



OCTA

Interstate 405 Major Investment Study

Final Report

PARSONS

IBI Group • URS Corporation • Albert Grover & Associates

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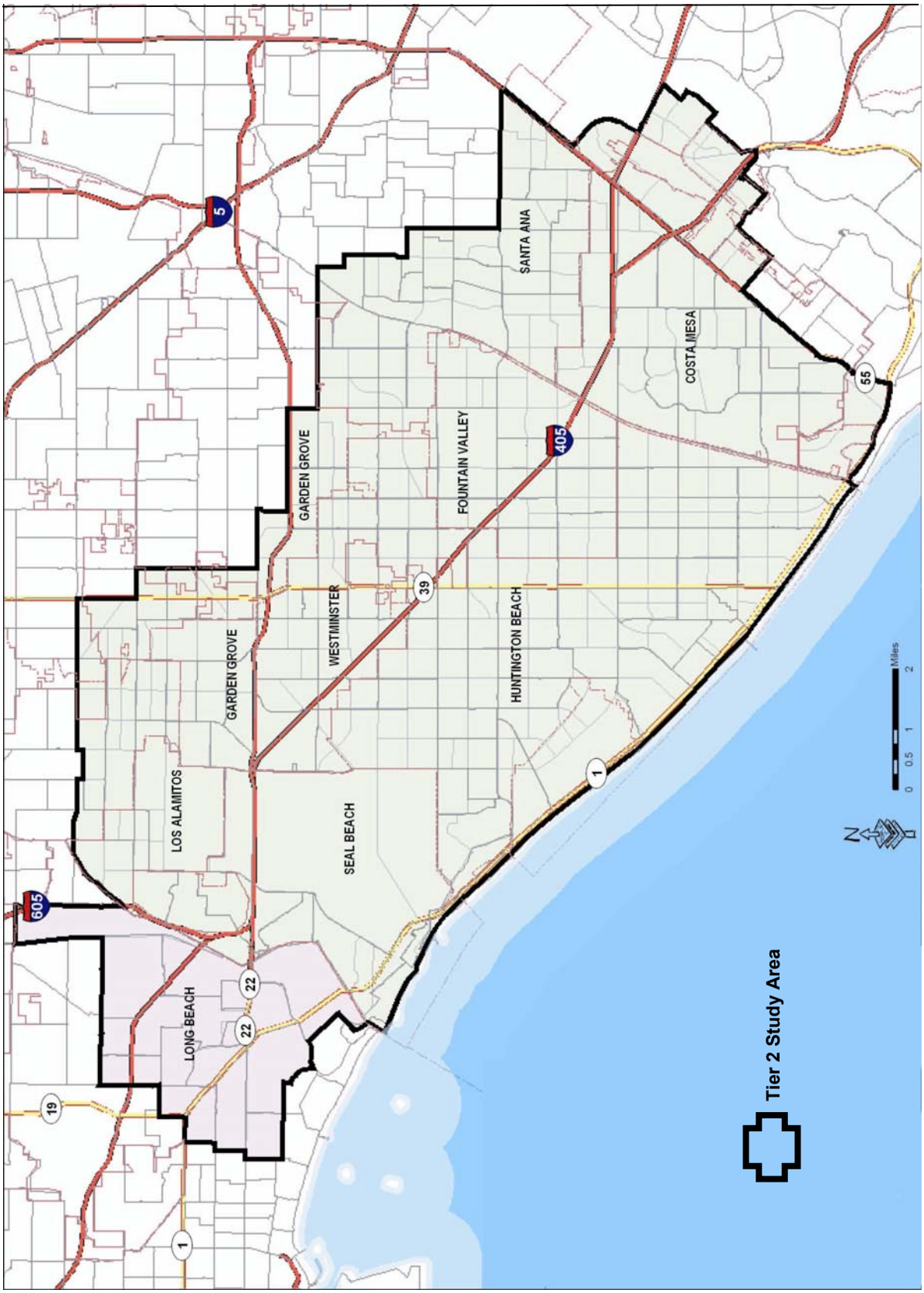
1 INTRODUCTION

The Interstate 405 (I-405) Major Investment Study (MIS) analyzed transportation issues and considered potential improvements to the thirteen-mile portion of I-405 in Orange County between the Interstate 605 (I-605) and State Route 73 (SR-73) freeways. In this area I-405 carries about 300,000 vehicles per day. Peak periods are heavily congested. Daily traffic is expected to increase to 360,000 vehicles per day in the year 2025. This report documents the two-year study of potential improvements in the corridor and presents analysis of the final alternatives considered for corridor improvement. The report describes adoption by the Orange County Transportation Authority (OCTA) Board of Directors of a Locally Preferred Strategy (LPS) to address the mobility problems in the corridor.

The study area is shown in Figure 1-1. The corridor passes through portions of Costa Mesa, Fountain Valley, Huntington Beach, Westminster, Garden Grove, and Seal Beach. It passes adjacent to Rossmoor, an unincorporated area of Orange County, and the U.S. Navy's Seal Beach Naval Weapons Station.

The MIS process in the I-405 corridor provides a long-range plan for the corridor aimed at relieving the existing and forecast mobility problems along the corridor. The MIS was sponsored and directed by the Orange County Transportation Authority in concert with the communities and stakeholders in the corridor. A Project Technical Advisory Committee (PTAC) with technical representatives from each of the jurisdictions along the corridor and Caltrans has met regularly to provide guidance and direction to the study. A Stakeholders Working Group, a City Managers Group, and a Policy Working Group (PWG) of elected officials were formed to provide guidance to the study. Prior to the completion of the study the OCTA Board of Directors


SANTA ANA
COSTA MESA
FOUNTAIN VALLEY
GARDEN GROVE
WESTMINSTER
HUNTINGTON BEACH
SEAL BEACH
LOS ALAMITOS
LONG BEACH
GARDEN GROVE
5
405
55
39
1
605
22
22
19
1
Tier 2 Study Area
Miles
0 0.5 1 2
N

created a committee to provide guidance to the study and information to the full board. That committee met jointly with the Policy Working Group to formulate a recommendation to the OCTA Board of Directors for a Locally Preferred Strategy for the I-405 corridor north of SR-73. Public meetings were held at key points in the study process and surveys were used to gather additional information useful to the project.

Currently, there is no funding identified to advance major improvements in this corridor. If funding becomes available in the future, state and federal regulations require the preparation of an Environmental Impact Report (EIR) and Environmental Impact Statement (EIS), as well as numerous other transportation and engineering reports. The process of producing those reports will further refine the project(s) ultimately to be constructed and will be subject to further review by the Orange County Transportation Authority and approval by the California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA).

This report consists of six sections. Following this Introduction, the second section covers the context in which this report should be viewed. The third section describes the alternatives whose analyses are presented in the fourth section. The report's fifth section provides a recommendation for the LPS to address the mobility problems identified in the I-405 corridor. The sixth section of the report contains several appendices of technical information. A separately bound Executive Summary presents a synopsis of the report's findings and the OCTA's adoption of the LPS.

2 BACKGROUND

This section of the report summarizes the activities and reports of the I-405 Major Investment Study leading up to the preparation of this report. A Major Investment Study (MIS) is a comprehensive transportation planning process designed to identify and address the mobility needs of a particular study area. As specified by the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA), the MIS process involves the following seven steps:

1. Identifying travel needs and mobility issues within the study area;
2. Establishing goals and objectives;
3. Developing a broad range of possible alternative transportation concepts;
4. Conducting initial screening processes in order to proceed with the most promising alternatives;
5. Refining remaining alternatives to be carried forward;
6. Conducting technical analyses and evaluation of alternatives; and
7. Selecting a Locally Preferred Strategy (LPS).

Steps 1 and 2 are documented in the *Interstate 405 Major Investment Study Corridor Mobility Problem and Purpose and Need Statement (P&N Statement)* dated March 2004. Step 3 is documented in the *Interstate 405 Major Investment Study Conceptual Alternatives Report* dated

May 2004. Step 4 is documented in the *Interstate 405 Major Investment Study Initial Screening Report* dated November 2004. This report documents steps 5-7. The sections below provide a summary of steps 1-4. Public and stakeholder involvement was a component of each step in the I-405 MIS.

2.1 EXISTING FACILITY

I-405 in Orange County north of SR-73 to I-605 has several distinct segments. From SR-73 north to Euclid Street the freeway was recently reconstructed. This segment has a single HOV lane and six general purpose lanes in each direction with numerous auxiliary lanes and braided ramps serving interchanges at Fairview Road, Harbor Boulevard (including a new ramp from South Coast Drive and Hyland Avenue), and Euclid Street.

There is a "lane drop" at Euclid Street. North of Euclid Street there are five general purpose lanes and a single HOV lane in each direction. There is another lane drop at Brookhurst Street.

North of Brookhurst Street to SR-22 (near Valley View Street) there are four general purpose lanes and a single HOV lane in each direction. There are no auxiliary lanes in this section which has interchanges at Warner Avenue, Magnolia Street, Edinger Avenue, Beach Boulevard (including ramps terminating at Center Avenue), Bolsa Avenue, Goldenwest Street, Westminster Boulevard (including a ramp terminating on Willow Lane), Springdale Street, Garden Grove Boulevard, and Valley View Street. This segment has the least number of travel lanes in the study area.

In the SR-22 overlap segment between Valley View Street and the SR-22 (7^{th} Street ramps) there are six general purpose lanes and a single HOV lane in each direction. There is a lane drop on I-405 at the SR-22 (7^{th} Street) ramps. North of the SR-22 (7^{th} Street) ramps to I-605 there are five general purpose lanes and a single HOV lane in each direction. There is a southbound auxiliary lane from the SR-22 (7^{th} Street) entrance ramp to the Seal Beach Boulevard exit ramp. There are also auxiliary lanes in the I-605 interchange area.

Caltrans is currently conducting Preliminary Engineering for auxiliary lanes between Beach Boulevard and Magnolia Street in both directions. There is currently sufficient width to provide an auxiliary lane southbound between the Magnolia Street on-ramp and the Warner Avenue off-ramp. However, the length of the section is too short to be striped as an auxiliary lane based on Caltrans standards, so the section has a wider than typical outside travel lane. Caltrans is also currently conducting Project Study Reports for auxiliary lanes and other improvements at the following locations:

- Magnolia Street to Warner Avenue southbound;
- Warner Avenue to Brookhurst Street southbound;
- Brookhurst Street to Euclid Avenue southbound;
- Euclid Avenue to Brookhurst Street northbound; and
- Brookhurst Street to Warner Avenue northbound.

2.2 CORRIDOR MOBILITY PROBLEM AND PROJECT PURPOSE AND NEED

Information on mobility problems in the I-405 corridor study area was developed from a variety of sources. Public meetings and surveys, as well as meetings of the groups formed to assist with the project, were used to gather information on problems in the corridor. Data were gathered from a variety of related studies and analyzed to shed light on the nature of the transportation problems in the study area. The need for improvements in the I-405 corridor stems from the mobility problems found in the corridor. The purpose of improvements is to address those problems.

Four key points were identified that represent the most significant mobility problems within the study area:

1. Demand already exceeds current capacity, resulting in significant travel delays during peak and some off-peak periods. During peak periods the freeway is already operating at unstable or breakdown conditions in both directions along the entire 13.5 miles (level-of-service E to F) and traffic is projected to grow approximately 20% by the year 2025 (based on forecasts derived from the Orange County Transportation Analysis Model (OCTAM)). Travel times on this section of the freeway range from 13 minutes in free-flow conditions to over 60 minutes during the most heavily congested times of day. These times are likely to increase and the peak period may spread to include more hours of the day in the future, affecting business and private commuter trip patterns. Existing congested conditions are illustrated in Figure 2-1.

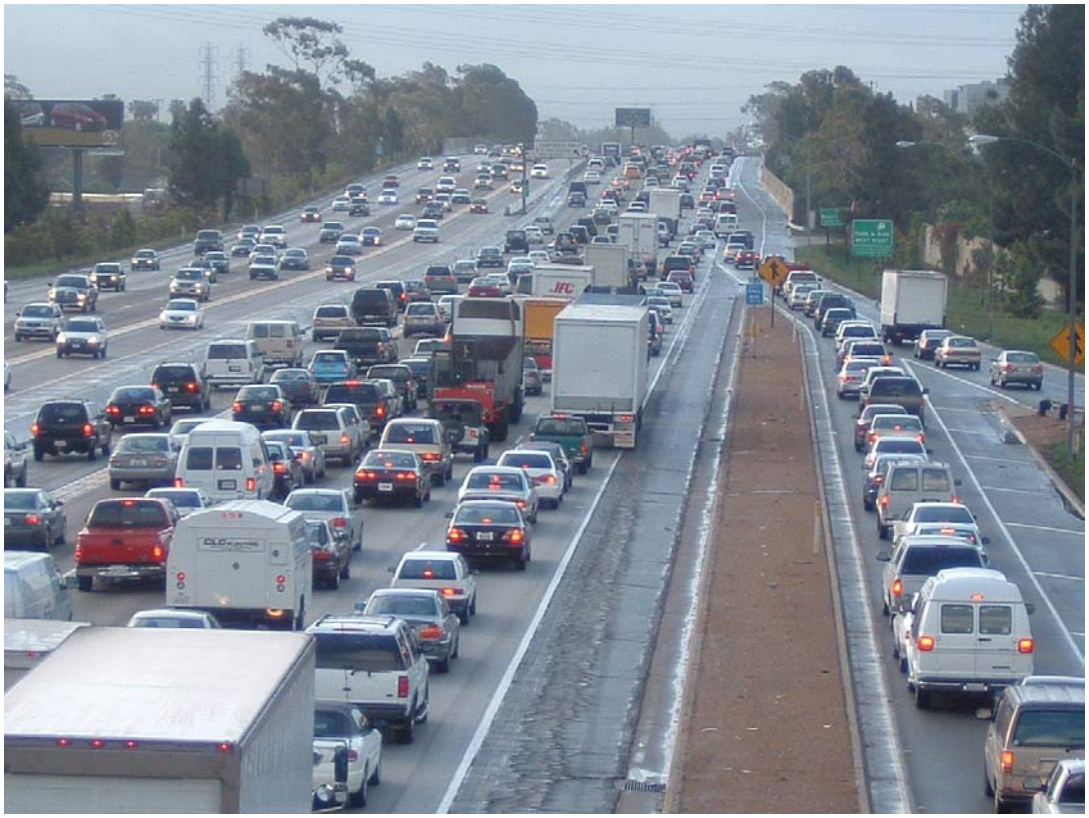


Figure 2-1. Existing Peak Period Congested Conditions on I-405

2. Diversion of traffic is taking place onto arterials because the freeway is too congested during peak periods. Approximately 15 to 30 percent of trips that could be using I-405 are instead using arterial routes, based on data derived from OCTAM, the Orange County Transportation Authority's travel demand forecasting model. The low end of the range is the number of trips with origin and destination pairs served by I-405 that do not use the freeway. The high end of the range is a model estimate of the additional traffic that would use I-405 if it operated at free-flow speeds instead of experiencing congestion. Because no arterial parallels the diagonal freeway, these diverted vehicles are traveling longer distances and causing higher levels of congestion on local streets.

3. Operational problems occur on the freeway, primarily because of physical bottlenecks. There are several locations where ramps merging onto the freeway and reductions in the number of general purpose lanes reduce the capacity of the freeway and cause traffic to be backed up during peak periods. Figure 2-2 shows the loss of the outside general purpose travel lane as I-405 northbound approaches the Brookhurst Street interchange.

Figure 2-2. Northbound I-405 Losing a Lane at Approach to Brookhurst Interchange

4. The corridor has a lack of public transportation options. Through a public outreach program, members of the public expressed interest in the study of public transit alternatives as part of the solution to the mobility problem along the corridor.

In addition to those four key points, other mobility, operations and safety, land use, travel choice, and implementation issues were identified and are summarized in Table 2-1. A more complete

Table 2-1
Summary of Project Purpose and Need

Issue	Problems and Needs	Study Objective
Freeway Mobility	▪ Average corridor travel time, on both mixed-flow and HOV lanes, can be nearly five times higher during the peak than free flow travel time, and is expected to significantly increase.	▪ Relieve current and future corridor congestion. ▪ Minimize corridor travel times.
	▪ Traffic demand along the I-405 corridor is already high with some sections carrying over 400,000 vehicles per day. ▪ Projected growth in daily vehicle trips from 2000 to 2025 is approximately 25%. I-405 will not have the capacity to accommodate the large number of trips that people want to make in this corridor. It is expected this will further degrade the freeway level of service and lengthen the peak period	▪ Increase I-405 facility capacity to meet future demand. ▪ Build in design flexibility within the freeway corridor for capacity improvements beyond 2025.
	▪ There are several physical bottlenecks along the freeway that reduce capacity and need to be addressed. Low speeds and frequent delays are results of this restricted capacity.	▪ Provide continuity of facilities and capacity (lane balance) within the study corridor. ▪ Relieve bottlenecks and provide better ingress/egress to the freeway and improved interaction between HOV and mixed use lanes.
Arterial Mobility	▪ It is estimated that 15% to 30% of traffic is being diverted from I-405 during peak hours due to congestion on the freeway. Due to the lack of local parallel facilities (the freeway is diagonal), this diversion creates more turning movements and congestion at key intersections.	▪ Provide better travel times on I-405 than using arterial alternatives, to limit diversion of traffic.
	▪ Some arterial interchanges are not complete, potentially overloading upstream and downstream ramps.	▪ Improve arterial interchange access/egress points and levels of service.
	▪ Due to design restrictions on I-405, some arterial crossings of I-405 create bottlenecks because they have fewer or narrower lanes than approaches.	▪ Identify I-405 improvements at crossings that make provisions for arterial improvements, focusing on bottleneck locations.
Safety and Operations	▪ Incidents and accidents throughout the study corridor further exacerbate the problems of safety and mobility. In the years 1999-2003 the total accident rate in most of the study corridor was less than the average total accident rate for similar California highways. But in some segments the average rate was exceeded. [1]	▪ Reduce the number of conflict points that induce incidents and accidents in the study corridor. ▪ Provide physical improvements and employ enhanced management techniques (TSM) to better control the impacts of incidents.

[1] Caltrans TASAS Data – Table B [Time Periods for Accident Data: 4 Years From 09/01/1999 to 08/31/2003]

Table 2-1 cont'd

Issue	Problems and Needs	Study Objective
	▪ Several sections of I-405 are not built to current Caltrans and FHWA design standards, in particular requirements for wider medians and shoulders.	▪ Where feasible, comply with Caltrans and FHWA design standards to enhance safety for users of the freeway and communities along the corridor.
Travel Choices	▪ Public transportation options along the I-405 are very limited, with the OCTA operating three express bus routes (to Los Angeles CBD and Central Orange County) 3-4 times per peak period. Most bus routes use either east-west or north-south arterials and provide limited service to LA County north of the study area, and there is no rail.	▪ Develop and enhance different modes of transportation in the corridor that would be competitive with the single-occupant vehicle.
	▪ Some corridor residents do not drive or own a car, and rely solely on public transit service. 3.9% of the households in the corridor do not own a car[2]. Many of these are concentrated in the north part of the study corridor.	▪ Provide transit service to accommodate the needs of transit dependent residents in the study area.
Land Use / Economic Development	▪ Population and employment along the corridor is projected to increase by 13 percent and 24 percent respectively by 2025[3]. These increases need to be accommodated by the transportation system. ▪ Maintaining access to jobs and attractions such as employment centers, shopping malls, and educational facilities is a critical element to economic growth and vitality of the corridor.	▪ Maintain and improve travel times for commuters within the study area. ▪ Provide/maintain access to existing and future developments. ▪ Coordinate alternatives with City land use plans.
	▪ In 2001, truck volumes on the I-405 in the study corridor ranged from 5.8% to 7.1% of average daily traffic[4]. There is a need to maintain and enhance goods movement in and through the corridor (including traffic to the ports, other counties, and Mexico) while minimizing impacts on local communities.	▪ Maintain and improve travel times / trip reliability. ▪ Reduce potential points of conflict between trucks and general purpose traffic.
Implementation	▪ Obtaining federal, state and local funds for any improvements will be contingent upon selecting a competitive and cost-effective project.	▪ Develop an implementation program that maximizes cost-effectiveness and the useful life of short-term and mid-term improvements.
	▪ Tradeoffs would have to be made between various alternatives that will have different effects on neighborhoods, public facilities, and quality of life along the corridor.	▪ Seek public consensus and include environmental considerations and influence on neighborhoods and public facilities, when developing and evaluating alternatives.

[2] 2000 Census data [includes all Census Tracts within a two-mile buffer of the I-405 freeway]
[3] 2002 OCP data [Tier 2 Study Area includes all TAZs within a two-mile buffer of the I-405 freeway]
[4] Caltrans (2001) Truck Traffic Counts [the low occurs in the vicinity of SR-22 and the high in the vicinity of SR-39.]

description of the mobility problem in the corridor is contained in the *Corridor Mobility Problem and Purpose and Need Statement*.

2.3 CONCEPTUAL ALTERNATIVES

The *I-405 Major Investment Study Conceptual Alternatives Report* documents the identification of thirteen conceptual alternatives developed to test how well different types of solutions can be expected to address the major transportation problems in the corridor identified in the *P&N Statement*. The first step in developing the conceptual alternatives was the identification of conceptual themes; the second step was identification of the improvement elements (or types of improvements) to be considered; and the third step was application of the themes and elements to the creation of cross sections containing the range of freeway improvement elements.

Three conceptual themes for improvements to the freeway corridor were identified:

1. **Minimal Right-of-Way Widening.** Conceptual Alternatives 1 through 4 required the least additional right-of-way. These alternatives added one lane in each direction along the I-405 corridor and generally stayed within the existing right-of-way.

2. **Horizontal Widening.** Conceptual Alternatives 5 through 9 added several freeway lanes and transit facilities by expanding the freeway outward. Some of these alternatives added more than one type of freeway lane to address the needs of multiple travel markets. A major impact of these alternatives was displacement of adjacent land uses.

3. **Vertical Expansion.** Conceptual Alternatives 10 through 13 increased freeway and transit capacity through construction of elevated viaducts. The expansion would be similar in capacity to the horizontal widening alternatives with potential visual and noise impacts from the elevated viaduct replacing the displacement of adjacent land uses.

Five basic elements were combined to create a variety of potential solutions to the mobility problems:

- general purpose lanes;
- high occupancy vehicle (HOV) lanes;
- auxiliary lanes;
- express lanes; and
- fixed guideway transit.

HOV lanes are commonly referred to as carpool lanes. Auxiliary lanes are lanes that extend an entrance ramp lane to the next downstream exit ramp, providing a continuous travel lane from entrance to exit and lengthening the distance over which merging maneuvers may be completed. Express lanes are similar to general purpose lanes but they are isolated in the median of the freeway and have infrequent entrance and exit ramps.

