridesharing, or transit - are far less effective in this setting, where casinos operate round the clock all year, and there are literally dozens of shift time and workweek permutations. But SJTPO's greatest challenge in crafting its CMS was to define and address the most serious congestion problem in the region – seasonal traffic.

In 1999, the New Jersey Department of Transportation estimated that the total amount of congestion experienced on summer weekends exceeded that encountered in the region during all weekdays throughout the year. Unfortunately, the statewide CMS tool that had been developed by the NJDOT did not capture seasonal traffic volumes, this meant that the SJTPO needed to build its CMS from the ground up and employ tools and techniques relevant to conditions in the SJTPO region. Toward this end, a consultant team was selected to assist SJTPO in the customization of a CMS for the SJTPO region. This paper highlights the unique elements and approach learned in the development of the SJTPO CMS.

BACKGROUND

The South Jersey Transportation Planning Organization (SJTPO) is the federally recognized Metropolitan Planning Organization (MPO) for the southern New Jersey region, serving Atlantic, Cape May, Cumberland, and Salem Counties. Formed in mid – 1993, SJTPO replaced three small existing MPO's and assumed planning and programming responsibility for areas not previously served. SJTPO was designated as an MPO largely in response to the landmark Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which strengthened the role of the local community in transportation decision - making. Under ISTEA and its successor, the Transportation Efficiency Act for the 21st Century (TEA-21), MPO's carry out transportation planning and programming for urbanized areas, and provide a forum for partnerships among state and local officials, public and private transit operators, and the general public. They coordinate the planning activities of participating agencies and adopt long – range plans to guide transportation investment decisions.

As noted above, SJTPO replaced three existing MPO's, each of which included an urbanized area. Under ISTEA, additional benefits and responsibilities are assigned to MPO's whose urbanized population exceeds 200,000. These MPO's are designated as Transportation Management Areas (TMA's), which under federal law are responsible for operating their region's Congestion Management System. SJTPO's 1990 urbanized population exceeded 200,000, and was therefore designated a TMA. However, the nature and spatial distribution of SJTPO's urbanized population present special challenges to SJTPO in its CMS operations. SJTPO's urbanized population is actually scattered about the region in various forms. On one extreme lies Atlantic City, with its casino gambling industry and rapidly growing suburban areas, Classic congestion treatments for a typical metropolitan area - such as telecommuting, ridesharing, or transit - are far less effective in this setting, where the majority of employees do not work standard "9 to 5" shifts. Casinos operate round the clock all year, and there are literally dozens of shift time and workweek permutations. But SJTPO's greatest challenge in crafting its CMS was to define and address the most serious congestion problem in the region – seasonal traffic.

The eastern edge of the SJTPO region, in Atlantic and Cape May Counties, consists of highly developed barrier islands with a substantial amount of summer housing. Cape May County is a good example of SJTPO's seasonality, as Cape May's permanent population of 105,000 swells to over 600,000 in the summer. In 1999, the New Jersey Department of Transportation estimated that the total amount of congestion experienced on summer weekends exceeded that encountered in the region during all weekdays throughout the year. Unfortunately, the statewide CMS tool that had been developed by the NJDOT did not capture seasonal traffic volumes, but rather, was set for winter weekday conditions. This meant that the SJTPO needed to build its CMS from the ground up and employ tools and techniques relevant to conditions in the SJTPO region. Toward this end, a consultant team led by Parsons Brinckerhoff was selected to assist SJTPO in the customization of a CMS for the SJTPO region.

TECHNICAL APPROACH

To develop a successful and practical CMS, it is important to recognize that CMS is a dynamic, interactive and evolving process, it should be built upon existing processes/conditions and designed for flexibility and responsiveness. Therefore, the technical approach is based on the appreciation of the project's goals and objectives, the operation environment of the Statewide CMS and the capability of the South Jersey Travel Demand Model (SJ Model). More importantly, the understanding that it is not practical to build an ultimate all-purpose CMS in a single attempt, because technical and financial constraints together with potential institutional issues will prevent an instant success of such an ambitious mission. In contrast, a "build-as-you-go" approach would provide more flexibility to CMS owners in utilizing existing and future resources to customize their planning and operational needs for CMS, including adequate time to work out institutional arrangements/agreements with many stakeholders and operation agencies.