Potential transit improvements in the corridor included increases in local bus frequency, increases in express bus frequency, bus-rapid-transit (BRT) operating in the freeway HOV lanes, and a fixed guideway light rail transit system operating in the freeway median. Light rail (similar

to the San Diego Trolley and LA County's Blue, Green, and Gold lines) was considered for operation in the median of I-405 with stops every 1 to 2 miles. BRT was also considered for operation along the freeway HOV lanes with stops in the freeway median at arterial crossings where stations with elevators would permit riders to transfer to local buses operating along the arterials.

Thirteen conceptual alternatives were identified for the corridor based on the themes and elements described above. Detailed descriptions of the alternatives are provided in the *I-405 MIS Conceptual Alternatives Report*. Typical cross sections of the segment of each of the thirteen conceptual alternatives between Brookhurst Street and Valley View Street are shown in Figure 2-3.

2.4 INITIAL SCREENING

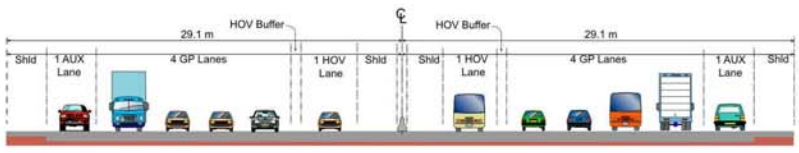
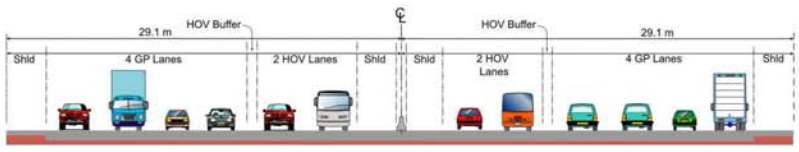
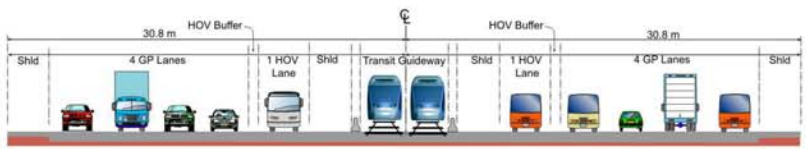
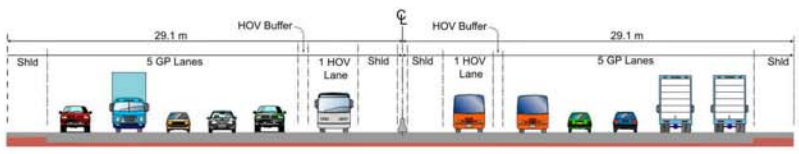
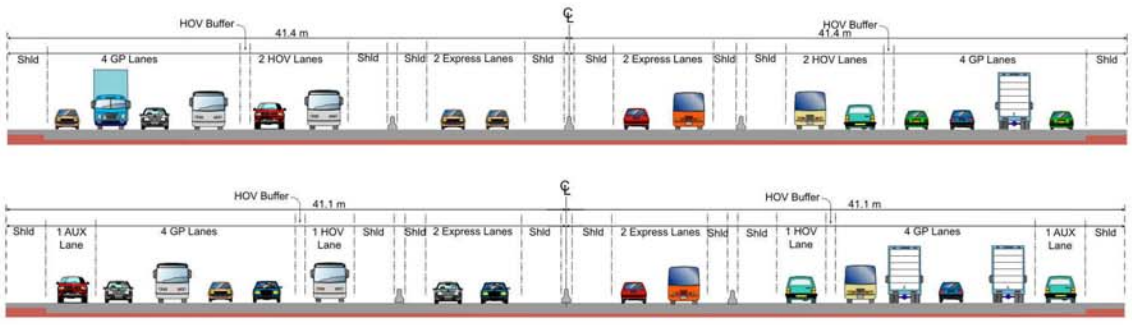
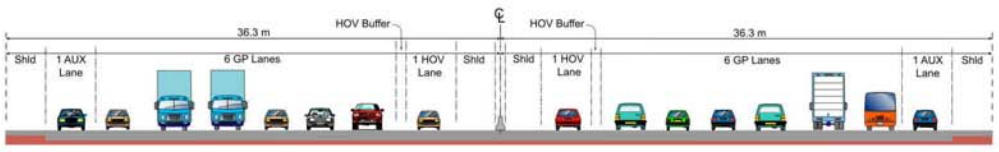
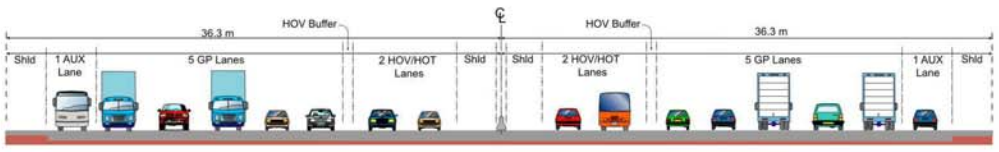
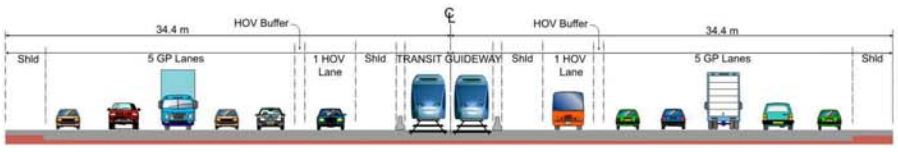
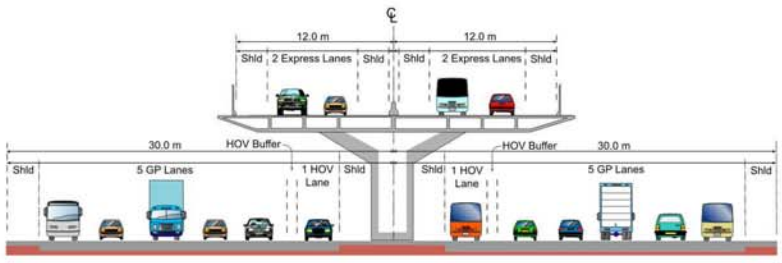
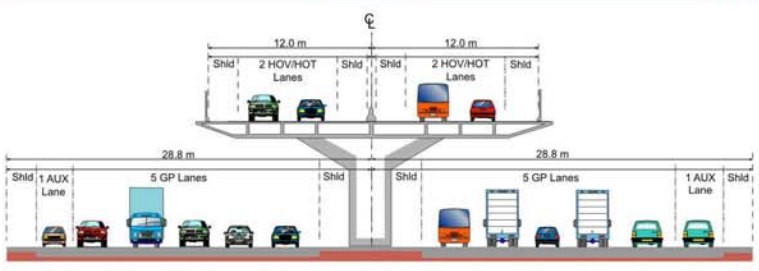
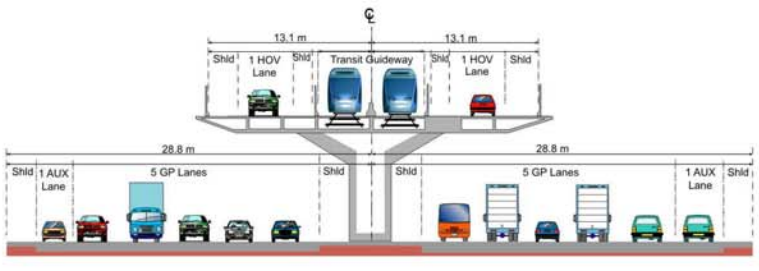
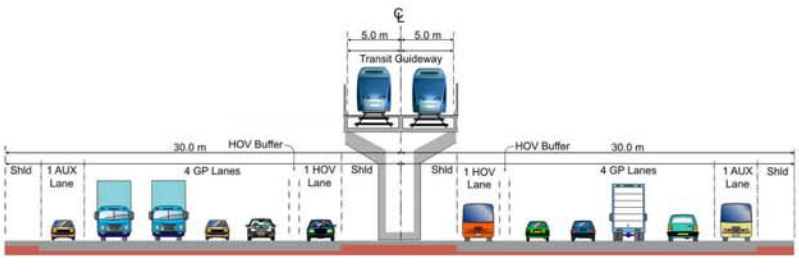
The thirteen conceptual alternatives were subjected to a screening process to identify the alternatives most responsive to the mobility probems and transportation needs described in the *P&N Statement*. A set of evaluation measures were developed. The measures are shown in the Table 2-2 below and are directly related to some of the objectives included in Table 2-1.

Table 2-2
Initial Screening Evaluation Measures

Issue	Measure
Freeway Mobility	Person (in vehicle) hours of delay in study area Percent change in peak period travel times on I-405 Volume-to-capacity ratios on I-405
Arterial Mobility	Reduction in arterial VMT
Travel Choices	Daily transit trips Daily HOV trips
Land Use / Economic Development	Value of time saved by commercial vehicles
Implementation	Total capital cost (of project) Cost effectiveness (cost per person hour of travel saved) Right-of-way impacted Visual impacts (from elevation)

As a result of the analysis and its review by the PTAC and other groups providing guidance, the following guidelines were used to assist in the selection of alternatives for Final Evaluation:

- Retain a Minimal Widening Alternative with a freeway capacity increase;
- Retain some major Horizontal Widening Alternatives;
- Retain the express lane concept and/or a High Occupancy Toll (HOT) option;
- Retain Bus Rapid Transit (BRT) in conjunction with HOV (or HOT) Lanes;

Alternative	Overall Right-of-Way Width in Feet	
1	198’	
2	198’	
3	209’	
4	198’	
5	277’	
6	277’	
7	245’	
8	245’	
9	233’	
10	204’	
11	196’	
12	196’	
13	204’	

LEGEND

Shld = Shoulder

GP = General Purpose Lane

HOV = Carpool (High Occupancy Vehicle)

HOT = Carpool or Single Occupant Toll

AUX = Auxiliary Lane between on-ramp to next downstream off-ramp

℄ = Centerline

* Right-of-Way width is outside shoulder to outside shoulder plus 3 feet each side.

Figure 2-3. Typical Cross Section between Brookhurst Street and Valley View Street of the Thirteen Conceptual Alternatives

- Eliminate LRT from further consideration in this study and address future guideway options on I-405 through regional planning efforts;

- Shift the centerline of I-405 to reduce right-of-way impacts;

- Reserve elevated options (based on Vertical Expansion Alternatives) for longer-term capacity enhancements unless right-of-way impacts are extraordinary.

These guidelines led to the identification by the PTAC of three conceptual alternatives to be carried forward into Final Screening: Alternatives 4, 6, and 8. To these alternatives were added the Baseline (No Build) Alternative and the Transportation Systems Management (TSM) Alternative. Those five alternatives were endorsed by the PTAC and the PWG for more detailed evaluation. Each alternative is fully described in the next section. A more complete description of the initial screening process is presented in the *Interstate 405 Major Investment Study Initial Screening Report*.

3 FINAL ALTERNATIVES

This section describes the final alternatives that are the subject of the analysis presented in the subsequent section. The final alternatives include the three build alternatives recommended from the initial screening (Alternatives 4, 6, and 8), the Baseline Alternative (which is the No Build Alternative), and the TSM Alternative. An additional final alternative (Alternative 8a) was identified by the PTAC during review of the alternatives analysis presented in the subsequent section. The components of each of these alternatives are enumerated below.

The PWG and the OCTA Board of Directors Subcommittee on the I-405 Major Investment Study meeting jointly requested exploration of modifications to Alternative 8 to reduce residential impacts. Alternative 8 Option b was developed in response to that request. Although it is not identical to Alternative 8, the modifications are limited in scope and location. Alternative 8 Option b is therefore not treated in this report as a full alternative, but as a set of potential options to Alternative 8. The effects of the inclusion of some or all of those options are noted in the text of the report.

3.1 BASELINE ALTERNATIVE

The Baseline Alternative (or No-Build Alternative) incorporates the funded and/or environmentally approved transportation improvements as of March 1, 2004. Highway improvements to the existing condition included in the Baseline are presented in Appendix 6.1.

Within the study area, these improvements include:

- Programmed headway and service improvements on the following OCTA transit

routes: 29 Beach Boulevard, 43 Harbor Boulevard, 47 Fairview, 62 Huntington Beach-Santa Ana, 64 Bolsa, and 70 Edinger-Irvine Center;

- Recently completed reconstruction of I-405 south of Euclid Street to SR-73 to provide additional travel lanes, auxiliary lanes, ramp braiding, and interchange improvements;
- Construction of a northbound ramp from Hyland Avenue;
- Addition of an auxiliary lane between Magnolia Avenue and Beach Boulevard; and
- Addition of a second HOV lane in each direction north of the interchange with SR-22 (near Valley View Street) to I-605 including direct carpool lane connectors between SR-22 and I-405 and between I-405 and I-605.

Cross sections of the various segments of I-405 under the baseline condition are provided in the figures below. Figure 3-1 is representative of the segment of I-405 between SR-73 and Euclid Street. This segment includes six general purpose lanes and one high occupant vehicle (HOV) lane in each direction. It also includes auxiliary lanes at some locations.

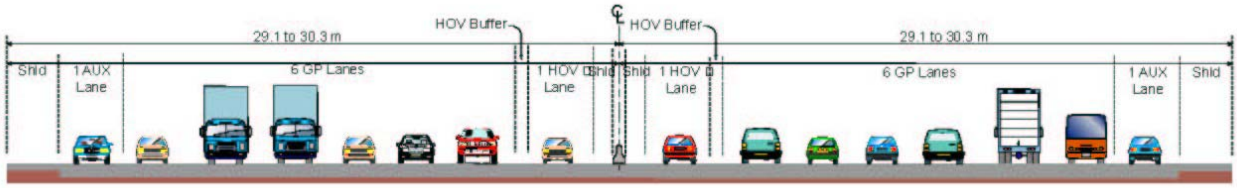


Figure 3-1. Baseline Cross Section between SR-73 and Euclid Street.

Figure 3-2 represents the baseline condition for the segment of I-405 between Euclid Street and Brookhurst Street. This segment includes five general purpose lanes, and one HOV lane in each direction with auxiliary lanes only as acceleration and deceleration lanes near interchange ramps.

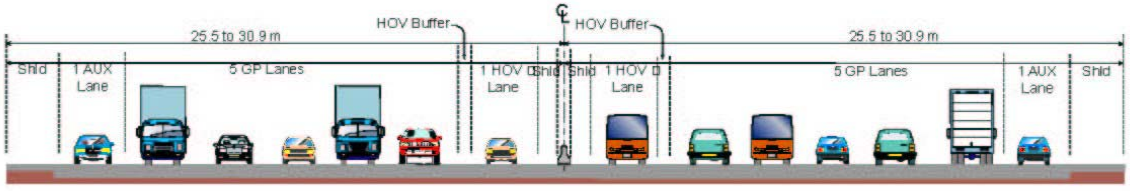


Figure 3-2. Baseline Cross Section between Euclid Street and Brookhurst Street.

Figure 3-3 illustrates the typical cross section of the freeway segment between Brookhurst Street and the interchange with SR-22 (near Valley View Street). This segment has four general

purpose lanes, one HOV lane in each direction, and an auxiliary lane in each direction between Magnolia Street and Beach Boulevard.

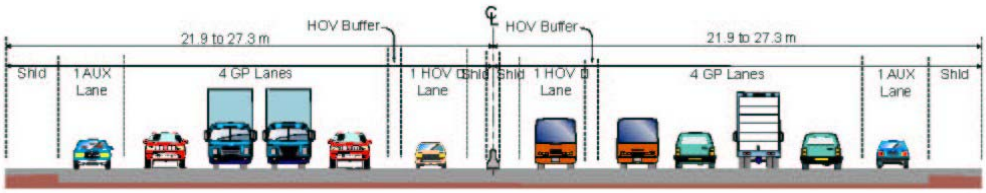


Figure 3-3. Baseline Cross Section between Brookhurst Street and SR-22 (near Valley View Street).

Figure 3-4 represents the typical cross section for the freeway between SR-22 (near Valley View Street) and I-605. This segment will have 6 general purpose lanes and 2 HOV lanes in each direction once the HOV interchange ramps are completed with SR-22 and I-605. This segment will also continue to have one auxiliary lane between 7th Street and Seal Beach Boulevard in the southbound direction.

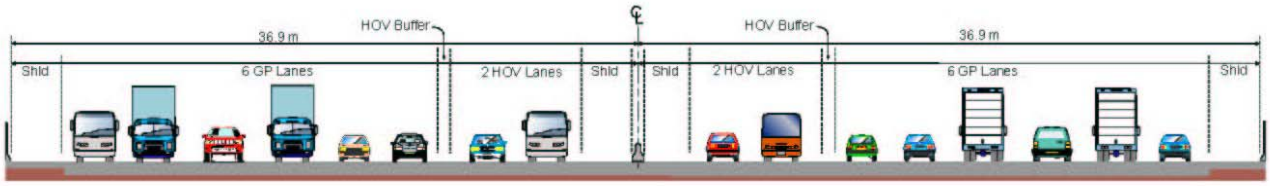


Figure 3-4. Baseline Cross Section between SR-22 (near Valley View Street) and I-605.

Figure 3-5 illustrates the Baseline Conditions on a corridor wide scale and shows how the segments relate to one another. The Baseline transit network is based on the following:

- The existing OCTA bus system based on the spring 2004 operations from the Bus Book;
- Addition of the CenterLine light rail system[1], with two branches (a line from Santa Ana Regional Transportation Center (SARTC) to John Wayne Airport (JWA) and another from SARTC to Santa Ana College (SAC)) having stations and travel times consistent with the latest (April 2004) set of assumptions;

[1] While the I-405 MIS was underway, the Orange County Transportation Authority discontinued advancing the Centerline light rail project. Since much of the study and analysis had already been completed assuming the completion of the Centerline, planning assumptions in the I-405 MIS were not changed in response to OCTA's action in order to maintain study consistency.

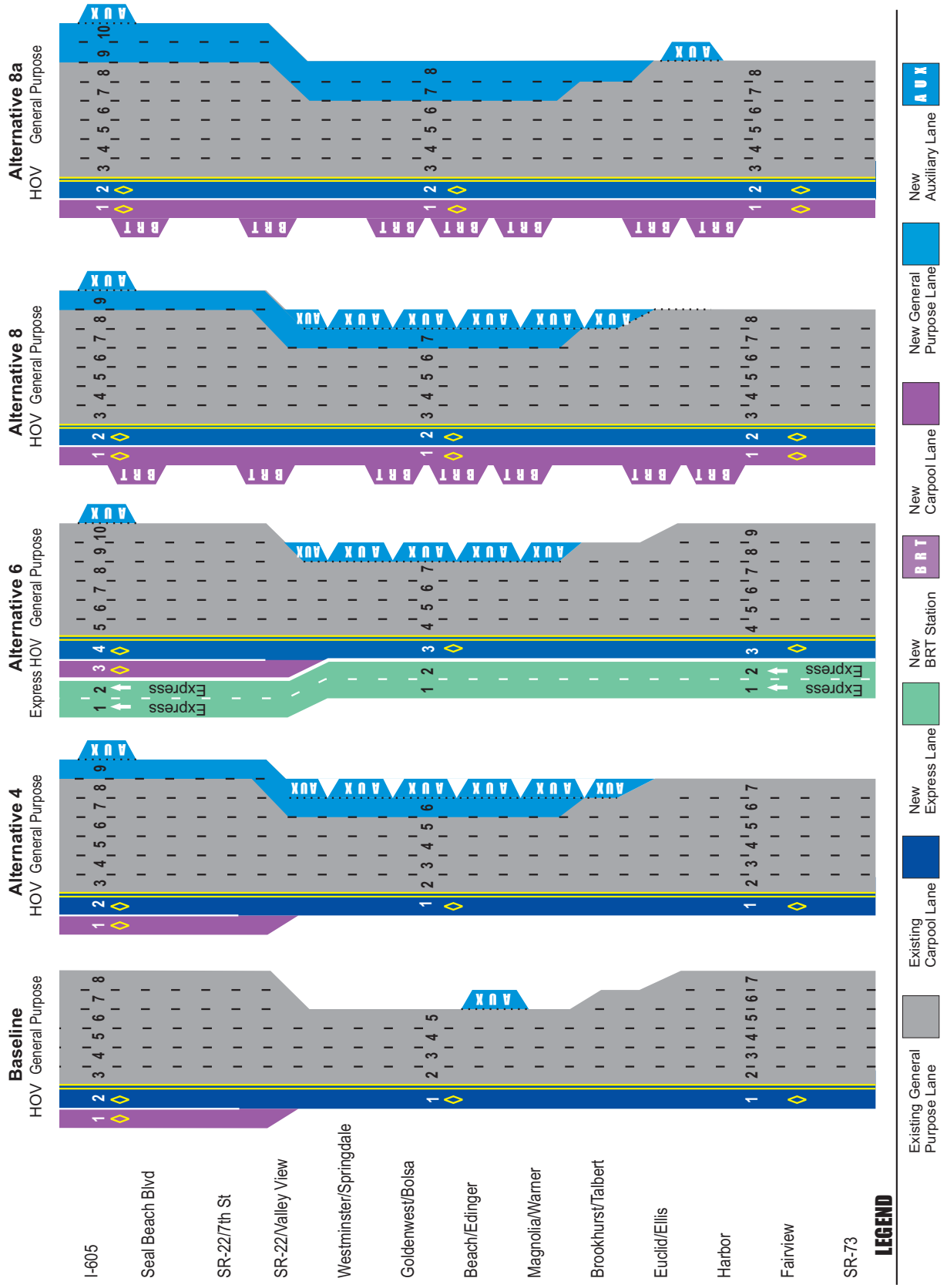


Figure 3-5. Summary Lane Schematic for Final Alternatives

- Restructuring of OCTA Route 57, which operates on Bristol and State College, to reduce some overlapping service with CenterLine and reallocate that service to the north and south consistent with the alignments and headways from the CenterLine modeling exercises; and

- Addition of a limited stop connection between JWA and the Irvine Transportation Center (ITC).

A number of transit headway changes are incorporated in the Baseline. These are summarized in a complete listing of the headway changes included in Appendix 6.2 Transit Headways.

3.2 TSM ALTERNATIVE

Transportation System Management (TSM) is the practice of improving the transportation system's capabilities by making changes in how the system is managed. Examples of such improvements include signal timing upgrades, freeway service patrols, variable message boards, ride match services for carpooling, road condition reports, pavement restriping, and other techniques. By its nature TSM does not include major increases in roadway or fixed guideway transit, such as new roadway lanes or additional rail track. However, it does include more minor physical improvements such as additional turning lanes at intersections, auxiliary lanes, and other similar lower cost improvements.

3.2.1 Highway TSM Elements

The TSM Alternative for the I-405 MIS includes a number of improvements to the highway and transit systems in the I-405 corridor. These highway improvements include auxiliary lanes on I-405 southbound from the Magnolia Street on-ramp to the Warner Avenue off-ramp, northbound from the Warner Avenue on-ramp to the Magnolia Street off-ramp on the collector-distributor (C-D) road serving those two interchanges, and northbound from the Brookhurst Street C-D road on-ramp to the Warner Avenue C-D road off-ramp.

A number of improvements to arterial roadways in close proximity to I-405 are included in the TSM Alternative. These include the following:

- Restriping of Edwards Avenue to provide two continuous travel lanes in each direction between Bolsa Avenue and Westminster Boulevard;
- Restriping of Golden West Street to provide three continuous lanes in each direction between Bolsa Avenue and Hazard Avenue;
- Restriping of Beach Boulevard from Edinger Avenue to the I-405 northbound entrance ramp to provide four lanes northbound; and
- Modifications to striping and median treatments on Magnolia Street between Warner Avenue and Heil Avenue to provide three lanes in each direction, except for the link containing the I-405 overcrossing.

Additionally, some major arterials are upgraded to the category of "superstreets" in areas close to the freeway. Such upgrading includes enhancements of signalization equipment, signal interconnection and coordination, vehicle volume and presence detection, video surveillance for incident and congestion management, motorist information, and other ITS improvements

designed to improve traffic flow on arterials in close proximity to freeway interchanges. The locations to be upgraded to superstreets are:

- Valley View Street and Bolsa Chica Road from Westminster Boulevard to Lampson Avenue;
- Westminster Boulevard from Bolsa Chica Road to Hoover Street;
- Bolsa Avenue from Springdale Street to Newland Street;
- Beach Boulevard from Warner Avenue to Hazard Avenue;
- Warner Avenue from Beach Boulevard to Euclid Street;
- Brookhurst Street from Garfield Avenue to Edinger Avenue;
- Euclid Street from Warner Avenue to the I-405 southbound ramps;
- Harbor Boulevard from West Segerstrom Avenue to Adams Avenue;
- Bristol Street from Red Hill Avenue to MacArthur Boulevard; and
- Red Hill Avenue from Bristol Avenue to Main Street.

The traffic management centers for all of the local jurisdictions along the freeway and Caltrans will be linked to permit data exchange and continuous traffic management. Such an integrated system would utilize the Southern California Association of Governments regional Intelligent Transportation System architecture. Additionally, signals controlling intersections of I-405 ramps and arterials will be integrated into arterial systems at the following intersections:

- I-405 SB at Springdale Street;
- I-405 SB at Bolsa Avenue;
- I-405 at Beach Boulevard;
- I-405 SB at Magnolia Street;
- I-405 at Brookhurst Street;
- I-405 at Euclid Street and Ellis Avenue; and
- I-405 at Harbor Boulevard.

Video detection and close circuit television equipment will be installed at the I-405 interchanges in the study area and 20 key arterial intersections. This equipment will be used to monitor and respond to traffic queues, through real time traffic signal timing adjustment, dissemination of information to motorists via variable message signs, and seamless contact with emergency services dispatching. Variable message signs (VMS) will be placed at 22 arterial locations in the corridor to inform motorists of current traffic conditions approaching, accessing, and on the freeway itself.

3.2.2 Transit TSM Elements

The transit elements of the TSM Alternative include changes in local bus headways, express and BRT services, and park-and-ride facilities. Those additions to the Baseline network are outlined below.

3.2.2.1 Local Bus Headways

Table 3-1 shows changes to headways for some local bus services in the I-405 corridor.

Table 3-1
TSM Alternative OCTA Local Bus Headway Improvements

Corridor	Route #	Headways (pk/mid)	Comments*
MacArthur	OCTA 76	20/40	Reduce headways
Euclid	OCTA 37	15/30	Reduce peak headway
Sunflower/Ellis	OCTA 172	30/30	Reduce headways
Warner Avenue	OCTA 72	15/30	Reduce peak headway
McFadden	OCTA 66	15/30	Reduce peak headway
Valley View	OCTA 21	30/45	Reduce peak headway

**Headways are the same as Baseline unless otherwise noted.*

3.2.2.2 Express Bus and Bus Rapid Transit (BRT)

A number of new and improved express bus services are included in the TSM Alternative. Appendix 6.3 provides the route by route paths and service parameters for the express bus improvements.

BRT services are included along four major arterials that cross the I-405 corridor. These services are the same as those included in the West Orange County Project Definition Study (WOCPDS). These routes operate along Edinger Avenue, Harbor Boulevard, Beach Boulevard, and Westminster Boulevard, with service into downtown Long Beach along 7th Street. Appendix 6.3 provides the route by route information for the BRT components of the TSM Alternative.

3.2.2.3 Park-and-Ride

Park-and-ride facilities are included in the TSM Alternative at I-405 intersections with:

- Harbor Boulevard;
- Euclid Street;
- Warner Avenue;
- Beach Boulevard;
- Bolsa Avenue;
- Valley View Street; and
- Seal Beach Boulevard.

Kiss-and-ride facilities are provided at the above locations for adjacent transit services.

3.3 ALTERNATIVE 4

Alternative 4 adds a single general purpose freeway lane in each direction to the I-405 segment from Brookhurst Street to Valley View Street which currently has only 4 such lanes. In order to avoid dropping a lane and creating a potential operational bottleneck, this lane is carried to the I-605 interchange on the north. Figure 3-5 shows the location and number of through lanes on the freeway for Alternative 4.

The interchange at Brookhurst Street is reconfigured from a nearly full cloverleaf to a partial cloverleaf. The C-D roads at this interchange are removed. A C-D road is added in the southbound direction serving the interchanges at Magnolia Street and Warner Avenue.

Auxiliary lanes will be provided between entrance ramps and downstream exit ramps at the following locations:

- in both directions between SR-22 (7th Street) and Seal Beach Boulevard (which already exists in the southbound direction);
- in the southbound direction from Valley View Street to Springdale Street;
- in the northbound direction from Westminster Boulevard to Valley View Street;
- in both directions between Westminster Boulevard and Goldenwest Street;
- in the southbound direction on the C-D road from Goldenwest Street to Bolsa Avenue;
- in both directions between Bolsa Avenue and Beach Boulevard;
- in both directions between Beach Boulevard and Magnolia Street linking the C-D roads at these locations and including an intervening entrance southbound from Edinger Avenue;
- in both directions on the respective C-D roads between Magnolia Street and Warner Avenue;
- in the northbound direction from Brookhurst Street to Warner Avenue;
- in the southbound direction from Talbert Avenue to Euclid Street;
- in the northbound direction from Euclid Street to Brookhurst Street;
- in the southbound direction from Euclid Street to Harbor Boulevard; and
- in the southbound direction from the northbound Harbor Boulevard on-ramp to the Fairview Street exit.

A layout plan of Alternative 4 was prepared on an aerial photo of the study corridor. The layout shows the existing right-of-way line, the right-of-way line needed to accommodate the alternative, and other features on the freeway itself. The layout is included electronically in this report in Appendix 6.6. Nearly all of the bridges carrying arterials over I-405 in the section to be improved will require demolition and new construction, since their spans are not capable of providing additional lanes underneath. Bridges carrying I-405 over arterials and other features can be widened in some cases but will require demolition and new construction in others.

A principal objective of this alternative is to minimize acquisition of right-of-way and the dislocation of residential, commercial, and public uses. However, some property acquisition will be required for this alternative as described in Section 4.7.1. Generally, Alternative 4 maintains the existing centerline of the freeway. In the area north of the SR-22 (7th Street) ramps to the I-605 ramp over crossings, the centerline is shifted to the west in order to remove impacts to residential properties in Rossmoor.

Alternative 4 includes the changes in local bus headways shown in Table 3-2.

Table 3-2
OCTA Local Bus Headway Improvements
Included in Alternatives 4, 6, and 8a

Arterial/Corridor	Transit Connections	Headways (pk/mid)	Comments*
Euclid/Ellis	OCTA 37	15/30	Reduce peak headway
	OCTA 74	45/45	No change
	OCTA 172	30/30	Reduce headways
Warner Avenue	OCTA 72	15/30	Reduce peak headway
Valley View	OCTA 21	30/45	Reduce peak headway
	OCTA 56	30/30	No change

**Headways are the same as for the Baseline unless otherwise noted.*

3.4 ALTERNATIVE 6

Alternative 6 adds two express lanes in each direction in the median of the freeway. Express lanes are general purpose lanes with limited entrances and exits. Figure 3-5 shows the location and number of through lanes on the freeway for Alternative 6. Two options for intermediate access were considered. Under one option there is no access between SR-73 and I-605. Under the other option there are direct access ramps providing for movements in each direction between Beach Boulevard and the express lanes. There would be no access between the general purpose and express lanes of the freeway between SR-73 and I-605. There is the potential for the express lanes to be operated as managed lanes with variable tolls whose value is adjusted to maintain a high speed traffic flow in the lanes.

The express lanes will be in the center of the freeway separated from the HOV lane and general purpose lanes on the outside. At the southern end of the study area, direct ramp connections will be provided to and from SR-73. On I-405 south of SR-73 where the express lanes terminate there will be a weaving area for HOV and express lane traffic to move to the appropriate lanes. At the northern end the HOV lanes and express lanes are combined and operate as a mixed flow facility south of I-605 for a sufficient distance to allow HOV and express traffic to use mixed flow flyover bridges connecting I-605 to I-405 to and from the south.

In addition to the two express lanes, the interchange at Brookhurst Street is reconfigured from a nearly full cloverleaf to a partial cloverleaf. The C-D roads at this interchange are removed. A C-D road is added in the southbound direction serving the interchanges at Magnolia Street and Warner Avenue. The interchange at Beach Boulevard is reconfigured to provide direct access ramps to the express lanes as well as to remove the weaving movements characteristic of the existing variation of a cloverleaf interchange.

Auxiliary lanes will be provided in nearly all locations along the corridor where they do not currently exist. These locations are:

- in both directions between SR-22 (7th Street) and Seal Beach Boulevard (which already exists in the southbound direction);
- in the southbound direction from Valley View Street to Springdale Street;
- in the northbound direction from Westminster Boulevard to Valley View Street;

- in both directions between Westminster Boulevard and Goldenwest Street;
- in the southbound direction on the C-D road from Goldenwest Street to Bolsa Avenue;
- in both directions between Bolsa Avenue and Beach Boulevard, with the northbound lane starting at the northbound Beach Boulevard on-ramp and including the intervening entrance from Beach Boulevard southbound;
- in both directions between Beach Boulevard and Magnolia Street linking the C-D roads at these locations and including an intervening entrance southbound from Edinger Avenue;
- in both directions on the respective C-D roads between Magnolia Street and Warner Avenue;
- in both directions between Brookhurst Street and Warner Avenue, with the northbound lane starting at the northbound Brookhurst Street on-ramp and including the intervening entrance from Brookhurst Street southbound;
- in the southbound direction from Talbert Avenue to Euclid Street; and
- in the southbound direction from the northbound Harbor Boulevard on-ramp to the Fairview Street exit.

A layout plan of Alternative 6 was prepared on an aerial photo of the study corridor. The layout shows the existing right-of-way line, the right-of-way line needed to accommodate the alternative, and other features on the freeway itself. The layout is included electronically in this report as Appendix 6.6. Nearly all of the bridges carrying arterials over I-405 in the section to be improved will require demolition and new construction, since their spans are not capable of providing additional lanes underneath. Bridges carrying I-405 over arterials and other features can be widened in some cases but will require demolition and new construction in others.

Alternative 6 relocates the centerline of the freeway in order to minimize residential property acquisitions along the corridor. The shift of the centerline is not a constant offset from the existing centerline, but adjusted along the length of the study area to reduce impacts. In some locations the centerline is fully shifted to one side such that all additional right-of-way needed for the alternative would be taken on one side, while at other locations it may be fully shifted to the other side, only partially shifted, or not shifted at all. The centerline of Alternative 6 is shifted from its current position over most of the study area and crosses the existing centerline numerous times within the study corridor.

Alternative 6 includes the changes in transit headways shown in Table 3-2. It also includes express bus services, but with routes using the HOV and/or express lanes of this alternative to gain time advantages. (See Figure 3-6 and Table 3-3.)

3.5 ALTERNATIVE 8

Alternative 8 adds a single general purpose freeway lane in each direction to the section from Brookhurst Street to Valley View Street which currently has only 4 such lanes. In order to avoid dropping a lane and creating a potential operational bottleneck, this lane is carried to the I-605 interchange on the north. Figure 3-5 shows the location and number of through lanes on the freeway for Alternative 8.

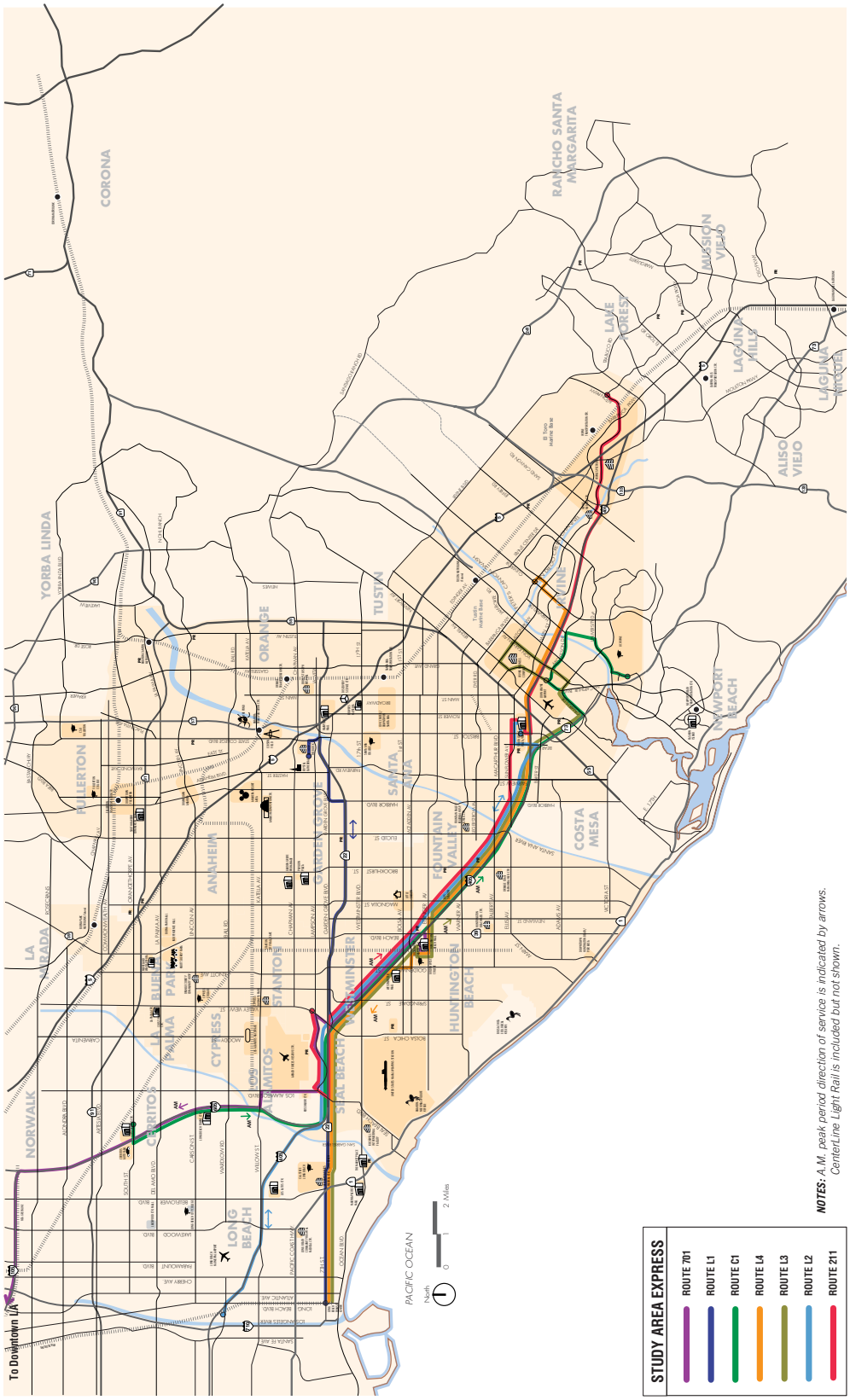


Figure 3-6. Transit Modifications in Alternatives 6 and 8a

Table 3-3
Express Bus Services Changed from Baseline in Alternatives 6 and 8a

#	Route	To/ From	Routing	AM Peak Headway	Intermodal Transfers	Other Stops	Notes
I-405 Corridor							
211	Seal Beach to Irvine Spectrum (TP 16011)	West End Park-n-Ride(Seal Beach) - Jeronimo/Alton	Lampson, Valley View, I-405 HOV , McFadden, GWTC, Center, I-405 HOV, Harbor, Sunflower, Ave. of the Arts, Anton, I-405 HOV, San Canyon, Irvine Spectrum	30	CenterLine at South Coast Metro; Metrolink at ITC	Golden West Transportation Center, South Coast Metro	Existing route AM bound to Irvine – Baseline headway
L2	South Coast Metro to Long Beach	Anton/Ave of the Arts - Wardlow Blue Line	Anton, Ave of the Arts, Sunflower, Bear, SR-73, I-405 Express Lanes, I-405 to Wardlow	20	CenterLine at SCM, Wardlow Blue Line	Sunflower/Bristol South Coast/Bear	NEW Bidirectional Service
L3	Long Beach to Irvine BC	LBTC to Irvine Business Complex (JWA)	7th Street, SR-22, I-405 HOV Lanes, Beach, GWTC, Edinger, Newland, I-405 Express Lanes to SR-73, Campus Drive, Von Karman, Alton, Red Hill, MacArthur, JWA	30	CenterLine at Main/ MacArthur and JWA Blue Line in Long Beach	CSULB, Golden West Trans. Center, In IBC at cross streets	NEW Southbound AM (and northbound PM) route
L4	Irvine to Long Beach	Culver/Barranca to Long Beach TC	Culver, I-405 HOV lanes, I-405 Express Lanes, Newland, Edinger, GWTC, McFadden, Golden West, 7th Street, , I-405 HOV Lanes, SR-22, 7th Street	30	Blue Line in Long Beach	Golden West Transportation Center; CSU Long Beach	NEW Northbound AM (and southbound PM) route
C1	Cerritos to IBC and UCI	Cerritos Center to UCI Research Park (California Drive)	Gridley, South, I-605, I-405 Express Lanes to SR-73, Campus Drive, MacArthur, Michelson, Harvard, University, California Drive	30	CenterLine at JWA (MacArthur at Michelson)	In IBC and at UCI at cross streets	NEW Southbound AM (and northbound PM) route
SR-22/I-405 Corridor							
L1	Long Beach to Orange	LBTC - The City Drive Area	7th, SR-22/I-405, Harbor, Garden Grove, SR-22, City Dr, City Blvd, City Parkway	30	LBTC/ Blue Line	CSULB City Parkway/ Lewis	NEW Bidirectional Service
Services to Los Angeles using I-405 (in part)							
701	Huntington Beach to Los Angeles	Golden West Transportation Center – LA CBD	Edinger, Beach, I-405 HOV lanes, Valleyview, Lampson, Los Al, Katella, I-605, I-105, I-110, downtown LA streets	30	Union Station (Metrolink, MTA)	West End Park and Ride (Seal Beach)	Existing northbound AM - Baseline headway

The interchange at Brookhurst Street is reconfigured from a nearly full cloverleaf to a partial cloverleaf. The C-D roads at this interchange are removed. A C-D road is added in the southbound direction serving the interchanges at Magnolia Street and Warner Avenue. The interchange at Beach Boulevard is reconfigured to remove the weaving movements characteristic of the existing variation of a cloverleaf interchange.

Auxiliary lanes will be provided in nearly all locations along the corridor where they do not currently exist. These locations are:

- in both directions between SR-22 (7th Street) and Seal Beach Boulevard (which already exists in the southbound direction);
- in the southbound direction from Valley View Street to Springdale Street;
- in the northbound direction from Westminster Boulevard to Valley View Street;
- in both directions between Westminster Boulevard and Goldenwest Street;
- in the southbound direction on the C-D road from Goldenwest Street to Bolsa Avenue;
- in both directions between Bolsa Avenue and Beach Boulevard, with the northbound lane starting at the northbound Beach Boulevard on-ramp and including the intervening entrance from Beach Boulevard southbound;
- in both directions between Beach Boulevard and Magnolia Street linking the C-D roads at these locations and including an intervening entrance southbound from Edinger Avenue;
- in both directions on the respective C-D roads between Magnolia Street and Warner Avenue;
- in both directions between Brookhurst Street and Warner Avenue, with the northbound lane starting at the northbound Brookhurst Street on-ramp and including the intervening entrance from Brookhurst Street southbound;
- in both directions between Brookhurst Street and Euclid Street;
- in the southbound direction from Euclid Street to Harbor Boulevard; and
- in the southbound direction from the northbound Harbor Boulevard on-ramp to the Fairview Street exit.

Alternative 8 provides two HOV lanes in each direction from I-605 to SR-73. The Baseline includes two HOV lanes west of SR-22 near Valley View Street to I-605 as part of the environmentally approved SR-22 HOV project. The second HOV lanes in this section are assumed to be completed. Alternative 8 adds a second HOV lane in each direction from SR-22 near Valley View Street south to SR-55.

If excess capacity is provided in the HOV lanes there is the potential to provide high occupancy toll (HOT) lanes. HOT lanes permit single occupant vehicles to utilize HOV lanes with the payment of a toll. Carpools continue to use the lanes free. The toll for single occupant vehicles is adjusted to control the volume of traffic in the HOT lanes so that a free flow of traffic is maintained.

Bus-rapid-transit (BRT) along the HOV lanes is included with station stops located in the median of the freeway. The proposed BRT route operates between John Wayne Airport and downtown

Long Beach and is shown in Figure 3-7. The route of the BRT service west of Seal Beach Boulevard to the California State University at Long Beach follows I-405 to Bellflower Boulevard, which it follows to 7th Street to downtown Long Beach. This deviation from the more direct route along SR-22 is a result of the location of stations in the median of the freeway. There is insufficient distance between the Seal Beach Boulevard station and the SR-22 (7th Street) ramps to accommodate a route leaving I-405 at that location. The portion of the BRT route along arterial streets will operate in mixed traffic. Signal priority along those routes is included as part of the alternative.

BRT is a "premium" transit service generally appropriate for routes on which regular urban bus service is insufficient but light rail service unwarranted. BRT service is typically frequent with headways for Alternative 8 assumed to be 8 minutes during peak periods and 15 minutes at other times.

The portion of the BRT in the study area is operated along the HOV lanes with stations in the median of I-405 similar to those shown in Figure 3-8. Stations are separated from the HOV lanes by a physical barrier with bus access to the stations from the HOV lanes provided by acceleration and deceleration lanes. A station layout is shown in Figure 3-9. Bus-rapid-transit stations in the study corridor are located at arterial crossings of:

- Harbor Boulevard;
- Euclid Street;
- Warner Avenue;
- Beach Boulevard and Edinger Avenue;
- Goldenwest Street;
- Valley View Street; and
- Seal Beach Boulevard.