Considering that the total effort required for the development of an integrated all-purpose SJTPO CMS is beyond the existing resources and schedule, a "build-as-you-go" approach was adapted and the goal was to maximize the available resources in building the foundation of the subject CMS, establish a complete CMS framework, and define the fundamental components to allow new or expanded CMS modules to be integrated into the system when ready. Therefore, at this initiative stage of the CMS development, emphasis and efforts will be placed on the thinking process of the entire CMS, and laying down all groundwork and procedures necessary to ensure that a comprehensive, integrative and coordinative CMS can be developed over time.

The technical approach in developing the CMS for SJTPO consists of four major tasks:

(1) ***Identify CMS Objectives and Issues*** - This task contains the first series of activity steps in the CMS process. It starts with the base of current policies/practices and existing traffic conditions and congestion

management practices. It attempts to set the overall framework best suited for SJTPO, and outlines the parameters of congestion/mobility issues to be analyzed and monitored within the scope of the defined framework. The main purpose of this task is to define and determine the cause of congestion and mobility problems in targeted areas/systems, and to select appropriate performance measures for evaluating congestion and mobility. An interesting requirement for CMS is that the system should reflect not only the transportation service provider and user perspectives, but also the perspective of the general public.

(2) ***Evaluate Alternative CMS Strategies*** - The purpose this task is to define strategies that will decrease congestion and improve mobility in the SJTPO region, subareas, corridors or local hot spots. The evaluation process began with the identification of available strategies to alleviate congestion, it centered on a detailed evaluation of the when, where and why congestion occurs (or recurs) and what congestion management strategies are appropriate and cost effective. A matching process was conducted based on measures of effectiveness derived from the performance measures specified in previous task and tailored to available data and the strategies being evaluated. It should be noted that no single strategy is expected to solve all congestion management problems, and several iterations are expected over time during the planning and refinement process. The refinement process will depend on data availability, measures of effectiveness, the transportation mode and system being evaluated and stakeholder involvement.

(3*) **Programming and Monitoring*** - After the most suitable CMS strategies have been defined for the SJTPO region, they must be placed in perspective with other proposed improvement projects and strategies – safety, bridge, resurfacing, transit, etc. – as well as with available funds. These other competing projects are likely to be generated by other management systems as well as projects that were programmed in previous years but have yet to be initiated, and there may also be other projects suggested and recommended by authority, county and local government bodies. Therefore, this task is intended to assist SJTPO in two ways. First, to provide the SJTPO Board with the information needed to annually update the LRP, STIP and /or TIP. Second, to aid the decision-support system in establishing an on-going program for monitoring congestion on the transportation systems, including measuring the effectiveness of implemented CMS strategies, thus, lay down the groundwork for the annual report card on the state of the systems.

(4) ***Development of CMS Tool*** - For SJTPO to plan, evaluate and execute the CMS, an analytical tool is needed in order to quantify system performance and effectiveness of the CMS strategies. However, it is important that its capability and areas of focus must be compatible and consistent with the CMS it intends to serve. In another words, the subject CMS tool should be tailored specifically to the performance measures defined by the SJTPO CMS, and more importantly, has the ability to mature along with the CMS over time.

STUDY HIGHLIGHTS

This section provides a brief summary of findings for the overall CMS effort, however it will focus mainly on areas that are unique for the SJTPO region and different to typical urbanized CMS settings and environment, namely (a) CMS analysis areas; (b) CMS network inclusion; (c) Performance measures; (d) CMS needs; and (e) Applicable CMS strategy groupings.

CMS Analysis Areas

Travel conditions in the SJTPO region vary significantly from those present in much of the rest of the state. These conditions include seasonal fluctuations and peak periods related to summer recreational travel and the gaming industries. In order to accurately reflect these unique conditions, SJ CMS performance measures will be reviewed according to standards and criteria based on area type. In this manner, system performance will be judged according to local needs and expectations that take into account context and intensity of activity.