Parking facilities are provided at each of these stations. The size of the parking facilities was determined after forecasting demand for the service. It was assumed that one-third of riders would drive to the station. The other two-thirds of riders would arrive by some other means including: passengers in autos being parked at the station, auto passengers being dropped off at the station (kiss-and-ride), passengers in other transit vehicles, walking, and riding a bicycle. The location of the parking facilities at each station was not determined. A total of 3800 parking spaces was assumed to serve the forecast ridership.

Arterials are widened at I-405 crossings with BRT stations to provide a transfer point to buses operating along the arterial system. The supporting local transit system is also modified to provide improved transit access to BRT stations along I-405. Table 3-4 shows the affected transit lines in Orange County. Changes to Long Beach Transit routes passing near stations along 7th Street are expected but no specific changes are included in Alternative 8.

A layout plan of Alternative 8 was prepared on an aerial photo of the study corridor. The layout shows the existing right-of-way line, the right-of-way line needed to accommodate the alternative, and other features on the freeway itself. The layout is included electronically in this report in Appendix 6.6. The layout plan also shows the BRT station locations and includes the right-of-way width necessary to accommodate the stations.

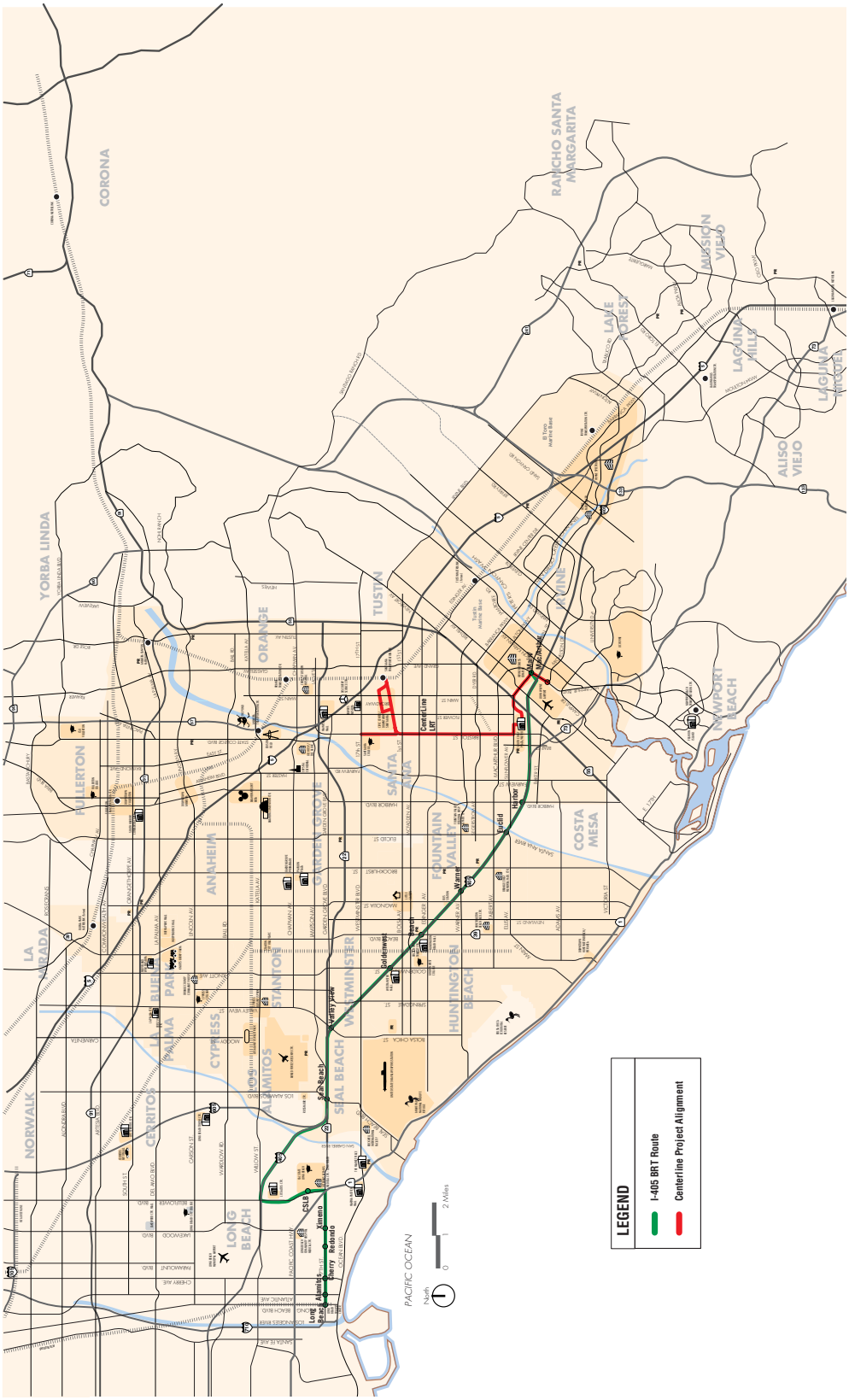


Figure 3-7. I-405 Bus Rapid Transit for Alternative 8

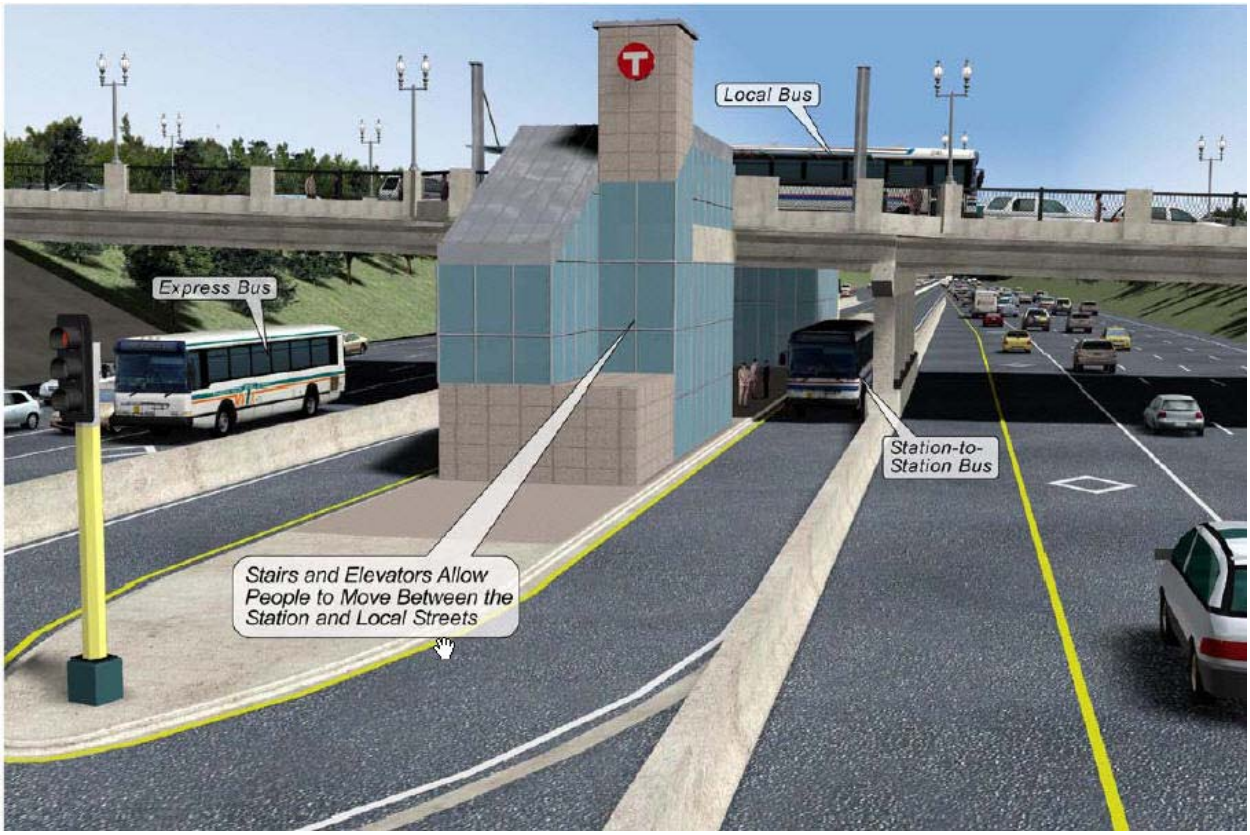


Figure 3-8. BRT Station in Freeway Median with Access to Arterial Buses
(Rendering from I-35W Study in Minneapolis, MN)

Nearly all of the bridges carrying arterials over I-405 in the section to be improved will require demolition and new construction, since their spans are not capable of providing additional lanes underneath. Bridges carrying I-405 over arterials and other features can be widened in some cases but will require demolition and new construction in others.

Alternative 8 relocates the centerline of the freeway in order to minimize residential property acquisitions along the corridor. The shift of the centerline is not a constant offset from the existing centerline, but adjusted along the length of the study area to minimize impacts. In some locations the centerline is fully shifted to one side such that all additional right-of-way needed for the freeway would be taken on one side, while at other locations it may be fully shifted to the other side, only partially shifted, or not shifted at all. The centerline of Alternative 8 is shifted from its current position over most of the study area and crosses the existing centerline numerous times within the study corridor.

In response to comments received from the PWG and OCTA Board of Directors Subcomittee on the I-405 Major Investment Study modifications were made to Alternative 8 in attempt to reduce its impacts on residential properties in the City of Westminster. Alternative 8 Option b (Alternative 8b) identifies two potential modifications to Alternative 8. The first modification shifts the centerline slightly to the north as compared to Alternative 8 in the section between

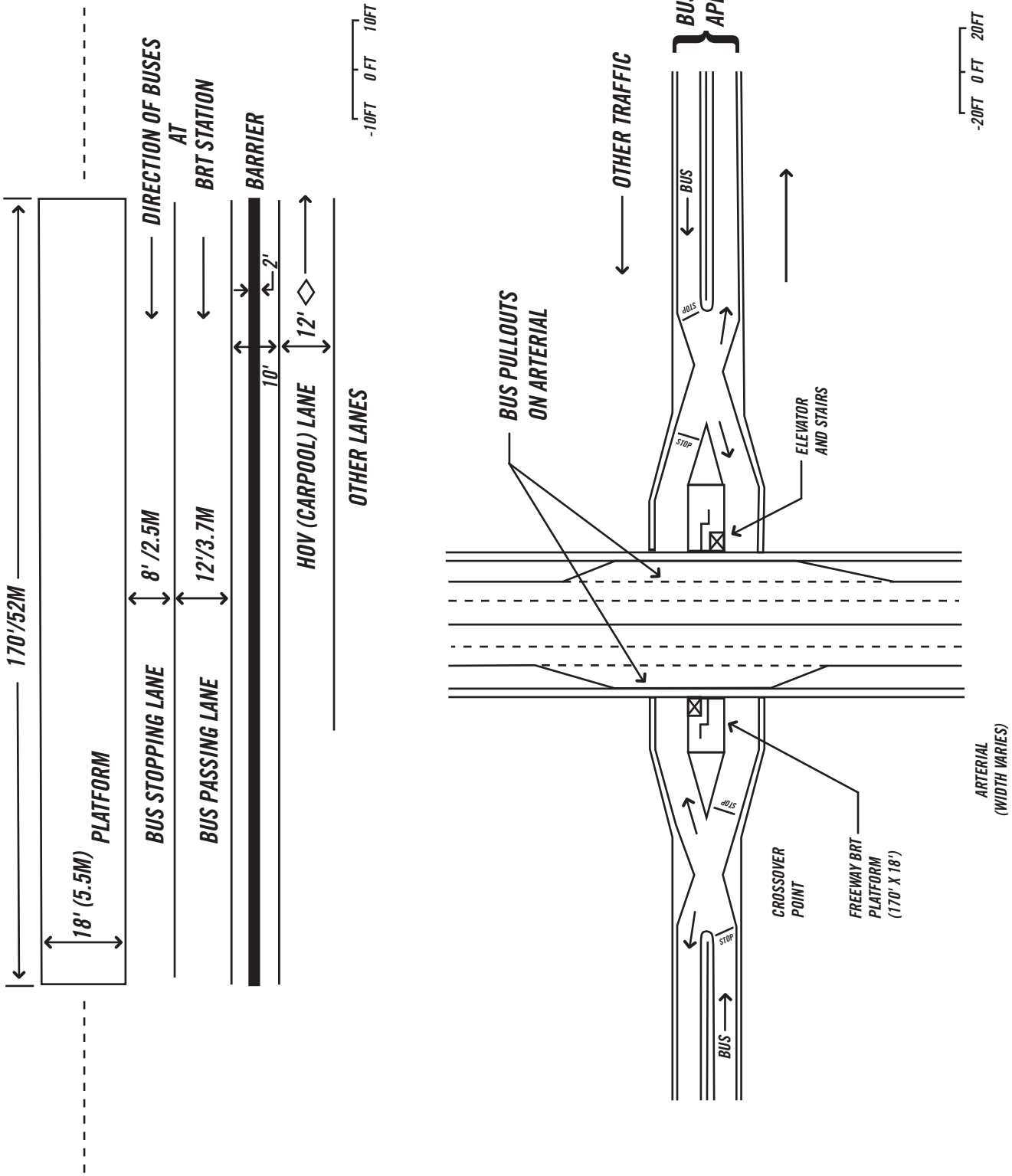


Figure 3-9. Potential Bus-Rapid-Transit Station Layout

Table 3-4
OCTA Bus Connections to BRT in Alternative 8

Station	Transit Connections	Baseline Headways (peak/midday)	Alt. 8 Headways (peak/midday)	Comments*
Main/MacArthur	Centerline	8/15	8/15	
	OCTA 53	24/30	24/30	
	OCTA 76	30/60	23/45	Reduce headways
Bristol	OCTA 55	15/20	15/15	Reduce off-peak headway
	OCTA 57	7.5/12 (multiple branches)	7.5/12 (multiple branches)	
Harbor	OCTA 43	7.5/10 (multiple branches)	7.5/10 (multiple branches)	
Euclid/Ellis	OCTA 37	20/30	15/30	Reduce peak headway
	OCTA 74	45/45	45/45	
	OCTA 172	60/60	30/30	Reduce headways
Warner Avenue	OCTA 72	20/30	15/30	Reduce peak headway
Beach/Edinger	OCTA 29	10/15 (branches)	10/15 (branches)	
	OCTA 70	12/15 (branches)	12/15 (branches)	
Goldenwest & Bolsa	OCTA 25	30/30	30/30	
	OCTA 62	15/20	15/20	
	OCTA 64	7.5/15 (branches)	7.5/15 (branches)	
Valleyview	OCTA 21	45/45	30/45	Reduce peak headway
	OCTA 56	30/30	30/30	
Seal Beach	OCTA 42	30/40 (served by one of two branches)	15/20	Eliminate short turn (line 41) and increase service to entire route (line 42)

**Headways are the same as Baseline unless otherwise noted.*

Magnolia Street and Newland Street. The second modification removes the auxiliary lane and reduces the HOV buffer to 1 foot in the section between Springdale Street and Valley View Street. These modifications were developed to reduce the potential impacts to residences in the City of Westminster.

3.6 ALTERNATIVE 8A

Alternative 8a adds two general purpose freeway lanes in each direction to the section of the freeway in the study area which currently has only 4 such lanes. In order to avoid dropping a lane and creating a potential operational bottleneck, one lane starts at the Euclid Street interchange and is carried to the I-605 interchange on the north, while the other starts at the Brookhurst Street interchange and is also carried to SR-22 (7th Street). Figure 3-5 shows the location and number of through lanes on the freeway for Alternative 8a.

The interchange at Brookhurst Street is reconfigured from a nearly full cloverleaf to a partial cloverleaf. The C-D roads at this interchange are removed. A C-D road is added in the southbound direction serving the interchanges at Magnolia Street and Warner Avenue. The interchange at Beach Boulevard is reconfigured to remove the weaving movements characteristic of the existing variation of a cloverleaf interchange.

Auxiliary lanes will be provided in nearly all locations along the corridor where they do not currently exist. These locations are:

- in both directions between SR-22 (7th Street) and Seal Beach Boulevard (which already exists in the southbound direction);
- in the southbound direction from Valley View Street to Springdale Street;
- in the northbound direction from Westminster Boulevard to Valley View Street;
- in both directions between Westminster Boulevard and Goldenwest Street;
- in the southbound direction on the C-D road from Goldenwest Street to Bolsa Avenue;
- in both directions between Bolsa Avenue and Beach Boulevard;
- in both directions between Beach Boulevard and Magnolia Street linking the C-D roads at these locations and including an intervening entrance southbound from Edinger Avenue;
- in both directions on the respective C-D roads between Magnolia Street and Warner Avenue;
- in both directions between Brookhurst Street and Warner Avenue, with the northbound lane starting at the northbound Brookhurst Street on-ramp and including the intervening entrance from Brookhurst Street southbound;
- in both directions between Brookhurst Street and Euclid Street;
- in the southbound direction from Euclid Street to Harbor Boulevard;
- in the northbound direction from Hyland Street to Euclid Street; and
- in the southbound direction from the northbound Harbor Boulevard on-ramp to the Fairview Street exit.

Alternative 8a provides two HOV lanes in each direction from I-605 to SR-73. The Baseline includes two HOV lanes west of SR-22 near Valley View Street to I-605 as part of the environmentally approved SR-22 HOV project. The second HOV lanes in this section are assumed to be completed. Alternative 8a adds a second HOV lane in each direction from SR-22 near Valley View Street south to SR-55.

If excess capacity is provided in the HOV lanes there is the potential to provide high occupancy toll (HOT) lanes. HOT lanes permit single occupant vehicles to utilize HOV lanes with the payment of a toll. Carpools continue to use the lanes free. The toll for single occupant vehicles is adjusted to control the volume of traffic in the HOT lanes so that a free flow of traffic is maintained.

Alternative 8a includes the changes in transit headways shown in Table 3-2. It includes express bus services on routes 701, L3, L4, and 211 shown on Figure 3-6 and Table 3-3. Alternative 8a also includes arterial bus-rapid-transit services along Edinger Avenue, Beach Boulevard, and Harbor Boulevard following the routes of the existing Routes 70, 29, and 43, respectively.

A layout plan of Alternative 8a was prepared on an aerial photo of the study corridor. The layout shows the existing right-of-way line, the right-of-way line needed to accommodate the alternative, and other features on the freeway itself. The layout of Alternative 8a is essentially the same as Alternative 6 north of the Santa Ana River and Alternative 8 south of the river.

Those layouts were used for Alternative 8a and are appropriately labeled for both alternatives. The layouts are included electronically in this report in Appendix 6.6.

Nearly all of the bridges carrying arterials over I-405 in the section to be improved will require demolition and new construction, since their spans are not capable of providing additional lanes underneath. Bridges carrying I-405 over arterials and other features can be widened in some cases but will require demolition and new construction in others.

Alternative 8a relocates the centerline of the freeway in order to minimize residential property acquisitions along the corridor. The shift of the centerline is not a constant offset from the existing centerline, but adjusted along the length of the study area to minimize impacts. In some locations the centerline is fully shifted to one side such that all additional right-of-way needed for the freeway would be taken on one side, while at other locations it may be fully shifted to the other side, only partially shifted, or not shifted at all. The centerline of Alternative 8a is shifted from its current position over most of the study area and crosses the existing centerline numerous times within the study corridor.

4 COMPARISON OF ALTERNATIVES

A comparative evaluation of the alternatives was performed utilizing criteria identified in the *P&N Statement*. The criteria relate to the most significant issues in the I-405 MIS study area as described in the *P&N Statement*. These issues include:

- freeway mobility;
- arterial mobility;
- safety and operations;
- travel choices;
- land use and economic development; and
- implementation.

The comparative evaluation focuses on a variety of benefits and potential impacts of the alternatives. The evaluation provides a broad comparison of the alternatives in order to inform a decision to select one of them as the locally preferred strategy (LPS) to address the issues in the study corridor. The evaluation process involved the identification of a set of measures associated with the issues listed above. The measures are fully described in the *Evaluation Criteria Technical Memorandum Update* (November 2004) and summarized in Table 4-1. The application of the measures to each alternative was used to develop data for the alternatives. Data development involved review of travel demand forecasting model output data from the Orange County Transportation Analysis Model (OCTAM). It also involved the development and review of information on costs, benefits, and impacts.

Table 4-1
Measures Used to Evaluate the Final Alternatives

Issue	Measure
Freeway Mobility	Person (in vehicle) hours of delay in study area Percent change in peak period travel times on I-405 Volume-to-capacity ratios on I-405 Flexibility to increase capacity and manage demand Number of breaks in lane continuity (bottlenecks) Completeness of auxiliary lanes
Arterial Mobility	Reduction in arterial vehicle miles (VMT) and hours (VHT) of travel Number of signalized intersections operating at LOS E or F Total delay at signalized arterial/freeway-ramp intersections Volume-to-capacity ratios of arterial mid-block sections Volume-to-capacity ratios of freeway crossings not at interchanges
Operations	Number of freeway entrances and exits ramps requiring more than one lane
Travel Choices	Daily transit trips HOV lane travel time improvements Transit service to transit-dependent areas
Land Use / Economic Development	Peak period travel times to major activity centers Value of time saved by commercial vehicles
Implementation	Total capital cost Cost effectiveness Right-of-way acquisition impacts to residential and commercial buildings and property Environmental justice impacts Archaeological sites impacted Public facilities impacted Parks and recreation impacts Acquisition of sites with hazardous materials

The following subsections present an analysis of the alternatives based on the data developed for the alternatives. Each subsection describes a measure, its application to the alternatives, and the resulting data. Because of its identification late in the analysis process, there was a limited development of data for Alternative 8a. In some subsections Alternative 8a data are not presented.

Table 4-2 shows existing (2003) average daily traffic (ADT) on I-405 in the study corridor. The table also shows average weekday traffic forecast for the year 2025 for each of the alternatives.

Table 4-3 summarizes the number of lanes provided by each alternative in each segment of the study corridor. General purpose, HOV, and express lanes are included. Auxiliary lanes are not included.

Table 4-2
Existing (2003) Average Daily Traffic and
Forecast Average Weekday Traffic (in Thousands) for Year 2025

Location	East of Seal Beach Boulevard		Between Bolsa and McFadden		Between Bushard and Warner		At the Santa Ana River	
Direction	North	South	North	South	North	South	North	South
Existing 2003	233	231	152	151	155	153	189	187
Baseline	230	234	165	155	164	162	193	189
TSM Alternative	228	232	165	156	164	163	193	189
Alternative 4	239	242	175	164	172	169	199	193
Alternative 6	245	246	189	178	184	182	211	207
Alternative 8	237	240	176	166	173	172	199	196
Alternative 8a	234	248	182	171	180	178	204	201

Source: Existing adapted from Caltrans and year 2025 forecast from Orange County Transportation Analysis Model (OCTAM).
Note: Volumes combine traffic in general purpose, carpool, express, and auxiliary lanes.

Table 4-3
Number of Through Lanes by Segment

Segment		Through Lanes – Sum of Both Directions					
		Alternative					
From	To	Base	TSM	4	6	8	8a
I-605	SR-22/Valley View Street	7	7	8	9	8	8
SR-22/Valley View Street	Brookhurst Street	5	5	6	7	7	8
Brookhurst Street	Euclid Street	6	6	6	8	7	8
Euclid Street	SR-73	7	7	7	9	8	8

Table 4-4 shows the number of lane miles in each alternative on I-405. Auxiliary lanes are included. Alternative 8a provides the largest number of lane miles, followed by Alternatives 6, 8, and 4, respectively in descending order. The TSM Alternative provides a very minor addition in lanes miles compared to the Baseline.

Table 4-4
Lane Miles of Each Alternative on I-405

Segment			Lane Miles – Sum of Both Directions					
			Alternative					
From	To	Miles	Base	TSM	4	6	8	8a
I-605	SR-22/Valley View Street	3.0	47.8	47.8	53.9	59.9	53.9	59.0
SR-22/Valley View Street	Brookhurst Street	7.3	72.7	72.7	87.2	101.8	101.8	116.3
Brookhurst Street	Euclid Street	0.9	10.4	10.4	10.4	13.9	12.2	13.9
Euclid Street	SR-73	2.4	33.1	33.1	33.1	42.5	37.8	37.8
Auxiliary Lanes - All Segments			2.3	3.1	8.7	9.7	11.8	11.8
	Total	13.5	166.2	167.0	193.2	227.8	217.4	238.8

4.1 FREEWAY MOBILITY

This section presents the measures associated with the freeway mobility objective of the *P&N Statement*. Freeway mobility addresses the degree to which freeway traffic conditions improve under each of the final alternatives. This issue is addressed by forecasting the improvement in hours of corridor travel delay, peak period travel times, volume-to-capacity ratios, design flexibility, lane continuity, and lane interaction provided by each alternative as compared to the Baseline.

4.1.1 Hours of Corridor Travel Delay

Hours of I-405 corridor travel delay are measured by the reduction of person hours of travel in the Tier 2 study area (see Figure 1-1) attributable to an alternative. The Tier 2 study area extends west of I-405 to the ocean and east 2-3 miles, as well as north and south of the project limits 2-3 miles. Tier 2 encompasses the "influence" area of the segment of I-405 that is the subject of this study. Traffic conditions on I-405 between I-605 and SR-73 will have their most prevalent influence on route selection decisions within the Tier 2 area.

Vehicle person hours of travel are person hours in automobiles. The trips used in this measurement include those occurring during peak periods using any highway facility within the Tier 2 study area. The measure is calculated by subtracting the Tier 2 person vehicle hours of travel in the Baseline from the person hours of travel in the alternative. This provides a value that can be compared across the alternatives. The data for this measure were developed from the travel demand forecasts for the year 2025 provided by the Orange County Transportation Analysis Model (OCTAM), OCTA's travel forecasting model.

Table 4-5 shows the forecast weekday person vehicle hours of delay in the Tier 2 study area for each of the alternatives. The TSM Alternative provides a 0.5% reduction in the amount of delay. Alternative 4 provides about twice as much improvement as the TSM Alternative with a 1.1% reduction. Alternatives 6 and 8 with their larger increases in freeway capacity provide about twice as much reduction in delay as Alternative 4 with 2.4% and 2.2% reductions, respectively. Alternative 8a has the largest reduction in delay (2.8%), since it adds the largest number of lanes in the section of the freeway that is the narrowest and most heavily congested. (See Figure 3-5.)

In terms of annual hours of weekday delay, the alternatives generally provide more reduction of delay outside the Tier 2 study area than within it. This is due to a combination of two factors. First, because of delay within the I-405 corridor under the Baseline condition traffic is avoiding the corridor altogether when other faster travel paths are available. Second, the increased speeds the alternatives provide within the I-405 corridor attract some of the traffic avoiding the corridor altogether under the Baseline. Furthermore, the increased speeds also attract traffic from other corridors because those corridors are congested and the I-405 corridor has become somewhat more attractive. The additional traffic attracted to the I-405 corridor reduces the travel time advantage the improvement provides to Baseline I-405 motorists.

In short, congestion within the region spills over from one freeway corridor to another. When one corridor is improved some traffic will change travel paths to take advantage of the improved corridor. This reduces congestion on unimproved corridors and increases the traffic in the improved corridor. Thus, the benefits of improvements in the I-405 corridor provide congestion

benefits well beyond the corridor itself.

The alternatives with the lower amounts of improvement in the I-405 corridor provide lower amounts of reduction in region-wide delay. The TSM Alternative provides an annual region-wide reduction of 1.7 million person vehicle hours of delay. Alternative 4 provides a reduction of 3.9 million hours. The alternatives with the greatest amounts of improvement, Alternatives 6 and 8a, provide reductions of 8.4 and 9.9 million hours of delay, respectively. Alternative 8 with its moderate amount of improvement to the I-405 corridor provides a reduction of 7.8 million hours of delay region-wide.

4.1.2 Peak Period Travel Times on I-405

The percent change in travel time on I-405 between I-605 and SR-73 is used to measure travel time improvements of an alternative compared to the Baseline. In the case of express lanes, which do not exist in the Baseline, comparison is made to the general purpose lanes of the Baseline. Travel time change is calculated for the AM and PM peak periods. The percent change in time can be compared across the alternatives. The data for this measure were developed from the travel demand forecasts for the year 2025 provided by OCTAM.

Table 4-5 shows the percent reductions in peak period travel time in the general purpose and HOV lanes by direction for each alternative compared to the Baseline. Under the TSM Alternative the general purpose lanes enjoy less than a 1% improvement in travel time and show an increase in travel time in most cases. The HOV lanes show a 3-5% reduction in travel times. These minor improvements reflect the lack of improvements on the freeway itself under this alternative.

Alternative 4 has a 12-15% reduction in general purpose lane travel time during the peak periods. It also is forecast to have a 3-10% improvement in HOV lane travel times. Among the build alternatives these represent the lowest levels of travel time improvement and reflect the alternative's low level of capacity improvement on the freeway.

Alternative 6 has travel time reductions in the general purpose lanes during peak periods forecast at 18-22% reflecting the additional capacity provided in the express lanes. Reductions in the HOV lanes are 9-23% due to the diversion of some HOV lane traffic from the HOV lane to the general purpose lanes. The speed increases in the general purpose lanes, including the express lanes, reduce the volumes in the HOV lanes and thereby increase speeds.

Alternative 8 has peak period travel time reductions in the general purpose lanes of 14-16%. Improvement in the HOV lanes, reflecting the additional HOV lane in each direction from SR-55 to SR-22 near Valley View Street, is forecast at 26-35%. Alternatives 8 and 4 both add a single general purpose lane in each direction north of Brookhurst Street to I-605. Alternative 8 enjoys better reduction in travel time in its general purpose lanes than Alternative 4. This is because Alternative 8 also adds an HOV lane which increases HOV speeds and thus attracts traffic from the general purpose lanes whose speeds therefore increase.

Alternative 8a has the highest level of travel time improvements during the peak periods in both the general purpose and HOV lanes, reflecting its additional capacity in both the HOV and general purpose lanes. In the general purpose lanes travel time is reduced by 20-27%, exceeding

Table 4-5
Final Screening Evaluation Matrix

Screening Category / Objectives	Measures	Baseline Condition	TSM Alternative	Alternative 4	Alternative 6	Alternative 8	Alternative 8a
Arterial Mobility							
Limit diversion of traffic	**Daily Tier 2 Travel on Freeways versus Other Roads**						
	Daily Freeway VMT	9,859,000	9,814,000	10,107,000	10,390,000	10,097,000	10,484,000
	Daily Arterial VMT	11,112,000	11,151,000	11,031,000	10,924,000	10,963,000	10,890,000
	Percent Arterial VMT Reduction from Baseline		-0.4%	0.7%	1.7%	1.3%	2.0%
	Daily Freeway VHT	216,600	215,800	216,700	217,800	213,900	218,100
	Daily Arterial VHT	370,600	369,200	367,800	362,900	365,400	361,500
	Percent Arterial VHT Reduction from Baseline		0.4%	0.8%	2.1%	1.4%	2.5%
	Number of Signalized Intersections Operating at Various LOS						
	AM Peak Hour						
	LOS D or Better	24	25	25	23	24	n/a
	LOS E or F	5	4	4	6	5	n/a
	PM Peak Hour						
	LOS D or Better	23	22	22	22	22	n/a
	LOS E or F	6	7	7	7	7	n/a
	Total Delay at Signalized Arterial/Freeway-Ramp Intersections (Hours)						
	AM Peak Hour	400	390	430	660	450	n/a
	PM Peak Hour	530	510	540	860	580	n/a
	Sum of Peak Hours	930	900	970	1,520	1,030	n/a
	Reduction from Baseline		30	-40	-590	-100	n/a
	V/C Ratios for Arterial Mid-Block Sections						
	Number of Selected Arterial Mid-Block Sections with V/C =>1.00	17	16	17	18	17	n/a
	V/C Ratios for Arterial Freeway Crossings not at Interchanges						
	Number of Arterial Crossings with V/C =>1.00	4	1	3	4	3	n/a
Operations							
Reduce Conflict Points	**Number of Freeway Entrance and Exit Ramps Requiring Multiple Lanes**			10	12	10	n/a
Travel Choices							
Develop Other Modes	**Daily Tier 2 Transit Trips**	143,500	152,800	145,400	146,700	157,700	150,000
	Percent Increase		6.5%	1.3%	2.2%	9.9%	4.5%
	HOV Lane Travel Time Improvement (minutes)						
	HOV Lane Improvement in Travel Time (average of AM, PM, north and south)		0.9	1.3	3.2	5.7	5.8
	GP Lane Improvement in Travel Time (average of AM, PM, north and south)		-0.2	3.2	4.5	3.5	5.5
	Difference		1.1	-1.9	-1.3	2.2	0.3
Accommodate transit-dependents	**Transit Service to Transit-Dependent Areas - Improvement by Rank**	0	4	1	2	5	3
Land Use & Economic Development							
Improve commute times	**Peak Period Travel Times**						
	Reductions in Travel Time to Major Activity Centers in the Corridor						
	AM Peak		-2.7%	3.2%	5.5%	3.2%	6.4%
	PM Peak		0.5%	5.0%	5.5%	6.0%	7.7%
Improve truck travel time	**Annual Value of Time Saved Annually for Commercial Vehicles - Millions of 2004 $**		-$0.21	$3.40	$4.84	$3.77	$5.94

Table 4-5 cont'd
Final Screening Evaluation Matrix

Screening Category / Objectives	Measures	Baseline Condition	TSM Alternative	Alternative 4	Alternative 6	Alternative 8	Alternative 8a
Arterial Mobility							
Limit diversion of traffic	**Daily Tier 2 Travel on Freeways versus Other Roads**						
	Daily Freeway VMT	9,859,000	9,814,000	10,107,000	10,390,000	10,097,000	10,484,000
	Daily Arterial VMT	11,112,000	11,151,000	11,031,000	10,924,000	10,963,000	10,890,000
	Percent Arterial VMT Reduction from Baseline		-0.4%	0.7%	1.7%	1.3%	2.0%
	Daily Freeway VHT	216,600	215,800	216,700	217,800	213,900	218,100
	Daily Arterial VHT	370,600	369,200	367,800	362,900	365,400	361,500
	Percent Arterial VHT Reduction from Baseline		0.4%	0.8%	2.1%	1.4%	2.5%
	Number of Signalized Intersections Operating at Various LOS						
	AM Peak Hour						
	LOS D or Better	24	25	25	23	24	n/a
	LOS E or F	5	4	4	6	5	n/a
	PM Peak Hour						
	LOS D or Better	23	22	22	22	22	n/a
	LOS E or F	6	7	7	7	7	n/a
	Total Delay at Signalized Arterial/Freeway-Ramp Intersections (Hours)						
	AM Peak Hour	400	390	430	660	450	n/a
	PM Peak Hour	530	510	540	860	580	n/a
	Sum of Peak Hours	930	900	970	1,520	1,030	n/a
	Reduction from Baseline		30	-40	-590	-100	n/a
	V/C Ratios for Arterial Mid-Block Sections						
	Number of Selected Arterial Mid-Block Sections with V/C =>1.00	17	16	17	18	17	n/a
	V/C Ratios for Arterial Freeway Crossings not at Interchanges						
	Number of Arterial Crossings with V/C =>1.00	4	1	3	4	3	n/a
Operations							
Reduce Conflict Points	**Number of Freeway Entrance and Exit Ramps Requiring Multiple Lanes**			10	12	10	n/a
Travel Choices							
Develop Other Modes	**Daily Tier 2 Transit Trips**	143,500	152,800	145,400	146,700	157,700	150,000
	Percent Increase		6.5%	1.3%	2.2%	9.9%	4.5%
	HOV Lane Travel Time Improvement (minutes)						
	HOV Lane Improvement in Travel Time (average of AM, PM, north and south)		0.9	1.3	3.2	5.7	5.8
	GP Lane Improvement in Travel Time (average of AM, PM, north and south)		-0.2	3.2	4.5	3.5	5.5
	Difference		1.1	-1.9	-1.3	2.2	0.3
Accommodate transit-dependents	**Transit Service to Transit-Dependent Areas - Improvement by Rank**	0	4	1	2	5	3
Land Use & Economic Development							
Improve commute times	**Peak Period Travel Times**						
	Reductions in Travel Time to Major Activity Centers in the Corridor						
	AM Peak		-2.7%	3.2%	5.5%	3.2%	6.4%
	PM Peak		0.5%	5.0%	5.5%	6.0%	7.7%
Improve truck travel time	**Annual Value of Time Saved Annually for Commercial Vehicles - Millions of 2004 $**		-$0.21	$3.40	$4.84	$3.77	$5.94

Table 4-5 cont'd
Final Screening Evaluation Matrix

Screening Category / Objectives	Measures	Baseline Condition	TSM Alternative	Alternative 4	Alternative 6	Alternative 8	Alternative 8a
Implementation							
Competitive project	**Project Cost Estimates in Millions of Constant 2004 Dollars**						
	Capital Cost - Highway Elements		$ 20	$ 480	$ 2,060	$ 1,200	$ 1,900
	Capital Cost - Transit Elements		$ 120	$ 10	$ 30	$ 370	$ 100
	Total Estimated Capital Cost (may not total due to rounding error)		$ 130	$ 490	$ 2,090	$ 1,570	$ 2,000
	Operations & Maintenance Cost - Highway		$ 2	$ 4	$ 5	$ 5	$ 5
	Operations & Maintenance Cost - [New] Transit		$ 32	$ 2	$ 5	$ 26	$ 15
	Total Estimated O&M Cost (Annual)		$ 34	$ 6	$ 10	$ 31	$ 20
	Cost Effectiveness						
	Average Annualized Project Cost in Millions of Constant 2004 Dollars		$ 44	$ 46	$ 179	$ 158	$ 182
	Annual Person Auto Hours of Travel Saved from Baseline in Millions		1.7	3.9	8.4	7.8	9.9
	Cost per person hour of travel saved		$ 26.02	$ 11.72	$ 21.34	$ 20.28	$ 18.38
Consider Impacts	**Right-of-Way Requirements**						
	Single Family Detached Dwelling Units		0	11	105	87	105
	Multiple Family Dwelling Units		0	0	282	64	282
	Commercial Buildings (square feet) (defined as all non-residential buildings)		0	48,300	584,300	361,000	542,200
	Land Associated with Single Family Homes - residence not taken (square feet)		-	0.16	0.81	0.39	0.48
	Land All Associated with Other Buildings (square feet)		-	3.56	50.54	26.12	46.35
	Environmental Justice						
	Affected Census Tracts with Greater than Study Area Average EJ Populations		0	0	4	3	4
	Potential Archaeological Sites Impacted		0	1	3	1	3
	Public Facilities						
	Number of Public Facilities Potentially Impacted		0	4	13	7	12
	Parks and Recreation - Number of Parks Potentially Impacted		0	3	6	3	5
	Hazardous Materials						
	Properties to be Acquired with Potential Hazardous Materials		0	0	6	4	6
INFORMATION ONLY							
	Daily 2025 Forecast Volumes (Weekday)						
	Northbound						
	East of Seal Beach Boulevard	230,000	228,000	239,000	245,000	237,000	246,000
	Between Bolsa and McFadden	165,000	165,000	175,000	189,000	176,000	182,000
	Between Bushard and Warner	164,000	164,000	172,000	184,000	173,000	180,000
	At Santa Ana River	193,000	193,000	199,000	211,000	199,000	204,000
	Southbound						
	East of Seal Beach Boulevard	234,000	232,000	242,000	246,000	240,000	248,000
	Between Bolsa and McFadden	155,000	156,000	164,000	178,000	166,000	171,000
	Between Bushard and Warner	162,000	163,000	169,000	182,000	172,000	178,000
	At Santa Ana River	189,000	189,000	193,000	207,000	196,000	201,000
	Both Directions Combined						
	East of Seal Beach Boulevard	464,000	460,000	481,000	491,000	477,000	494,000
	Between Bolsa and McFadden	320,000	321,000	339,000	367,000	342,000	353,000
	Between Bushard and Warner	326,000	327,000	341,000	366,000	345,000	358,000
	At Santa Ana River	382,000	382,000	392,000	418,000	395,000	405,000

Note: Data shown in this table are rounded and adjusted from raw OCTAM output.

the improvement of all the other alternatives. In the HOV lanes travel time is reduced by 25-36%, a level comparable to Alternative 8 and better than the other alternatives.

Table 4-6 shows these and other data presented in Table 4-5 in a graphic format. The darker the circle, the better the measure is addressed.

4.1.3 Volume-to-Capacity (V/C) Ratios

Volume-to-capacity (V/C) ratios are used to determine how well the capacity improvements provided in each alternative accommodate the year 2025 traffic demand on I-405. A single ratio is calculated across the different types of freeway lanes (general purpose, HOV, and express) in each alternative at four representative locations by direction in the AM and PM peak periods. The locations are:

- at the Santa Ana River crossing (between Harbor and Euclid);
- south of the Magnolia/Warner interchange (between Bushard and Warner);
- south of the Goldenwest/Bolsa interchange (between Bolsa and McFadden); and
- east of Seal Beach Blvd (in the SR-22 overlap section).

The V/C ratios provide an indication of congestion levels and the expected relationship between freeway demand and the ability of the freeway to serve that demand. V/C ratios are assessed in terms of the extent to which an alternative has V/C ratios forecast in excess of 1.00. The ratios are compared across all of the alternatives based on the number of Baseline ratios in excess of 1.00 that are reduced below 1.00 by an alternative. In the case of express lanes, which do not exist in the Baseline, comparison is made to the general purpose lanes of the Baseline. The data for this measure were developed from the travel demand forecasts for the year 2025 provided by the OCTAM.

Table 4-5 shows sixteen V/C ratios on I-405 for the Baseline and each of the alternatives. The range of the Baseline V/C ratios is 0.91 to 1.30 and thirteen of the values exceed 1.00. The highest values are in the narrowest section between Brookhurst Street and Valley View Street where there are four general purpose lanes and one HOV lane in each direction.

Under the TSM Alternative no additional capacity is added to I-405 and there are only very slight changes in the V/C ratios compared to the Baseline. Some of the ratios increase slightly under the TSM Alternative and some decrease slightly. The range of V/C ratios is from 0.93 to 1.30 and the same thirteen ratios remain over 1.00 as in the Baseline.

Under Alternative 4 a single general purpose lane is added in each direction north of Brookhurst Street. The V/C ratios in that area improve between 0.04 and 0.17 compared to the Baseline. The range of V/C ratios is from 0.93 to 1.19. The V/C ratios south of Brookhurst Street at the Santa Ana River increase by as much as 0.09 due to the increased capacity north of Brookhurst attracting additional traffic to the entire study corridor. Of the sixteen V/C ratios shown on Table 4-5, the same thirteen as in the Baseline equal or exceed 1.00.

Under Alternative 6 two express lanes are added to the freeway over the entire study corridor. All of the V/C ratios on the freeway improve between 0.09 and 0.24. The range of V/C ratios is 0.79 to 1.14. The five V/C ratios exceeding or equal to 1.00 lie in the narrowest section between

Table 4-6
Final Screening Graphic Presentation

Screening Category	Least desirable = ○ Most desirable = ●	Threshold					TSM Alternative	Alternative 4	Alternative 6	Alternative 8	Alternative 8a
Objectives	**Measures**	○	◔	◑	◕	●					
Freeway Mobility											
Congestion relief	**Person Vehicle Hours of Delay in Tier 2 Area**										
	Percent Reduction from Baseline	*<1.0*	*1.5*	*2.0*	*2.5*	*>2.5*	○	◔	◕	◕	●
Minimize travel time	**Percent Reduction in Corridor Travel Time - Average A.M. and P.M. Peak Period**										
	GP Lanes	*<5%*	*10%*	*15%*	*20%*	*>25%*	○	◑	◕	◕	●
	HOV Lanes	*<5*	*10*	*15*	*20*	*>25*	○	◔	◕	●	●
Meet future demand	**Peak Period Directional V/C Ratios on I-405 Across All Lanes at Four Locations**										
	Number out of 16 Total V/C Ratios Equal to or Exceeding 1.00	*>12*	*12*	*9*	*6*	*<3*	○	○	◕	◑	●
	Flexibility to Increase Capacity and Manage Demand	*0*	*1*	*2*	*3*	*4*	◔	○	◑	◑	○
Provide lane continuity	**Number of Breaks in Lane Continuity**	*4*	*3*	*2*	*1*	*0*	◑	◕	○	◑	◕
Improve ingress/egress	**Lane Interaction - Meters of Auxiliary Lanes**	*<4k*	*8k*	*12k*	*16k*	*>16k*	◔	◕	◕	●	●
Arterial Mobility											
Limit diversion of traffic	**Daily Tier 2 Travel on Freeways versus Other Roads**										
	Percent Arterial VMT Reduction from Baseline	*<0.4*	*0.8*	*1*	*1.6*	*>1.6*	○	◔	●	◔	●
Travel Choices											
Develop other modes	**Daily Tier 2 Transit Trips**										
	Percent Increase	*<2%*	*4%*	*6%*	*8%*	*>8%*	◔	○	◔	●	◑
	HOV Lanes Peak Period Average Travel Time Improvement - minutes										
	HOV Lane Travel Time Improvement in excess of GP Lanes Improvement	*<-1*	*0*	*1*	*2*	*>2*	◔	○	○	●	◑
Accommodate transit-dependents	**Transit Service to Transit-Dependent Areas - Improvement by Rank**	*1*	*2*	*3*	*4*	*5*	◔	○	◔	●	◑

Table 4-6 cont'd
Final Screening Graphic Presentation

Screening Category	Least desirable = ○ Most desirable = ●	Threshold					TSM Alternative	Alternative 4	Alternative 6	Alternative 8	Alternative 8a
Objectives	**Measures**	○	◕	◐	◕	●					
Land Use & Economic Development											
Improve commute times	**Peak Period Travel Times**										
	Percent Reductions in Travel Time to Major Activity Centers in the Corridor	*<0%*	*2%*	*4%*	*6%*	*>6%*	○	◕	◕	◕	●
Improve truck travel time	**Annual Value of Time Saved for Commercial Vehicles - Millions of 2004 $**	*<2*	*3*	*4*	*5*	*>5*	○	◐	◕	◐	●
Implementation											
Cost	**Project Cost Estimates in Millions of Constant 2004 Dollars**										
	Total Estimated Capital Cost - Billions of 2004 $	*>2.0*	*2.0*	*1.5*	*1.0*	*<0.5*	●	●	○	◔	◔
	Cost Effectiveness										
	Cost per person hour of travel saved - in 2004 $	*>$24*	*$21*	*$18*	*$15*	*<$12*	○	●	◔	◐	◐
Environmental	**Right-of-Way Requirements**										
	Single Family Dwelling Units Potentially Acquired	*>100*	*100*	*66*	*33*	*0*	●	◔	○	◔	○
	Mult-Family Dwelling Units Potentially Acquired	*>225*	*225*	*150*	*75*	*0*	●	●	○	◔	●
	Commercial Buildings Potentially Acquired - Sq Ft of Non-Residential Bldg Footprint	*>450k*	*450k*	*300k*	*150k*	*0*	●	◔	○	◔	○
	Environmental Justice										
	Affected Census Tracts with Greater than Study Area Average EJ Populations	*4*	*3*	*2*	*1*	*0*	●	●	○	◔	○
	Potential Archaeological Sites Impacted	*4*	*3*	*2*	*1*	*0*	●	◔	◔	◔	◔
	Public Facilities										
	Number of Public Facilities Potentially Impacted	*>12*	*12*	*8*	*4*	*0*	●	◔	○	◐	◔
	Parks and Recreation - Number of Sites with Potential Land Acquisition	*>6*	*6*	*4*	*2*	*0*	●	◐	◔	◐	◔
	Hazardous Materials										
	Number of Properties to be Acquired with Potential Hazardous Materials	*>6*	*6*	*4*	*2*	*0*	●	●	◔	◐	◔

Brookhurst Street and Valley View Street where there are 2 express lanes, 4 general purpose lanes, and 1 HOV lane.