A composite of the population, employment, and urbanized area data was used to distinguish among urban and rural areas, and based on these data, two distinct area types were identified for the SJTPO region – *Rural* and *Urbanized*. The inherent seasonality of travel in the region has been documented in numerous studies and reports, including the Shore Connection Study and the SJTPO 2025 Regional Transportation Plan. Along with these atypical travel peaks, population of shore communities swells well beyond recorded census data, particular during July and August weekends. Although the context may be different, the intensity of travel in areas that experience these conditions should be subjected to the same performance measure standards as those areas identified as *Urban*, because the conditions and causal factors are vastly similar. To account for this, a third performance measure area type was added for *Seasonal*.

Finally, a number of small urbanized areas are scattered across the SJTPO region. These are typically very small landmasses with urban densities but which lie within largely rural areas. To accurately capture the travel

effects of these areas which differ significantly from the urban conditions in Atlantic City, for example, a fourth area type was added: *Rural Center*. Each area was assigned a district number based on municipal designations.

CMS Network Inclusion

Several data sources were overlaid to define the coverage for the highway network. The NJDOT GIS base road layer depicts all classified roads for the four counties of the SJTPO region forms the base layer and serves as the final comparison for the overlaid layers. Because the SJTPO region abuts several counties of the DVRPC MPO area, roads from Burlington, Camden, and Gloucester counties are included the base layer to capture inter-regional travel patterns and ensure that regionally significant connecting routes are included in the highway coverage network. Additional overlays include the SJ Model network and statewide NJ CMS. Cross-comparison of these various data sources identifies deficiencies in these layers and opportunities for additional roadways to be included.

The South Jersey Travel Demand Model is the standard tool used to conduct regional long-range planning analysis for the SJTPO region. Data from the SJTDM can be used to calculate various performance measures, including v/c ratios so it was necessary to identify a CMS highway network for analysis purposes. The CMS highway network is comprised of the minimum set of roadways required to track and review highway system performance within and across the region in both existing and future analysis years. Consultation with SJTPO identified the following general guideline for the inclusion of CMS highway network:

- Include all 500 and 600 series routes in Cape May and Atlantic Counties;
- Include all 500 series routes and significant 600 series routes in Cumberland County as designated on the county map provided by SJTPO, also include Routes 615 (North and South), 645, 654, and 659;
- Include all 500 series routes and significant 600 series routes in Salem County as designated on the county map provided by SJTPO;
- The CMS analysis should focus on congestion and not identify problem areas based on safety issues;

A preliminary reviews of the SJ Model highway network indicated that 90% or more of these network links met these criteria. Therefore, based on these criteria and a review for completeness and consistency, the South Jersey CMS highway will include all roads in the SJ Model, not just those identified as CMS analysis links. Furthermore, these network links are grouped into 4 link group types based on the SJ Model. They are defined in Table 1 below. The performance measures from these CMS link groups will be used as the basis to assess the effectiveness and efficiency of various CMS strategies. Furthermore, based on SJTPO guidance, the transit focus of effort will take place during the strategy evaluation, not the measurement of travel conditions, so for the purposes of this study there is no official South Jersey CMS transit network.

Performance Measures

There are two sides in the transportation equation - the “demand” side and the “supply” side. The “demand” side consists of many demographic, socio-economic and land use variables as well as the number of person trips or vehicle trips. The “supply” side consists of all the components that formed the transportation systems, while congestion reflects the conditions associated within the transportation systems, in specific, the highway network. Ideally, when “demand” and “supply” are equal or balanced, congestion will no longer become a concern.