Under Alternative 8 a single general purpose lane is added in each direction north of Brookhurst Street and the second HOV lane north of Valley View Street is extended south through the study area to SR-55. All of the V/C ratios on the freeway improve between 0.04 and 0.31 compared to the Baseline. The range of V/C ratios is from 0.85 to 1.07. There are five V/C ratios that exceed 1.00 located up and down the corridor, with two additional V/C ratios at 1.00.

Under Alternative 8a a two general purpose lanes are added in each direction, one north of Brookhurst Street and the other north of Euclid Street. The second HOV lane north of Valley View Street is extended south through the study area to SR-55. All of the V/C ratios on the freeway improve between 0.01 and 0.36 compared to the Baseline. The range of V/C ratios is from 0.80 to 1.06. There are two V/C ratios that exceed 1.00 located at the Santa Ana River crossing.

Overall the TSM alternative provides very little improvement in V/C ratios with no reduction in the number of ratios exceeding 1.00. Alternative 4 provides no reduction in the number of V/C ratios equal to or exceeding 1.00 and results in increased V/C ratios at some locations. Alternatives 6 and 8 reduce the number of V/C ratios at or exceeding 1.00 to five and seven, respectively. Alternative 8a reduces the number to two.

Alternative 8a provides more improvement of V/C ratios than either Alternative 6 or Alternative 8 in the narrowest section of the freeway between Brookhurst Street and Valley View Street by 0.02-0.13. Alternative 8a provides three additional traffic lanes in this area and Alternatives 6 and 8 provide only two.

Alternative 6 generally provides more improvement of V/C ratios than Alternative 8 and Alternative 8a in the northernmost and southernmost portions of the freeway study corridor. Alternative 6 has one more lane in each direction than Alternative 8 in those areas and one more lane than Alternative 8a in the southernmost area.

4.1.4 Flexibility to Add Future Capacity and Manage Demand

This measure addresses the flexibility for the addition of capacity after implementation of the alternatives under study here. The measure considers the amount of non-residential land use that remains adjacent to the corridor for future widening. The measure also considers each alternative's flexibility to incorporate demand management to maximize effectiveness of the capacity include in each alternative. Table 4-5 provides a relative summary score for each of the alternatives with respect to flexibility to increase capacity and manage demand.

There is little appreciable difference among the alternatives in terms of the amount of non-residential land that remains adjacent to the corridor. Generally there are no areas where existing widening reduces the residential impact of additional future widening, except where future widening is limited to excess residual residential land acquired for an alternative under consideration here. Generally such excess residual residential land will be limited and does not represent a substantial benefit that can be used to effectively compare the alternatives. All of the alternatives retain the potential to accommodate an elevated viaduct for additional freeway

capacity, a maglev, or other transportation facility in the corridor. The Southern California Association of Governments is pursuing a plan that provides a maglev train between Los Angeles International Airport (LAX) and Orange County's John Wayne Airport elevated above I-405.

The TSM Alternative lends itself to demand management through the implementation of a number of ITS elements and significant transit improvements. Adjusting transit service headways provides a means to manage travel demand. However, the freeway corridor remains heavily congested in the TSM Alternative, so potential demand management through the use of transit is stymied by slow travel speeds. ITS elements include improvements in signalization near freeway ramps, motorist information, and incident detection and response. These improvements may both reduce freeway demand and increase freeway capacity. Demand reduction may occur in response to improved motorist information. Increased capacity may result from more efficient detection and removal of capacity reducing incidents such as accidents and breakdowns. The combination of these improvements is unlikely to affect the relationship between volume and capacity by 10 percent. However, even if a 10 percent reduction in V/C is assumed, 9 V/C ratios shown on Table 4-5 would still exceed 1.00. If a 5 percent reduction in V/C is assumed, all 13 V/C ratios on the table would still exceed 1.00. Thus the potential of the TSM Alternative to manage freeway demand is limited.

Alternative 4 with its additional general purpose lane has little potential to manage freeway demand. The reduction in headways on four routes serving the Euclid Street, Ellis Avenue, Warner Avenue, and Valley View Street corridors is unlikely to have substantial success in reducing or managing freeway corridor demand since the routes do not run along the freeway corridor.

The two express lanes in Alternative 6 have the potential to be operated as "managed lanes". Toll amounts could be adjusted to limit demand for the lanes in order to maintain a high speed operation. Alternative 6 includes the same headway reductions noted above for Alternative 4, which are unlikely to have substantial benefits in reducing or managing freeway corridor demand. Alternative 6 also includes four new express bus services operating on the express lanes (as shown in Table 3-3). One of the services has 20 minute peak period headways, while the remaining services have 30 minute peak period headways. Collectively, service frequency is 9 new buses per hour in the peak periods. Because the express lanes have very limited access within the corridor, express bus services operated in the express lanes provide improved "through" service in the corridor but very little additional "local" service within the corridor.

The introduction of a second HOV lane south of SR-22 (near Valley View Street) to SR-55 has the potential to provide a high occupancy toll (HOT) lane in Alternative 8. HOVs would travel free in the lanes. Unused capacity in the lanes would be available to single occupant vehicles for a toll. Toll amounts could be adjusted to limit demand for the lanes in order to maintain a high speed operation. This would remove some traffic from the general purpose lanes and increase the utilization of the HOV lanes. However, traffic forecasts for the PM peak period in the year 2025 indicate that there will be no unused HOV capacity north of Valley View Street. South of Valley View Street some portions of the HOV lanes are forecast with V/C ratios of 0.77. In order to maintain high speed operations in exchange for a reasonable toll, V/C ratios should generally be no higher than 0.80-0.85. Thus there is little unused capacity available for single occupant

vehicles paying a toll. The forecast HOV V/C ratios noted above are based on carpools of two or more occupants traveling free. If free carpools were limited to those with three or more occupants the unused capacity available for other vehicles paying a toll would increase and become a viable demand management tool. However this would require a change in the current HOV occupancy requirement of two persons per vehicle, which is in effect on all HOV lanes in the county. Such a change would shift the HOV demand attributable to carpools with two occupants into the general purpose lanes.

The BRT component of Alternative 8 also has the potential to manage demand for the freeway. BRT service along the HOV lanes would be on 8 minute headways thereby providing service frequency of 7.5 new buses per hour in the peak periods. With seven stations in the study area and the improved headways on local bus services shown in Table 3-4, both through service and local service in the study corridor is improved. Adjusting BRT service headways provides a means to manage travel demand in the freeway corridor.

Alternative 8a with its additional general purpose lanes has little potential to manage freeway demand. The introduction of a second HOV lane south of Valley View Street to SR-55 has limited potential to provide a HOT lane. V/C ratios for the HOV lane in Alternative 8a are generally lower than 0.60 south of Valley View Street, with values rising to a maximum of 0.73 north of Valley View Street. Thus there is some capacity that could be made available to single occupant vehicles. However, because the available capacity in the HOV lanes is somewhat limited, the ability to use the HOT concept to manage corridor traffic as a whole is somewhat limited.

Alternative 8a also includes BRT services on arterial streets as well as express bus services on I-405. Express bus service on the freeway is unlikely to yield substantial demand management benefits because of the difficulties of providing high speed service with stops that require the bus to exit and re-enter the freeway. BRT on surface arterials is also unlikely to yield substantial demand management benefits because of the diagonal nature of the freeway on the arterial grid. The additional time required to travel the arterial grid for movements in the diagonal direction of the freeway presents a substantial challenge to managing freeway demand with arterial transit services.

In summary, there is little appreciable difference among the alternatives in the ability to accommodate capacity increases beyond those included in the alternatives. In terms of managing demand, Alternative 4 provides the least potential. The TSM Alternative provides some potential through the provision of ITS. Motorist information, traffic signal, and incident management improvements provide the potential to gather and disseminate information in order to more effectively manage freeway demand. However, these improvements are not likely to effectuate substantial reductions in demand for travel in the freeway corridor. Alternative 6 provides the potential to manage demand in the express lanes through the use of tolls and the provision of express transit services in the express lanes. Alternative 8 provides greater potential than Alternative 6 to manage demand with transit service improvements for both through and local trips in the corridor. However, Alternative 8 provides substantially less potential to manage demand through tolls unless free access to HOV lanes is limited to vehicles with 3 or more occupants. Alternative 8a provides a bit more potential to manage demand with tolls than Alternative 8, however Alternative 8a provides very little ability to manage demand with transit.

The use of tolls in Alternatives 6, 8, and 8a would result in increased demand for the general purpose lanes due to toll resistance.

4.1.5 Continuity of Lanes

The narrowing of the freeway northbound at Euclid Street and Brookhurst Street creates substantial bottlenecks in northbound traffic. The purpose of this measure is to determine the extent to which through traffic lanes are continuous in the study area. Continuous through lanes reduce the potential bottlenecks caused by lane drops.

Figure 3-5 illustrates the continuity of lanes under each alternative. The Baseline and TSM Alternatives have the same freeway lane configurations and drop a single general purpose at the two locations noted above. Alternative 6 also drops lanes at these two locations. Alternatives 4 and 8 remove one of these lane drops by providing an additional general purpose lane north of Brookhurst Street. Alternative 8a removes both of these lane drops by adding one general purpose lane north of Euclid Street and a second north of Brookhurst Street.

The second HOV lane north of SR-22 near Valley View Street will connect directly to the SR-22 HOV lane currently under construction. By adding a second HOV lane on I-405 south of Valley View Street, Alternatives 8 and 8a create a bottleneck where three HOV lanes (two from I-405 and one from SR-22) are merged into two HOV lanes on I-405 north of Valley View Street.

The additional general purpose lanes in Alternatives 4, 8, and 8a remove lane drops at their southern ends and are matched to ramp lanes serving SR-22/7th Street and I-605 at their northern ends. These additional lanes do not introduce any lane continuity problems at their termini. The two new express lanes added in Alternative 6 are continuous in the corridor. However, at both ends of the study area the express lanes are dropped and require a merge into existing lanes.

In summary, the Baseline and TSM Alternative have two lane continuity problems. Alternative 4 removes one of them and introduces no additional lane continuity problems. Alternative 4 has one lane drop location. Alternative 6 removes neither of the lane continuity problems in the Baseline and introduces lane continuity problems at both ends of the study area. Alternative 6 has four lane drop locations. Alternative 8 removes one of the Baseline lane continuity problems and introduces one lane continuity problem where the HOV lanes from SR-22 and I-405 come together. Alternative 8 has two lane drop locations. Alternative 8a removes both of the Baseline lane continuity problems and introduces one lane continuity problem where the HOV lanes from SR-22 and I-405 come together. Alternative 8a has one lane drop location. Table 4-5 summarizes the number of occurrences of lane discontinuity in each alternative.

4.1.6 Lane Interaction

Merging and weaving maneuvers contribute to bottlenecks and congestion. Congestion is exacerbated when a large volume of these maneuvers occur over a short distance. To the extent that these maneuvers can be spread out over a longer distance congestion can be eased. This measure is the number of lane miles of auxiliary lanes included in each alternative. Auxiliary lanes provide a continuous travel lane from an on-ramp to the next downstream off-ramp. The length of an auxiliary lane is measured from gore point to gore point based on the gore point locations for existing ramps.

Currently there are only two locations with auxiliary lanes in the study corridor. One links the SR-22 eastbound on-ramp to I-405 southbound with the Seal Beach Boulevard off-ramp. The other links the northbound Harbor Boulevard on-ramp to I-405 southbound with the Fairview Street off-ramp. The Baseline includes the addition of a southbound auxiliary lane linking the Beach Boulevard on-ramp to Magnolia Street with the Edinger Avenue on-ramp intervening. The Baseline also includes a northbound auxiliary lane linking the C-D road serving the Magnolia Street and Warner Avenue interchanges with the C-D road serving the Beach Boulevard interchange.

The locations of auxiliary lanes in each alternative are included in the alternative descriptions above and are shown in Table 4-7. The total length of auxiliary lanes in each alternative is also presented in Table 4-5. The Baseline has 3,640 meters of auxiliary lanes. The TSM Alternative adds about 35% more for a total of 4,980 meters. Alternatives 4, 6, 8, and 8a have approximately 13,640, 15,580, 19,060, and 19,060, respectively. Alternative 4 includes auxiliary lanes only where additional acquisition of buildings is not required to accommodate them. Alternatives 6, 8, and 8a include auxiliary lanes in nearly all locations, but Alternative 6 has somewhat fewer because it includes a lane drop at Brookhurst Street, which makes the inclusion of an auxiliary lane problematic.

4.2 ARTERIAL MOBILITY

This category addresses mobility issues on arterials in the I-405 corridor. As a result of the levels of traffic congestion on the freeway, traffic is being diverted to nearby arterials thereby impairing arterial mobility.

4.2.1 Arterial Travel Reductions

To determine the improvement in arterial mobility, forecasts of vehicle miles of travel (VMT) and vehicle hours of travel (VHT) in the year 2025 for each alternative are compared to the Baseline. The VMT and VHT measures are calculated only for travel forecast on arterials in the Tier 2 study area. (See Figure 1-1.) The percent reduction between each alternative and the Baseline is calculated, yielding the amount of VMT and VHT reduction attributable to each alternative. This measures how effectively each alternative limits diversion of traffic from the freeway and permits comparison across the alternatives. All of the data for this measure are derived from OCTAM, the OCTA's regional travel forecasting model. The data are summarized in Table 4-5.

The daily VMT on arterials in the Tier 2 study area under the Baseline is forecast to be 11,112,000 in year 2025. Arterial VMT increases about 0.4% under the TSM Alternative reflecting arterial improvements included in that alternative, which has freeway improvements limited to a variety of ITS improvements. Arterial VMT is reduced under Alternative 4 by 0.7%. Reductions of 1.7% and 1.3% are forecast for Alternatives 6 and 8, respectively. Arterial VMT is reduced under Alternative 8a by 2.0%. Most of the arterial VMT reduction in the alternatives is due to the increases in capacity and higher travel speeds on I-405. A smaller component of the VMT reduction is due to the increases in transit service provided under each alternative.

VHT reduction on arterials follows the same comparative pattern as VMT. However, there is a 0.4% reduction in arterial VHT under the TSM Alternative. VHT reductions are 0.8%, 2.1%,

Table 4-7
Location and Length of Auxiliary Lanes in Each Alternative

From	To	Meters	Baseline	TSM	Alt 4	Alt 6	Alt 8	Alt 8a
Southbound								
SR-22 Eastbound	Seal Beach Blvd	640	640	640	640	640	640	640
Valley View	Springdale	1,440				1,440	1,440	1,440
Westminster	Goldenwest	960			960	960	960	960
Goldenwest	Bolsa (on the C-D road)	300			300	300	300	300
Bolsa	Beach	1,000			1,000	1,000	1,000	1,000
Beach	Magnolia (Edinger intervenes)	1,560	1,560	1,560	1,560	1,560	1,560	1,560
Magnolia	Warner (on C-D road in Alternatives)	300		300	300	300	300	300
Warner	Brookhurst	940				940	940	940
Brookhurst	Euclid (Talbert intervenes)	1,360					1,360	1,360
Talbert	Euclid	920			920	920		
Euclid	Harbor	1,260			1,260		1,260	1,260
Harbor	Fairview	480	480	480	480	480	480	480
Northbound								
Hyland	Euclid	800			800		800	800
Euclid	Brookhurst	980			980		980	980
Brookhurst southbound on-ramp	Warner	880		880	880			
Brookhurst northbound on-ramp	Warner	1,400				1,400	1,400	1,400
Warner	Magnolia (on the C-D road)	160		160	160	160	160	160
Magnolia	Beach	960	960	960	960	960	960	960
Beach C-D road	Bolsa	1,120			1,120			
Beach northbound on-ramp	Bolsa (Beach southbound on-ramp intervenes)	1,720				1,720	1,720	1,720
Goldenwest	Westminster	960			960	960	960	960
Westminster	Valley View	1,180				1,180	1,180	1,180
Seal Beach Blvd	SR-22 Westbound	660			660	660	660	660
TOTAL			3,640	4,980	13,940	15,580	19,060	19,060

1.4%, and 2.5% under Alternatives 4, 6, 8, and 8a, respectively. The greater respective values in all cases of VHT reduction on arterials as compared to VMT reductions indicates that travel speeds on arterials are generally improved.

4.2.2 Level-of-Service at Arterial/Arterial Intersections

Capacity and level-of-service (LOS) analyses were conducted using procedures defined in the *2000 Highway Capacity Manual* (*HCM*). A total of 29 arterial intersections, all of which are currently signalized, were identified for analysis. Analyses were conducted for both the AM and PM peak hours for the Baseline and all of the final alternatives except Alternative 8a. Comparable data for Alternative 8a were not developed due to the identification of that alternative late in the study process. The intersections are identified and the results of the analysis are presented in Appendix 6.7.

Year 2025 peak hour link volumes were obtained from OCTAM. Peak hour turning movement volumes were developed by post-processing the OCTAM forecast link volumes using existing turning movement volumes as a basis and procedures defined in *National Cooperative Highway Research Program (NCHRP) Report 255: Highway Traffic Data for Urbanized Area Project Planning and Design.*

As shown in Table 4-8, under Baseline conditions 23 of the 29 intersections analyzed operate at LOS D or better in both the AM and PM peak hours. Five intersections operate at LOS F during both the AM and PM peak hours. One intersection operates at LOS D during the AM peak hour but operates at LOS F during the PM peak hour. A comparison of the alternatives in Table 4-8 shows very little difference among the alternatives in the number of intersections operating at LOS E or F. There are seven intersections operating at LOS E or F in the PM peak hour in the Baseline and under all of the alternatives. In the AM peak hour the number of intersections varies from four to six.

Table 4-8
Number of Signalized Arterial/Arterial Study Intersections
Operating at Various Levels of Service

LOS	Baseline		TSM Alternative		Alternative 4		Alternative 6		Alternative 8	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
LOS D or Better	24	23	25	22	25	22	23	22	24	22
LOS E	0	0	0	0	0	0	0	0	1	0
LOS F	5	6	4	7	4	7	6	7	4	7

The number of signalized arterial/arterial study intersections in each alternative with increased, decreased, or unchanged V/C ratios is shown in Table 4-9. Alternatives 6 and 8 show the largest number of intersections with reductions (or improvements) in V/C ratios as compared to Baseline conditions. The TSM alternative shows the largest number of intersections with increased (or deteriorated) V/C ratios.

Table 4-9
Number of Signalized Arterial/Arterial Study Intersections
with Increased and Decreased Volume-to-Capacity Ratios Compared to the Baseline

LOS	TSM Alternative		Alternative 4		Alternative 6		Alternative 8	
	AM	PM	AM	PM	AM	PM	AM	PM
Number of Intersections with Increase in V/C	14	11	9	6	8	6	4	3
Number of Intersections with Decrease in V/C	9	10	11	15	15	17	19	19
Number of Intersections with No Change in V/C	6	8	9	8	6	6	6	7

Note: A total of 29 arterial intersections were analyzed. See Appendix 6.7 for a summary of measures.

Where a comparison of intersection LOS under an alternative compared to the Baseline resulted in deterioration to LOS E or F, mitigations were identified to restore the Baseline LOS. For intersections that were at LOS F under Baseline conditions, mitigations were identified to

remove an increase in volume-to-capacity (V/C) ratio. The details of the mitigations are presented in Appendix 6.7.

With mitigations there is very little difference among the alternatives in terms of signalized intersections with reductions in traffic service levels. In terms of improvements in traffic service levels, the build alternatives provide improvement (decreased V/C ratios) at more intersections than the TSM Alternative. Alternative 6 provides a bit more improvement than Alternative 4, and Alternative 8 provides a bit more improvement than Alternative 6.

Table 4-10 shows the total hours of delay forecast for the selected signalized arterial intersections. The TSM Alternative shows the largest reduction from the Baseline. The build alternatives show very little reduction, because the intersections evaluated are on arterials providing access to the freeway. Arterials near the freeway would be expected to have more traffic accessing an improved freeway. For example, Alternative 6 has an increase in delay at signalized intersections. This is largely due to the increase in delay along Beach Boulevard resulting from the attraction of additional traffic accessing the alternative's express lanes. Beach Boulevard is the only access point to the express lanes between SR-73 and I-605.

Table 4-10
Total Delay at Selected Arterial/Arterial Intersections (Hours)

Period	Baseline	TSM	Alternative 4	Alternative 6	Alternative 8
AM Peak Hour	2,340	2,149	2,310	2,575	2,266
PM Peak Hour	2,883	2,697	2,846	3,054	2,825
TOTAL	5,223	4,846	5,156	5,629	5,091
Reduction from Baseline		377	67	-406	132

4.2.3 Volume-to-Capacity Ratios for Arterial/Freeway Ramp Intersections

Capacity and level-of-service analyses for arterial/freeway ramp intersections that are signalized or stop-controlled were conducted using procedures defined in the *HCM*. For arterial/ramp intersections that are uncontrolled, volume-to-capacity ratio analysis was used. The 57 arterial/ramp intersections analyzed are identified and the analysis is presented in Appendix 6.8.

Year 2025 peak hour traffic volumes were obtained from OCTAM. Peak hour turning movement volumes were developed by post-processing the OCTAM forecast link volumes using existing traffic volumes as a basis and following procedures defined in *National Cooperative Highway Research Program (NCHRP) Report 255: Highway Traffic Data for Urbanized Area Project Planning and Design*.

Two clover-leaf type interchanges at Beach Boulevard and Brookhurst Street, are modified in some of the alternatives. The reconfiguration of these interchanges and the Baseline configurations of all of the interchanges on I-405 in the study corridor are shown in Appendix 6.8. The Beach Boulevard/I-405 Interchange is modified under Alternatives 6 and 8. The Alternative 6 modifications include provision for signalized access to the I-405 express lane

ramps.

All the arterial/freeway-ramp intersections operate at LOS E or better with the exception of express lane access at Beach Boulevard under Alternative 6, which needs to be further evaluated to achieve an acceptable level-of-service. The existing and future traffic volumes on Beach Boulevard at I-405, combined with additional traffic expected for the express lanes under Alternative 6 (especially, large peak hour turning movements), and the need for three 8-phase signalized intersections in close proximity, could present traffic operational problems on Beach Boulevard.

The overall total delay at signalized arterial/freeway-ramp intersections for the Baseline and the alternatives was also computed for both the AM and PM peak hours, and is summarized in Table 4-11. Data for Alternative 8a were not developed due to the identification of that alternative late in the study process. Alternative 6 produces the greatest amount of total delay at arterial/freeway-ramp intersections, primarily because of greater delays at Beach Blvd/I-405 freeway interchange that includes access to express lanes. Without those additional amounts of delay the total delay of the build alternatives is similar. The express lane access at Beach Boulevard is the only access between SR-73 and I-605. The access at Beach Boulevard could present operational problems because of the additional traffic attracted to Beach Boulevard in order to access the express lanes. Consideration in future studies should be given to alternative access to the express lanes. Alternatives for potential consideration include providing no access between SR-73 and I-605, providing the access at another location, and splitting the access among multiple arterials.

Table 4-11
Summary of Total Delay at Signalized Arterial/Freeway-Ramp Intersections

Period	Baseline	TSM	Alternative 4	Alternative 6	Alternative 8
AM Peak Hour	400	390	430	660	450
PM Peak Hour	530	510	540	860	580

Notes:
1. *Total delay is a product of average vehicle delay and total peak hour intersection volume, summed over all signalized arterial/freeway-ramp intersections.*
2. *See Appendix 6.8 for total delay calculation details.*
3. *All arterial/freeway-ramp intersections use Baseline lane geometrics with the exception of Beach Blvd (for Alternatives 6 & 8) and Brookhurst St (for Alternatives 4, 6, & 8).*

4.2.4 Volume-to-Capacity Ratios for Arterial Sections

Volume-to-capacity (V/C) ratios were used to determine the change in year 2025 traffic demand on arterial segments (which typically include many intersections) based on the I-405 freeway capacity improvements provided in each of the alternatives. The V/C ratios provide an indication of congestion levels and the expected relationship between arterial traffic demand and the ability of the arterial to serve that demand. V/C ratios are assessed in terms of the extent to which an alternative has V/C ratios forecast in excess of 1.00. The ratios are compared across all of the alternatives based on the number of Baseline ratios in excess of 1.00 that are reduced below 1.00 by an alternative. Average Daily Traffic (ADT) volume-to-capacity ratios were calculated for a total of 79 arterial segments near I-405 using data obtained from OCTAM. The data are

presented in Appendix 6.9. No data were developed for Alternative 8a since it was identified late in the study process.

Under the Baseline a total of 17 arterial segments show daily V/C ratios equal to or in excess of 1.00. For all alternatives there is only a very minor change in the number of arterial segments with V/C ratios exceeding 1.00, as shown in Table 4-12. On some arterial segments, the TSM Alternative shows minor changes in V/C ratios (both higher and lower) based on the improvements included within that alternative. Similarly, Alternatives 4, 6 and 8 show minor changes in V/C ratios across the various arterial segments. In Alternative 6 Beach Boulevard between Bolsa Avenue and Warner Avenue shows slightly higher V/C ratios compared to the Baseline due to the access to the I-405 express lanes at Beach Boulevard.

Table 4-12
Number of Arterial Mid-Block Sections with V/C Equal to or Greater than 1.0

	Baseline	TSM	Alternative 4	Alternative 6	Alternative 8
Number of Arterial Mid-Block Sections with V/C Equal to or Greater than 1.0	17	16	17	18	17

Overall there is very little difference among the alternatives based on V/C ratios of mid-block arterial sections.

4.2.5 Ramp Layouts and Access

A number of the interchanges along I-405 in the study area do not provide for all the possible traffic movements because the interchanges lack a complete set of ramps. This may result in motorists selecting somewhat longer arterial paths to access the freeway than they would if a full set of ramps were provided. The objective of this measure is to determine the extent to which each alternative provides for a complete set of movements at each interchange thereby reducing the potential arterial travel required to access the freeway.

In terms of comparing the alternatives, there is only one interchange which is different across the alternatives, the Beach Boulevard interchange. That difference is not of a magnitude to suggest differences among the alternatives corridor-wide.

4.2.6 Volume-to-Capacity Ratios for Arterial Crossings not at Interchanges

Volume-to-capacity (V/C) ratios were used to determine the change in year 2025 traffic demand on arterial freeway crossings of I-405 not at freeway interchanges. V/C ratios are assessed in terms of the extent to which an alternative has V/C ratios forecast in excess of 1.00. The ratios are compared across all of the alternatives based on the number of Baseline ratios in excess of 1.00 that are reduced below 1.00 by an alternative.

Daily volume-to-capacity ratios were obtained for a total of nine arterial freeway crossings not at I-405 freeway interchanges from OCTAM. The data are provided in Appendix 6.9. When compared to the Baseline condition, the TSM alternative has three fewer crossings with a V/C ratio in excess of 1.00, as shown in Table 4-13. The other alternatives have the same or one fewer than the Baseline. No data were developed for Alternative 8a. The difference among the build alternatives is only one crossing. There is not a major difference among the alternatives on

this measure.

Table 4-13
Number of Arterial Freeway Crossings not at Interchanges with V/C Equal to or Greater than 1.0

	Baseline	TSM	Alternative 4	Alternative 6	Alternative 8
Number of Arterial Freeway Crossings not at Interchanges with V/C Equal to or Greater than 1.0	4	1	3	4	3

4.3 OPERATIONS

High volume ramps entering and exiting the freeway mainline may require more than a single exit or entry lane. Generally, where ramp volumes exceed 1,500 vehicles per hour dual lane entrances and exits are needed. For the build alternatives Table 4-14 shows the year 2025 peak hour volumes forecast for each ramp in the study area as it merges into or diverges from the freeway mainline. The table only shows the arterial interchange ramps, since freeway to freeway interchanges in the study area generally have ramps with more than a single lane. No data were developed for Alternative 8a since it was identified late in the study process.

The table shows that north of Beach Boulevard ramp volumes are not forecast to exceed the 1,500 vehicle per hour threshold under any of the build alternatives and single lane ramps would generally be adequate. At Beach Boulevard different ramps exceed the threshold under the different alternatives. The consolidation of entering and exiting volumes on a collector-distributor (C-D) road at the Magnolia Street and Warner Avenue interchanges results in volumes exceeding the 1,500 vehicle per hour threshold at all four freeway intersection points during either the morning or evening peak hour under all of the build alternatives.

The I-405 northbound off-ramp to Brookhurst Street also exceeds the threshold under all of the build alternatives, but the southbound off-ramp only exceeds it under Alternatives 4 and 8. The northbound I-405 off-ramp to Euclid Street and the Ellis Avenue on-ramp to southbound I-405 also exceed the threshold under all build alternatives. The I-405 southbound off-ramp to Harbor Boulevard exceeds the threshold in the morning peak hour under Alternative 6.

In terms of a comparison, there are 10 ramps in Alternative 4 that exceed the threshold and 12 ramps in Alternatives 6 and 8. There is insufficient difference among the alternatives for this to be a meaningful measure upon which to differentiate the alternatives. It should be noted that the ramp volume forecasts are based on a regional travel forecasting model and will require substantial additional study before they can be used in interchange design.

4.4 TRAVEL CHOICES

This section looks at the change in modal use between each alternative and the Baseline in both the Tier 2 study area and the region. Forecast daily transit trips and corridor travel time improvements in the HOV lanes, as well as changes in transit travel time to selected zones with an above average transit-dependent population, are compared across the alternatives. The data

Table 4-14
Year 2025 Forecast Peak Hour Ramp Volumes at the Freeway Mainline

	Alternative 4		Alternative 6		Alternative 8	
Southbound	**A.M.**	**P.M.**	**A.M.**	**P.M.**	**A.M.**	**P.M.**
Seal Beach Blvd Off-Ramp	830	1,200	850	1,200	800	1,190
Seal Beach Blvd On-Ramp	820	1,110	820	1,110	820	1,110
Valley View Off-Ramp	1,410	1,180	1,370	1,190	1,380	1,200
Valley View On-Ramp	800	1,020	870	1,140	800	1,050
Springdale Off-Ramp	650	400	640	410	630	400
Westminster Eastbound Off-Ramp	380	440	370	410	380	440
Westminster On-Ramp	770	980	790	990	760	980
Goldenwest/Bolsa Off-Ramp	980	940	860	910	960	930
Goldenwest/Bolsa On-Ramp	790	1,340	770	1,330	790	1,340
Beach Off-Ramp	1,210	1,950	610	750	960	1,500
Beach Southbound On-Ramp	650	1,110	540	450	720	1,060
Beach Southbound Express Off-Ramp			1,520	1,870		
Beach Southbound Express On-Ramp			2,170	1,970		
Edinger Eastbound On-Ramp	780	900	780	900	790	900
Magnolia/Warner C-D Road Off-Ramp	1,080	1,700	970	1,660	1,050	1,710
Magnolia/Warner C-D Road On-Ramp	2,670	1,240	2,670	1,240	2,670	1,240
Brookhurst Off-Ramp	1,520	1,020	1,470	1,010	1,520	1,030
Brookhurst Southbound On-Ramp	660	830	590	840	540	830
Talbert Eastbound On-Ramp	1,300	850	1,310	920	1,300	860
Ellis Off-Ramp	180	350	330	380	170	350
Ellis On-Ramp	1,750	1,360	1,750	1,360	1,750	1,360
Harbor Off-Ramp	1,390	1,380	1,640	1,370	1,230	1,320
Harbor On-Ramp from Sb Harbor	720	1,420	790	1,140	730	1,140
Harbor On-Ramp from Nb Harbor	1,400	930	1,400	930	1,400	930
Fairview Off-Ramp	290	780	290	780	290	780
Northbound	**A.M.**	**P.M.**	**A.M.**	**P.M.**	**A.M.**	**P.M.**
Seal Beach Blvd On-Ramp	700	1,040	680	1,040	700	1,040
Seal Beach Blvd Off-Ramp	1,300	990	1,280	950	1,290	960
Valley View Off-Ramp	1,000	1,080	1,120	1,120	1,020	1,090
Westminster On-Ramp	990	1,080	990	1,060	990	1,090
Westminster Off-Ramp	290	380	260	380	280	380
Goldenwest Northbound On-Ramp	860	1,170	820	1,060	850	1,180
Bolsa Westbound Off-Ramp	1,260	1,010	1,160	930	1,240	1,000
Beach C-D Road On-Ramp (Alt 4)	1,770	2,100				
Beach On-Ramp from Southbound Beach (Alts 6 & 8)			280	400	410	360
Beach On-Ramp from Northbound Beach (Alts 6 & 8)			370	280	1,490	1,570
Beach Off-Ramp	880	1,100	1,150	750	1,870	2,130
Beach Northbound Express On-Ramp			1,670	990		
Beach Northbound Express Off-Ramp			1,320	1,950		
Magnolia/Warner C-D Road On-Ramp	2,070	1,440	2,070	1,440	2,070	1,450
Magnolia/Warner C-D Road Off-Ramp	1,170	1,570	1,090	1,540	1,170	1,560
Brookhurst On-Ramp from Southbound Brookhurst	480	370	360	350	380	380
Brookhurst On-Ramp from Nb Brookhurst	700	800	700	820	700	740
Brookhurst Off-Ramp	1,620	1,750	1,670	1,800	1,610	1,760
Euclid On-Ramp	230	630	210	630	240	640
Euclid Off-Ramp	1,700	2,030	1,690	2,010	1,710	2,020
Hyland On-Ramp	450	1,500	450	1,500	450	1,500
Harbor Northbound On-Ramp	530	760	610	760	510	760
Fairview On-Ramp	610	750	610	750	610	750

indicates a volume in excess of 1,500 vehicles per hour, the threshold for a dual lane ramp.

for these measures were developed from the year 2025 forecasts provided by OCTAM.

4.4.1 Daily Transit Trips

To determine the extent of shift in travel mode associated with each alternative, daily transit trips to, from, and within the Tier 2 study area are compared among the alternatives. These data allow an assessment of each alternative in terms of the demand for the transit services included in the alternative and in terms of potential congestion reduction due to diversion of auto traffic to another mode.

Table 4-15 summarizes the analysis results for the final alternatives. All five of the alternatives generate an increase in transit trips in the Tier 2 Study Area. This is an expected result since all alternatives incorporate increases in existing bus services and/or new transit lines. Alternative 8 includes a bus-rapid-transit (BRT) line operating on I-405 and three new arterial BRT routes, resulting in transit trip increases of 9.9% compared to the Baseline. The TSM Alternative adds some express bus routes with few stops in the I-405 corridor itself, and achieves a gain of 6.5% transit trips. Alternative 8a includes the same three new arterial BRT lines as well as express services on I-405 with a gain of 4.5% transit trips. Alternative 4 and 6 include headway improvements on some corridor bus routes. Alternative 6 also includes additional express bus services in the corridor. Alternatives 4 and 6 show only modest increases in transit trips of 1.3% and 2.2%, respectively.

Table 4-15
Travel Choice – Daily Transit Trips (Weekday

Alternative	Daily Transit Trips Based in Tier II Area	% Increase in Daily Transit Trips over Baseline
Baseline	143,500	--
TSM/TDM	152,800	6.5%
Alternative 4	145,400	1.3%
Alternative 6 (with Beach Blvd Access)	146,700	2.2%
Alternative 8	157.700	9.9%
Alternative 8a	150,000	4.5%

Source: Orange County Transportation Analysis Model (OCTAM)

Table 4-16 presents the estimated daily passenger boardings for the proposed freeway BRT line included in Alternative 8. The BRT line operating on the freeway and on 7th Street in Long Beach is forecast to attract 25,200 boardings per day. The stations in Orange County have ridership in the range 1,600 to 3,200 boardings per day.

The stops in Long Beach are a little closer together and the bus is in mixed traffic. It therefore operates more slowly. It generates lower numbers of boardings for the stations in the 7th street segment. The Blue Line connection (near the intersection of 7th Street and Long Beach Boulevard) and CSULB stops perform well, with over 2,300 riders apiece.

4.4.2 HOV Lane Travel Time Improvement

The relative improvement in HOV lane travel time compared to general purpose lane travel time is an indicator of the extent to which each alternatives encourages the formation of carpools. This measure computes the difference between the improvement in HOV lane travel time along the

Table 4-16
Alternative 8 Bus-Rapid-Transit Daily Ridership

County	Location	Peak	Off-Peak	Daily
Orange County	Main/MacArthur	2,900	300	3,200
	Harbor	2,400	700	3,100
	Euclid	1,000	700	1,700
	Warner	1,500	700	2,200
	Beach	1,500	800	2,300
	Bolsa	1,500	600	2,100
	Valley View	1,200	500	1,700
	Seal Beach	1,200	400	1,600
Los Angeles County	CSULB	1,900	400	2,300
	7th/Ximeno	400	200	600
	7th/Redondo	400	300	700
	7th/Cherry	500	200	700
	7th/Alamitos	300	300	600
	7th/Long Beach	1,800	600	2,400
TOTAL		18,500	6,700	25,200

length of the study corridor from SR-73 to I-605 and the improvement in general purpose lane travel time. If HOV travel time improves more than general purpose travel time, HOV travel enjoys additional comparative advantage than it would enjoy under the Baseline condition and additional carpool formation is encouraged.

Table 4-5 shows the travel time savings forecast for the HOV lanes and the general purpose lanes in the study corridor. The savings are averaged for the morning and evening peak periods in both directions. The HOV lanes in Alternative 8 save 5.7 minutes over the HOV lanes in the Baseline. The general purpose lanes in Alternative 8 save 3.5 minutes over the Baseline. Thus, HOV lane travel time in the corridor is reduced by 2.2 minutes more than general purpose lane travel time. Alternative 8 provides the best comparative advantage for travel in the HOV lanes. This is due to the provision of a second HOV lane from Valley View Street south of the study area to SR-55.

The TSM Alternative and Alternative 8a provide somewhat less improvement to the advantage of the HOV lane travel. The advantage to HOV lane travel provided by the second HOV lane in Alternative 8a is nearly offset by the additional capacity added to the general purpose lanes. Alternatives 4 and 6 reduce the advantage of HOV travel enjoyed under the Baseline. This is due to the provision of additional general purpose and express lane capacity in these alternatives with no increase in HOV lane capacity.

4.4.3 Transit Service to Transit-Dependent Areas

Transit-dependent population is defined as persons without regular access to a car. This measure compares change in transit travel time under each alternative relative to the change in automobile travel times to see how well each alternative provides benefits to non-auto users in the corridor.

The specific measure is the percentage change from the Baseline in the ratio of transit and auto travel times for a set of ten representative origin-destination pairs. One zone in each origin-destination (O-D) pair is a major activity center in the Tier 2 study area. The other zone in each O-D pair has a higher than average transit-dependent population. The transit and automobile travel times for AM and PM peak period trips between the transit-dependent zones and the activity centers were obtained from OCTAM output forecasts for the year 2025. Ratios of these times were compared between the Baseline and each of the alternatives. A decrease in the ratio of transit-to-auto times generally indicates that the transit times have improved more than auto times, whereas an increase in the ratio would mean that auto times improved more than the transit times. A decrease in the ratio usually reflects frequency improvements or new transit routes serving that particular O-D pair. An increase in the ratio typically indicates an O-D pair where auto times have improved and transit times are either unchanged or improved less than auto times.

The six activity centers are:

- John Wayne Airport (as a focal point for the Irvine Business Center);
- South Coast Plaza (Bristol/Sunflower);
- Fountain Valley Business Park (Slater/Euclid);
- Little Saigon (Magnolia/Bolsa);
- Goldenwest College (Goldenwest/McFadden);
- California State University, Long Beach (CSLUB) – the front entrance on 7th Street.

Five zones with higher than average transit-dependent population are labeled A-E and are shown in Figure 4-1. Ten origin-destination pairs are used in the analysis and are shown with numbers in Table 4-17.

Table 4-17
Origin-Destination Pairs for Transit-Dependent Travel Time Analysis

Zones (TAZ)	John Wayne Airport (2331)	South Coast Plaza (2302)	Fountain Valley Bus. (2197)	Little Saigon (2112)	Goldenwest College (2138)	CSU Long Beach (____)
A (2070)	①			②		
B (2096)	③		④			
C (2232)		⑤				⑥
D (1985)	⑦					⑧
E (2384)					⑨	⑩

Table 4-18 summarizes the results of comparing the travel time ratios for each of the alternatives against the Baseline Condition. Since a decrease in the ratio is a positive finding for transit travel times, they are shown as a positive result. The greatest drop is 45% for one of the travel time comparisons, meaning that the transit time improved substantially relative to the auto time. There are some pairs where there was either no change or no relative change in the travel times (resulting in a 0% result), and some where the auto times improved more than the transit times; these cases are shown as negative percentages and the greatest of these is –18%.