National Cooperate Highway Research Program (NCHRP) Report 398 reported that it is difficult to conceive of a single value that will describe all of the traveler’s concerns about congestion, but there are four components that interact in a congested road network. These components vary among and within areas and are defined as follows:

- Duration – the amount of time congestion affects the travel system.
- Extent – the number of people or vehicles affected by congestion, and by the geographic distribution of congestion.
- Intensity – the severity of the congestion that affects travel. The level and total amount of congestion on the transportation systems.
- Reliability – the variation in the above three elements. Recurrent congestion is relatively stable and predictable, but non-recurrent (due to incidents, weather, etc.) delay causes greater variation in the amount of congestion and is much less easily predicted. Reliability is the impact of non-recurrent congestion on the transportation system.

Four performance measures have been recommended for the SJ CMS to fully measure these components of congestion:

1. ***Volume to capacity ratio (v/c)*** – is a link-based measure that reflects mobility and quality of travel of a facility or a section of a facility. It is a very common performance measure for many MPOs and is widely used in CMS and transportation studies. It is also very easy to set different performance standards for different geographical areas in order to differentiate various levels of toleration to congestion among communities.
2. ***Vehicle-mile traveled (VMT) by Level of Service by trip purpose*** – is a mobility-based measure that provides excellent applicability in measuring system-wide congestion, and is the only performance measure that is capable of measuring level of service by trip purpose - an important factor in assessing recreational travel in the South Jersey region.
3. ***Peak period vehicle unacceptable delay (in vehicle hours)*** – is also a mobility-based performance measure, which not only provides excellent applicability on system-wide congestion, but also reflects well on peak period characteristics.
4. ***Vehicle-hour traveled (VHT) by Level of Service by facility type*** – is a measure that is capable of reflecting mobility as well as quality of travel at the system level and/or the facility level. Its advantage over the VMT-based measures is that VHT also include the amounts of delays that occur during travel, thereby it will better correlate with road congestion.

At this initial stage of CMS development, SJTPO will utilize performance measure #1 (volume to capacity ratio) as the primary indicator to identify traffic congestion in the region. As the SJ CMS becomes more fully developed in the future performance measures #2 to #4 will be incorporated to help measure the effectiveness of recommended CMS strategies.

CMS Needs

Volume-to-capacity (v/c) data from the South Jersey Travel Demand Model was used to identify areas of need. The v/c ratio is a basic measure of transportation performance that identifies areas where travel demand exceeds the available capacity. Use of the SJ model with the identified v/c data ranges is referred to as the SJ CMS Tool.

The New Jersey Statewide Long Range Transportation Plan, the SJTPO 2025 Regional Transportation Plan (RTP), and the New Jersey Congestion Management System are all examples of studies that have relied on relative v/c data to help identify congested corridors and intersections. Although the terminology varies, these studies generally employed a three-tiered rating of v/c: Below Capacity, Approaching Capacity, and Above Capacity. The project team reviewed these studies as well as other regional Congestion Management Systems, including those developed for the Puget Sound Regional Council in Seattle, Washington, and WILMAPCO in Delaware. Consultation with SJTPO identified the following guidelines for analysis of travel conditions:

- Summer Friday PM Peak hour simulations
- Base Year = 2000 and the future year = 2025
- Four area types: Urban, Rural, Recreation/Seasonal, Rural Center
- Three-tiered v/c rating system: Below Capacity, Approaching Capacity, and Above Capacity
- Selection of v/c data ranges consistent with the RTP problem area identification process

Table 2 summarizes the system of area types, v/c categories, and data ranges for the SJTPO region.

Plots were prepared for each SJTPO County based on this system, and these plots were then compared to the list of existing and future problem areas developed through the RTP process. The comparison ensures the selection of v/c data ranges for the SJ CMS Tool that are consistent with the RTP problem area identification process and that reflect a similar level of congestion in both the existing and future years.

The comparison indicated strong consistency between the two analysis methods and confirms the validity of the proposed combined system of congestion level and area type to identify CMS needs across the region using the SJTDM tool and the volume-to-capacity measure. The RTP process identified a total of 93 deficient locations in the existing year and 111 locations in the future year, and the SJ CMS Tool also identified the vast majority of these locations. Some problems were unique to the RTP, others were unique to the CMS Tool, and many were identified by both. In both the existing and future years, the RTP process identified problems that were not identified by the screening of v/c data by the CMS Tool. The composite of the two methods forms the overall list of 'CMS Needs'.

Applicable CMS Strategy Groupings

The project team has conducted a literature search on CMS strategies through federal and state references in particular the technical documents for the New Jersey Statewide CMS, the South Jersey Regional Transportation Plan, and CMS documents of other neighboring MPOs such as the North Jersey Transportation Planning Authority

(NJTPA), the Delaware River Regional Planning Commission (DVRPC) and the Wilmington Area Planning Council (WILMAPCO). The goal is to establish a list of potential strategies applicable to both the demand side and the supply side of the equation. The broad categories of CMS strategies generally include the following:

- Growth Management
- Travel Demand Management (TDM)
- Transportation System Management
- Transportation Capacity Improvement
- Intelligent Transportation System (ITS)

As each of the above CMS categories covers considerable numbers of strategies, it is not practical to analyze and evaluate all of them individually. Therefore, it becomes necessary to customize these strategies into different strategy groups for the SJTPO region. Based on review of the available information, eleven (11) CMS strategy groupings have been proposed for the SJTPO region, and there may be 1 or 2 sub-categories of strategy types within each group, which make up are a total of 14 sub-categories. Within each of the defined sub-categories are individual strategies with similar principles and objectives. These groupings and their respective sub-categories are listed in Table 3 below:

One of the main functions of the CMS toolbox is to evaluate the effectiveness of these CMS strategies in addressing congestion related problems. The ability of the SJTPO to undertake this evaluation is largely dependant upon the available technical data and methodologies at the time of the analysis and evaluation. Because the SJTPO CMS will be developed on a "build-as-you-go" basis, it becomes necessary to make assumptions regarding the evaluation methods that are achievable and available under various staging of CMS developments.

It is logical to assume three general stages of CMS development for SJTPO. They are: 1) Initial/Near-term – based on the resources and schedule for the current CMS development effort; 2) Mid-term – assumed reasonable enhancements will be made to the existing technical analytical tools such as the South Jersey Model and the Statewide CMS reporter; and 3) Long-term into the future – where advanced technologies may induce additional opportunities in data collection/interfacing and technical analysis that allow further enhancement to the CMS toolbox, and newly identified traffic counts, data sources, and stakeholder input aid in the monitoring process begin to come on-line.

Table 4 summarizes the potential CMS strategies under each sub-category and their evaluation methods anticipated under various staging of CMS development. A total of 44 strategies have been identified including the majority of CMS strategies that have been considered and/or been implemented by transportation professionals around the nation. Additional strategies may me included at a later date. Also presented in the table are the types of evaluation methods suggested for each strategy relative to each CMS development stage over time. Based on the review of the level of effort for the Near Term, it is recommended that a qualitative approach be undertaken to assess the effectiveness for each of the 14 sub-categories. This qualitative method will be utilized for the next stage but some suggested strategies would be assessed quantitatively, depending upon enhancement of the technical tools. Similarly the enhancement will continue, as more strategies will be subjected to quantitative evaluation.

STUDY SUMMARY

According to the Federal Highway Administration, an effective Congestion Management System is a systematic process for managing congestion that provides information on transportation system performance and on alternative strategies for alleviating congestion and enhancing the mobility of persons and goods to levels that meet State and local needs. The level of system performance deemed acceptable may vary by type of transportation facility, geographic location, and/or time of day.

Having stated that, there are important points that can drawn from this study effort, first, it is critical for a CMS to be able to address the local issues and concerns that associated with the local settings and environment. The seasonal characteristics of the SJTPO region require different approach and treatments in CMS development in order to capture not only the fluctuation in traffic but most important, the local's perception on congestion and their concerns, which ultimately, would have an influence on the transportation decision-making process and policy outcomes of the SJTPO region. The project team worked together with SJTPO to ensure that the CMS framework is working within SJTPO's planning process and that the CMS products are addressing the local problems.

Another point is the utilization of a "build-as-you-go" approach to CMS development. It is important to recognize all of the technical and non-technical constraints and limitations at the beginning of the development process, so a set of realistic and practical expectations can be set and accomplished. This process avoids the danger

of taking on more than can be handled, which may ultimately lead to partial or complete failure. In general, all CMS rely on good data in particular forecasting data typically generated by travel demand models, and enhancements or customization to those models are often difficult, expensive and time consuming. Therefore, the ability of the CMS owners to maintain and update such important analytical tools must be considered in the design of CMS components, especially the ability to estimate changes in performance measures by various types of CMS strategies. With the "build-as-you-go" approach, SJTPO will have the flexibility to enhance the CMS process and the individual module according to the needs and priority over time.

Last but not the least, CMS is more than just a technical exercise, the technical process in the development of a CMS is important, but equally critical is the transportation planning process or the "thinking" process that forms the backbone of transportation decision-making. Without the inputs and feedback from the stakeholders, the execution and implementation of a CMS is meaningless, therefore, a true partnership must be formed in order to develop an effective and applicable CMS, in particular for non-urbanized areas where congestion is a very sensitive local issue.

LIST OF TABLES AND FIGURES

TABLE 1 Cross Reference Table for CMS Link Groups and SJ Model

CMS Link Groups	South Jersey Model Facility Types
Freeway and Expressway	Freeway Class 1 and Class 2
Arterial	Principal Arterial, Major Arterial and Minor Arterial
Collector	Collector Class 1, Class 2 and Class 3
Local	Local Class 1 and Class 2

Table 2 SJTPO V/C Analysis System

Area Type	V/C Categories	V/C Ranges
Urban	Below Capacity	VC<=0.80
	Approaching Capacity	0.80<VC<=1.00
	Above Capacity	VC>1.00
Rural	Below Capacity	VC<=0.75
	Approaching Capacity	0.75<VC<=0.90
	Above Capacity	VC>0.90
Seasonal	Below Capacity	VC<=0.80
	Approaching Capacity	0.80<VC<=1.00
	Above Capacity	VC>1.00
Rural Center	Below Capacity	VC<=0.75
	Approaching Capacity	0.75<VC<=.90
	Above Capacity	VC>0.90

TABLE 3 Proposed CMS Strategy Groupings and Sub Categories

	Strategy Grouping	Sub-Category
A	Growth Management	1) Smart Growth
B	Transportation Demand Management – Economic Based	1) Pricing and Incentive
C	Transportation Demand Management – Employer / TMA Based	1) Person-Trip Reduction 2) Vehicle-Trip Reduction
D	Transportation Demand Management – Preferential Based	1) Priority Treatment
E	Intelligent Transportation Systems (ITS)	1) Preserve Capacity 2) Enhance Capacity / Operations
F	Bus Services / Operation Enhancements	1) Improvements to Existing Services
G	Rail Services / Operations Enhancements	1) Improvements to Existing Services
H	New Transit Services	1) Increase Service Capacity
I	Intermodal Integration	1) Improvements to Connectivity and Coordination
J	New Roadway Capacity	1) Minor Localized Improvements 2) Major Corridor-wide Improvements
K	Improvements to Non-Motorized Modes	1) Encourage non-motorized trips

TABLE 4 CMS Strategy Grouping Proposed for The SJTPO Region

	EVALUATION METHOD		
Strategy Grouping	***Near-Term***	***Mid-Term***	***Long-Term***
a) Growth Management			
1. Smart Growth	**Qualitative**	**Qualitative**	**Qualitative**
■ Land use policies/ zoning standards		Quantitative	Quantitative
■ Access management and site design			Quantitative
b) TDM – Economic Based			
1. Pricing and Incentive	**Qualitative**	**Qualitative**	**Qualitative**
■ Congestion / Seasonal Pricing			Quantitative
■ Tolling / HOV tolling saving			Quantitative
■ Parking pricing			Quantitative
■ Business tax incentive			Quantitative
c) TDM – Employer / TMA Based			
1. Person-trip Reduction	**Qualitative**	**Qualitative**	**Qualitative**
■ Alternate work week		Quantitative	Quantitative
■ Flex time		Quantitative	Quantitative
■ Telecommuting			
2. Vehicle-trip Reduction	**Qualitative**	**Qualitative**	**Qualitative**
■ Ride match / Guarantee ride–home program			Quantitative
■ Regional telework center			Quantitative
■ Mid-week based shore rental period			Quantitative
d) TDM – Preferential Based			
1. Priority Treatment	**Qualitative**	**Qualitative**	**Qualitative**
■ HOV/ HOT lanes		Quantitative	Quantitative
■ Exclusive bus-way		Quantitative	Quantitative
■ Exclusive truck facilities		Quantitative	Quantitative
■ Ramp-by-pass		Quantitative	Quantitative
■ Parking preferential (HOV, E-ZPass, etc.)			Quantitative
e) Intelligent Transportation Systems (ITS)			
1. Preserve Capacity	**Qualitative**	**Qualitative**	**Quantitative**
■ Incident management systems/plans for seasonal and non-seasonal travels			Quantitative
■ Ramp metering / control			Quantitative
2. Enhance Capacity / Operations	**Qualitative**	**Qualitative**	**Quantitative**
■ Advanced Traffic Management Systems		Quantitative	Quantitative
■ Advanced Traveler Information Systems			Quantitative
■ Electronic Toll Collection			Quantitative

	EVALUATION METHOD		
Strategy Grouping	***Near-Term***	***Mid-Term***	***Long-Term***
f) Bus Service /Operation Enhancements			
1. Improvements to Existing Services	**Qualitative**	**Qualitative**	**Qualitative**
■ Increase service frequencies /hours		Quantitative	Quantitative
■ Provide express services		Quantitative	Quantitative
■ Upgrade facilities / amenities (bike racks, shelters, ADA requirements, security, etc.)			Quantitative
g) Rail Service /Operation Enhancements			
1. Improvements to Existing Services	**Qualitative**	**Qualitative**	**Qualitative**
■ Increase service frequencies /hours		Quantitative	Quantitative
■ Provide express services		Quantitative	Quantitative
■ Upgrade amenities / facilities (bike racks, shelters, ADA requirements, security, etc.)			Quantitative
h) New Transit Services			
1. Increase Service Capacity	**Qualitative**	**Qualitative**	**Qualitative**
■ Provide new /expanded bus services		Quantitative	Quantitative
■ Provide new / expanded rail services		Quantitative	Quantitative
■ Provide new / expanded ferry services		Quantitative	Quantitative
i) Intermodal Integration			
1. Improvements to Connectivity and Coordination	**Qualitative**	**Quantitative**	**Quantitative**
■ New/expanded multimodal transfer facilities – passenger (bus, rail, jitney, taxi) and freight		Quantitative	Quantitative
■ Shore destination park-&-ride facilities		Quantitative	Quantitative
■ Regional transit fare / schedule integration			Quantitative
j) New Roadway Capacity			
1. Minor Localized Improvements	**Qualitative**	**Quantitative**	**Quantitative**
■ Improvement of intersections/interchanges		Quantitative	Quantitative
■ Ramp addition and/or modifications		Quantitative	Quantitative
■ Lane / shoulder widening		Quantitative	Quantitative
2. Major Corridor-wide Improvements	**Qualitative**	**Quantitative**	**Quantitative**
■ New lanes on existing facilities		Quantitative	Quantitative
■ New facilities		Quantitative	Quantitative
■ Directional reversible lane(s)		Quantitative	Quantitative
■ New interchange / grade-separation		Quantitative	Quantitative
k) Improvements on Non-Motorized Modes			
1. Encourage Non-motorized Trips	**Qualitative**	**Qualitative**	**Qualitative**
■ Provide new / expanded bikeways			Quantitative
■ Provide new / expanded pedestrian facilities			Quantitative
■ Traffic calming measures			Quantitative