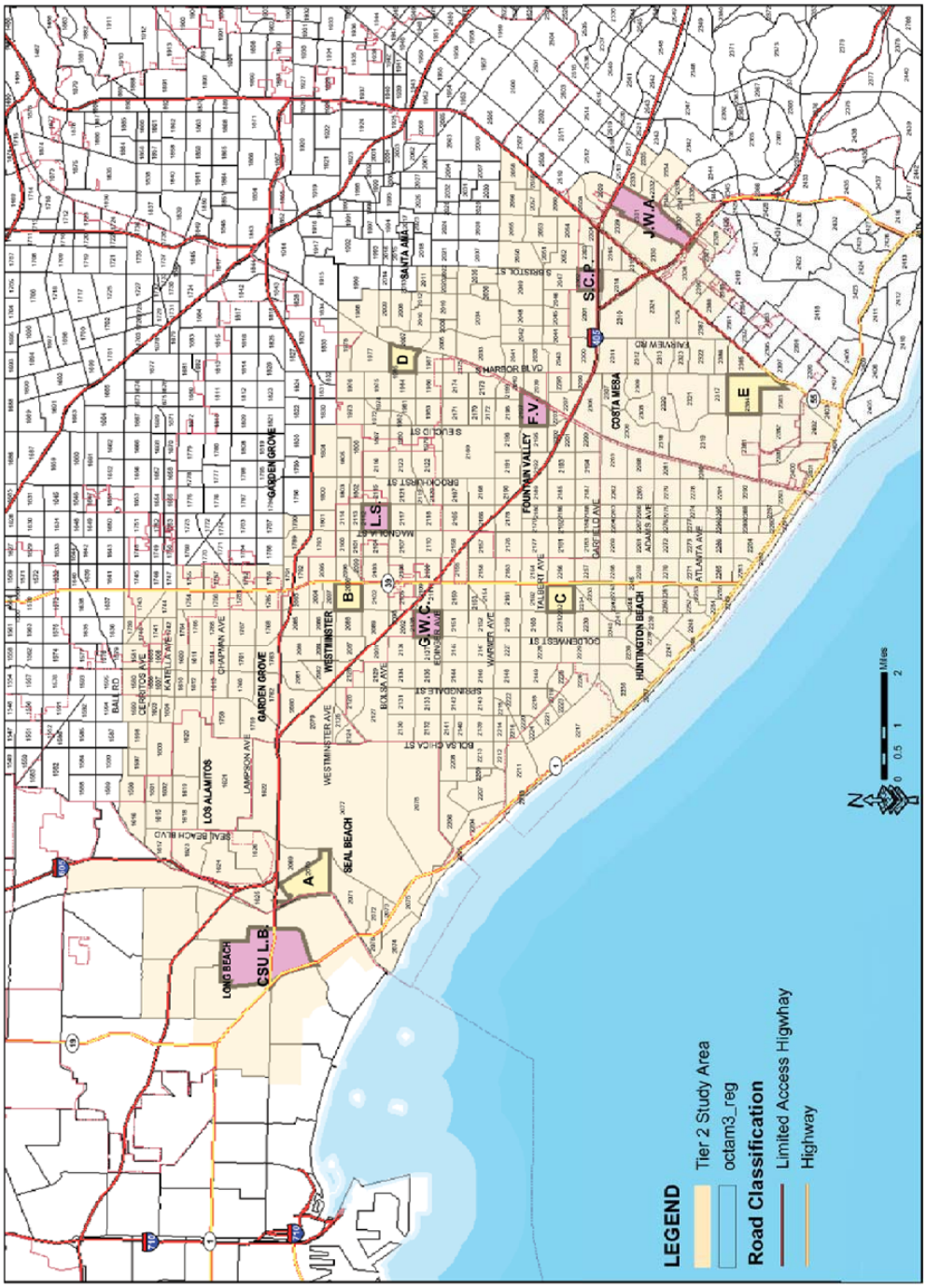


Figure 4-1. Origin-Destination Pairs for Transit/Auto Comparison

Table 4-18
Decrease in Ratio of Transit to Driving Travel Times
Compared to Baseline for Ten Representative O-D Pairs
Serving Transit-Dependent Populations

Origin-Destination Pairs			% Decrease in Ratio of Transit to Drive Times							
			TSM/TDM		Alt 4		Alt 6		Alt 8	
#	Trip Start	Trip End	AM	PM	AM	PM	AM	PM	AM	PM
1	A (2070)	JWA	1	1	-8	-4	18	-4	27	29
	JWA	A (2070)	1	1	-8	-11	-13	19	29	27
2	A (2070)	Little Saigon	1	1	0		-8	0	6	6
	Little Saigon	A (2070)	8	1	0	0	0	7	6	6
3	B (2096)	JWA	0	0	-5	-6	10	-6	28	27
	JWA (2331)	B (2096)	0	0	-6	-5	-13	10	27	28
4	B (2096)	Fountain Valley Bus.	4	-5	4	-5	4	-5	6	-3
	Fountain Valley Bus.	B (2096)	4	4	-6	-5	-6	-5	-4	-3
5	C (2232)	South Coast Plaza	10	10	0	0	-8	0	6	6
	South Coast Plaza	C (2232)	10	10	0	0	-9	-8	6	6
6	C (2232)	CSU Long Beach	36	32	6	-5	39	37	36	26
	CSU Long Beach	C (2232)	29	28	-12	-7	30	32	25	28
7	D (1985)	JWA (2331)	2	-6	0	-8	0	-8	11	-8
	JWA (2331)	D (1985)	2	-6	0	-8	0	-8	0	4
8	D (1985)	CSU Long Beach	23	23	-3	-6	31	35	20	18
	CSU Long Beach	D (1985)	27	23	0	-3	32	31	22	19
9	E (2384)	Goldenwest College	9	4	-6	0	-6	-18	8	3
	Goldenwest College	E (2384)	-2	3	-6	-7	-18	-14	-3	7
10	E (2384)	CSU Long Beach	11	1	0	-7	0	-8	45	38
	CSU Long Beach	E (2384)	1	1	-12	-5	-13	-8	37	39

Inspection of Table 4-18 indicates that Alternative 8 has the greatest benefit to transit-dependent populations. The transit-to-auto ratios typically decrease more in Alternative 8 than in the other alternatives, as shown by the greater predominance of positive values under Alternative 8 in the table. The TSM/TDM Alternative has some significant improvements for certain pairs but is not as consistent as Alternative 8. Alternative 6 shows some benefit but for some pairs the auto times improve more than the transit times. For pairs 2 and 3 in Alternative 6 there is a mixed result; this occurs because there are express bus improvements in Alternative 6 that affect only one direction of travel. Alternative 4 has more negative than positive values in the table. This is the result of auto travel time improvements against minimal transit service improvements. No data were developed for Alternative 8a since it was identified late in the study process. However, it has all of the transit improvements included in Alternatives 4 and 6, plus nearly all of the improvements included in the TSM Alternative. Therefore, Alternative 8a would rank above Alternatives 4 and 6, but below the TSM Alternative and Alternative 8. A complete set of rankings is presented in Table 4-5.

presents supplementary information on transit travel times, indicating the estimated changes in average travel time during the peak periods. This is provided to demonstrate some of the places

where transit times improve because of frequency increases and the introduction of new services. Alternative 8 tends to have the greatest reductions in travel time relative to the Baseline because it includes a freeway-based BRT line.

Table 4-19
Savings in Minutes of Transit Travel Time Compared to the Baseline for Ten Representative O-D Pairs Serving Transit-Dependent Populations

Origin-Destination Pairs			Travel Time Decreases (min)							
			TSM/TDM		Alt 4		Alt 6		Alt 8	
#	Trip Start	Trip End	AM	PM	AM	PM	AM	PM	AM	PM
1	A (2070)	JWA	1	1	0	0	31	0	40	40
	JWA	A (2070)	1	1	0	0	0	31	40	40
2	A (2070)	Little Saigon	1	1	0	0	0	0	4	4
	Little Saigon	A (2070)	1	1	0	0	0	0	4	4
3	B (2096)	JWA	0	0	0	0	16	0	27	27
	JWA (2331)	B (2096)	0	0	0	0	0	16	27	27
4	B (2096)	Fountain Valley Bus.	2	2	2	2	2	2	3	3
	Fountain Valley Bus.	B (2096)	2	2	2	2	2	2	3	3
5	C (2232)	South Coast Plaza	5	5	0	0	0	0	3	3
	South Coast Plaza	C (2232)	5	5	0	0	0	0	3	3
6	C (2232)	CSU Long Beach	25	26	0	0	33	34	29	30
	CSU Long Beach	C (2232)	26	25	0	0	34	33	30	29
7	D (1985)	JWA (2331)	1	1	0	0	0	0	6	0
	JWA (2331)	D (1985)	1	1	0	0	0	0	0	6
8	D (1985)	CSU Long Beach	19	19	0	0	27	26	18	18
	CSU Long Beach	D (1985)	19	19	0	0	26	27	18	18
9	E (2384)	Goldenwest College	6	-1	0	0	0	-7	9	2
	Goldenwest College	E (2384)	-1	6	0	0	-7	0	2	9
10	E (2384)	CSU Long Beach	1	1	0	0	0	3	48	48
	CSU Long Beach	E (2384)	1	1	0	0	3	0	48	48

4.5 LAND USE AND ECONOMICS

An indicator approach was taken in measuring impacts of the alternatives on land use and economic development. This approach assumed that land values would increase and economic development would be encouraged if travel times to major industrial, employment, and other centers along the corridor were reduced. Additionally, improvements in travel times were evaluated for peak period cost savings for commercial vehicles.

4.5.1 Peak Period Travel Times

This measure compares auto travel time reductions to major activity centers in the study corridor. The percent improvement in auto travel times of each alternative over the Baseline will be compared for travel between the ten zonal pairs shown above in Table 4-17. The total travel time between each zonal pair in each direction during each peak period was provided from OCTAM for each of the alternatives. These values were summed for each peak period providing an

estimate of the total amount of travel time in both directions for each alternative. The percent improvement in each peak period was calculated by comparing the total for each alternative with the total for the Baseline.

As would be expected the most substantial reductions occur among the zone pairs with the longest distance to be traversed along the freeway. Among these the greatest reductions are found in Alternative 8a because it provides the most additional freeway capacity. The least reductions are found in Alternative 4 because it provides the least additional freeway capacity.

Peak period auto travel times between the ten zonal pairs decrease less than 1% in the TSM Alternative and actually increase in the morning peak period. In Alternative 4 morning peak period total travel time decreased by 3.2% and evening peak period by 5.0%. Alternative 8 is forecast to have a travel time reduction between zones similar to Alternative 4 in the morning peak and a 6.0% reduction in the evening period. Alternative 6 will have a 5.5% reduction in both the morning and evening peak periods. Alternative 8a is forecast to reduce travel time to major activity centers in the corridor by 6.4% and 7.7% in the morning and evening peak periods, respectively. These data are presented in Table 4-5.

4.5.2 Value of Time Saved for Commercial Vehicles

Travel time savings for commercial vehicles translate directly to economic benefits. This measure provides a comparative assessment of the potential value of travel time savings for trucks on I-405 in the study area. The measurement calculates the travel time savings that trucks on I-405 under the Baseline would enjoy under each of the alternatives. Some trucks not on I-405 in the Baseline but on nearby facilities may enjoy some travel time savings by shifting routes to use I-405 under one or more of the alternatives. Such savings are not included in the method used here. Thus, the travel time savings for trucks calculated may underestimate the total benefit.

The minimum peak period Baseline traffic volume forecast for year 2025 at the four locations whose ADTs are shown in Table 4-2 was determined by direction. The minimum volume was assumed along the entire corridor and therefore results in a conservative estimate of the amount of traffic and commercial travel time savings. The minimum volume in each direction includes traffic in all lanes. The current truck and total volumes on I-405 are shown in Table 4.5-2 and 4.5-3 in the *Corridor Mobility Problem and Purpose and Need Statement.* The truck percentages shown in those tables apply only to the general purpose lanes so the truck percentages were adjusted to reflect all traffic. They range from 4.9% to 5.7% depending upon the time of day and direction of travel. Truck percentages were multiplied by the total volume by direction and peak period to estimate the number of trucks traveling each direction on the freeway during each peak period when congestion relief is likely under the alternatives. The resulting Baseline truck volumes were multiplied by the overall travel time savings along the corridor for each alternative by direction. This calculation provides the amount of time saved under each alternative by the trucks on I-405 in the Baseline. This value was converted to daily truck hours saved and then multiplied by 260 business days in a year and by the cost of time to determine an annual cost savings for trucks.

The cost of time used is based on studies of the value of time for commercial vehicles. The Oregon and Washington State Departments of Transportation collaborated on a study of I-5 in the greater Portland area. (See http://www.fhwa.dot.gov/planning/toolbox/index.htm.) Table 1 of

that case study provides cost data in 1995 dollars for commercial travel. The table includes compensation for occupants, the value of the vehicle, and the value of the inventory in the vehicle. Four different types of trucks are included in those data, whose average hourly cost per vehicle is $23.59. Using the gross domestic product deflator of 1.1634 for the period 1995 to 2004, the 2004 estimate of cost per commercial vehicle hour is $27.45 per hour.

As shown in Table 4-5, the TSM Alternative is not expected to result in any cost savings for trucks. Among the build alternatives, Alternative 4 yields the lowest amount of cost savings at $3.40 million annually (in constant 2004 dollars). Alternative 8 has somewhat more savings at $3.77 million. Alternatives 6 and 8a have the most cost savings for trucks, forecast at $4.84 and $5.94 million, respectively. These cost savings of the alternatives are consistent in rank with the amounts of additional capacity added by each alternative.

4.6 COSTS

This section presents the two cost measures: the capital and operating costs of implementing each of the alternatives and the cost effectiveness of each alternative. The assumptions used to develop values for these measures are presented.

4.6.1 Capital and Operating Costs

The capital costs of construction were estimated for each alternative. The estimates are at a planning level of detail. Costs use year 2004 constant dollars. Highway costs include roadway, structure, and right-of-way and utility cost estimates. They include percentage factors to address drainage, traffic, minor items, and mobilization.

Transit costs include estimates for stations and parking, transit vehicles, and right-of-way. For BRT the costs include bus stops and signal priority, but no major construction or widening. The transit costs include the entire BRT system from downtown Long Beach to John Wayne Airport, including the portions outside the study area west of I-605 and southeast of SR-73.

Costs are estimated using a variety of unit costs developed from recent experience and standard construction cost references. The cost estimate for each alternative includes a contingency of 30% to cover unforeseen conditions, as well as an additional 30% to cover engineering support costs.

A complete explanation of the cost estimate methodology covering the unit costs used, the quantity estimation procedures, the items included under each category, and other topics is included in the Appendix 6.5 Cost Methodology.

As shown in Table 4-5 the capital cost of the TSM Alternative is $130 million. It has the lowest capital costs among the alternatives. The roadway components account for $20 million with the remainder attributable to the transit components. There is extensive implementation of arterial bus-rapid-transit in the alternative as described above in Section 3.2.2. Annual operating and maintenance costs are estimated at $2 million for the roadway components and $32 million for the transit components.

The capital cost of Alternative 4 is $490 million. It is the least expensive of the build

alternatives. It is the narrowest of the build alternatives and requires the least additional right-of-way. Because it has the narrowest cross section of the build alternatives it requires the shortest bridge spans. Except for the area north of Seal Beach Boulevard, the existing freeway centerline is maintained in Alternative 4. Much of the existing pavement and grading can be used. The roadway components, including the additional general purpose lane on the freeway in both directions north of Brookhurst Street to I-605, account for $480 million of the capital cost. The remaining $10 million is for the transit components including the capital costs associated with providing reduced headways on routes identified in Section 3.3. Annual operating and maintenance costs are estimated at $4 million for the roadway components and $2 million for the transit components.

The capital cost of Alternative 6 is $2.09 billion. It is the most expensive of the alternatives. It is the widest of the four build alternatives and requires the most additional right-of-way. Since Alternative 6 is the widest of the build alternatives it requires the longest bridge spans and has the highest bridge costs. Because the freeway centerline of Alternative 6 is shifted from the existing centerline along most of the study area, much of the existing roadbed will require regrading and pavements will require replacement. The roadway components, including the two express lanes in each direction, account for $2.06 billion of the capital cost. The remaining $30 million is for the transit components including the capital costs associated with providing new express bus services along the freeway corridor and providing reduced headways as described in Section 3.4. Annual operating and maintenance costs are estimated at $5 million for the roadway components and $5 million for the transit components.

The capital cost of Alternative 8 is $1.57 billion. It is less expensive than Alternative 6 and requires less right-of-way overall. However, more right-of-way is required in the vicinity of the seven BRT stations within the study area for both the stations and parking facilities. Bridge replacements of nearly every bridge are required but spans are somewhat shorter than under Alternative 6. However, at the BRT station locations additional arterial bridge width is required to accommodate transfer platforms for buses operating on arterial routes. The centerline of Alternative 8 is shifted from the existing freeway centerline in much of the study area with the necessity to regrade the roadbed and replace most pavement. The roadway components, including an additional HOV lane south of SR-22 (near Valley View Street) and the additional general purpose lane north of Brookhurst Street account for $1.20 billion of the capital cost. The remaining $370 million is for the transit components including the capital costs associated with providing bus-rapid-transit (BRT) service along the I-405 HOV lanes between John Wayne Airport and downtown Long Beach. Costs include the construction of BRT transfer stations in the median of I-405 at arterial crossings as described in Section 3.5. Annual operating and maintenance costs are estimated at $5 million for the roadway components and $26 million for the transit components.

Alternative 8a has a $2.00 billion capital cost. It is nearly as expensive as Alternative 6. North of the Santa Ana River its right-of-way footprint is similar to Alternative 6. It is less wide than Alternative 6 south of the river. Alternative 8a requires replacement of nearly every bridge in the corridor and replacement of the roadbed and pavement due to freeway centerline shifting. The roadway components, including two additional general purpose lanes to address lanes drops at Euclid and Brookhurst Streets and an additional HOV lane south of SR-22 (near Valley View Street), account for $1.90 billion of the capital cost. The remaining $100 million is for BRT

service on three arterials in the corridor and additional express bus services on I-405. Annual operating and maintenance costs are estimated at $5 million for the roadway components and $15 million for the transit components.

4.6.2 Cost Effectiveness

This measure computes the annual cost of each alternative per person hour of travel saved compared to the Baseline. Person hours of travel (PHT) saved under an alternative is the difference in total person hours of auto travel under the Baseline and the alternative. The person hours of travel for the year 2025 are derived from OCTAM, OCTA's travel demand forecasting model. The number of person hours saved is factored to an annual value. OCTAM data are for an average weekday. The annual value is the average weekday value times 6 days per week times 52 weeks per year. Some person hours of travel time savings can be expected on weekend days. Since these are not modeled by OCTAM, weekend person hours of travel per day are assumed to be half of weekdays, with half the savings.

Costs include both the costs of the capital improvements of each alternative, as well as their operating and maintenance costs. Highway operating and maintenance costs are estimated from unit data obtained from Caltrans for state highways in Orange County. Transit operating and maintenance costs are derived from data and reports obtained from OCTA. The methodology used to develop capital and operating costs is fully explained in Appendix 6.5 Cost Methodology. Operating costs are calculated on an annual basis. Capital costs are annualized using a 30 year average life, although there are project components that have a "useful life" other than 30 years (right-of-way 100 years, pavement 25, bus 12). Structures have a useful life of 30 years. A simplified 30 year project life is reasonable for an MIS. Circular A-94 from the U.S. Office of Management and Budget requires that federal projects use a discount rate of 7 percent. Over 30 years this yields a discount factor of 0.081 which is applied to the total estimated capital cost of each alternative. (The discount factor is determined by calculating the net present value of $1.00 received over the next 30 years assuming an annual discount rate of 7 percent. The net present value of $1.00 received over 30 years at a discount or interest rate of 7 percent is $0.081.)

The complete formula for the cost effectiveness of each alternative (Alt.#) is:

$$\frac{(\text{Alt.\# total capital cost} \times 0.081) + (\text{Alt.\# annual O\&M cost})}{(\text{Alt.\# Daily PHT} - \text{Baseline Daily PHT}) \times 6 \text{ days a week} \times 52 \text{ weeks}}$$

The TSM Alternative is the least cost effective of the alternatives at $26.02 per person hour of auto travel saved. This alternative has the lowest annualized cost of the alternatives. Since it also has the lowest amount of savings in person hours of auto travel, the cost per hour saved is high as shown in Table 4-5. By comparison, Alternative 4 has a very similar annualized cost but over twice the annual savings in person hours of auto travel. The result is the lowest cost per hour saved among all of the alternatives at $11.72 per person hour of travel saved.

Alternative 8a is less cost effective than Alternative 4. Its annualized cost is 4 times greater than Alternative 4 but its annual person hour savings are only 2.5 times as great. It has a cost per person hour of auto travel saved of $18.38.

Alternative 8 is somewhat less cost effective than Alternative 8a. Its annualized cost is about 3.5 times greater than Alternative 4's but its person hours of travel saved is only about 2 times greater. It has a cost per person hour of auto travel saved of $20.28. Alternative 6 is a bit less cost effective than Alternative 8. Alternative 6 has annualized cost about 4 times greater than Alternative 4 but person hours of travel saved only about 2 times greater. Its cost per person hour of travel saved is $21.34.

Alternative 4 is the most cost effective of the build alternatives. While Alternative 4 saves the least amount of person hours of travel among the build alternatives, its costs are much lower than those of the other build alternatives. As a consequence, the person hours of travel that are saved under Alternative 4 are saved at a much lower unit cost than those of the other alternatives that save larger amounts of person hours of travel.

4.7 ENVIRONMENTAL IMPACTS

Six environmental measures were used to screen the alternatives. These six measures are not based on a comprehensive environmental assessment of the corridor and the alternatives. This limited set of measures is used to differentiate among the alternatives and is not intended to thoroughly document their potential impacts and necessary mitigations. The data provided are sufficient to inform decision makers charged with selecting a locally preferred strategy for the corridor about the relative impacts of each of the alternatives. The data are drawn from a Preliminary Environmental Assessment Report (PEAR) which is provided in the Appendix 6.4. The purpose of the PEAR is to identify the specific environmental process appropriate to the locally preferred strategy, the topics requiring special studies during the environmental process, and the resources necessary to complete the environmental process. It provides a preliminary assessment of the environmental issues to be examined as a project is advanced toward implementation.

The six environmental measures used to screen the alternatives are potential right-of-way impacts, environmental justice population impacts, archaeological impacts, public facilities impacts, parks and recreation impacts, and hazardous materials issues. A seventh topic, potential biological impacts, is included below but is not used to compare the alternatives because it shows very little difference among the alternatives. Each of the measures is described below. The data for all but the right-of-way impacts are drawn directly from the PEAR, which provides additional detail on each subject.

Right-of-Way Impacts

The existing right-of-way varies in width. It is widest in the segment recently reconstructed between SR-73 and Euclid Street and the segment north of Valley View Street. It is narrowest between Brookhurst Street and Valley View Street. Table 4-20 shows the minimum widths needed for each alternative in several sections of the study area. The values shown on the table are based on the minimum right-of-way width necessary to accommodate the alternative or the existing right-of-way width if it exceeds the minimum necessary. The minimum width consists of the roadway width from outside shoulder to outside shoulder plus one meter on each side to accommodate sound walls and retaining walls, except in the section from Harbor Boulevard to SR-73 where recently constructed braided ramps increase the right-of-way width substantially. Right-of-way width is wider at interchanges. The existing right-of-way width varies considerably

within each section and the table presents a typical width within each segment.

Table 4-20
Approximate Minimum Right-of-Way Width in Feet[1]

Location	Existing	Alternative 4	Alternative 6	Alternative 8	Alternative 8a
SR-22 Overlap Area	248	268	292	268	292
Valley View Street to Brookhurst Street	222	222[2]	277	245	268
Brookhurst Street to Euclid Street	230	222	277	245	268
Euclid Street to Harbor Boulevard	240	245	300	268	268
SR-73 to Harbor Boulevard	421	421	461	426	426

[1]Existing right-of-way width varies within each segment. Minimum for each alternative is based on roadway width from outside shoulder to outside shoulder plus 1 meter on each side for sound and retaining walls, except south of Harbor Boulevard where recently constructed braided ramps increase the minimum width substantially.
[2]Includes widths for auxiliary lanes, which are not illustrated in the typical cross sections but which can be implemented in many locations.

Freeway widening may result in the acquisition and displacement of adjacent land uses. This represents a major potential impact of freeway improvements. Location of potential right-of-way boundaries was determined through planning level engineering of mainline freeway cross sections and interchanges, generally adjusting existing ramp configurations to match mainline widening. The extent of potential property acquisitions was determined through plotting the potential right-of-way boundaries on aerial photographs, electronic copies of which are provided in Appendix 6.6. Separate drawings were prepared for Alternatives 4, 6, and 8. The right-of-way footprint of Alternative 8a is essentially the same as Alternative 6 north of the Santa Ana River and essentially the same as Alternative 8 south of the river. Those drawings were used to determine the impacts of Alternative 8a. Separate drawings were prepared for the areas in which Alternative 8 Option b differs from Alternative 8.

Full acquisition of single family dwelling units was assumed if any portion of a building was found to be within the potential right-of-way or, in most cases, if the potential right-of-way encroached more than 1 meter into a parcel based on apparent property boundaries as indicated by fences and other parcel boundary indicators. Otherwise, partial acquisitions of land associated with single family dwelling units were assumed. Partial acquisitions were assumed in a small number of cases in which lot size was large, encroachment exceeded 1 meter, encroachment did not affect the dwelling unit, and encroachment resulted in a remaining lot size not inconsistent with other nearby lots.

For all land uses other than single family dwelling units, land acquisition areas were determined based upon the footprint of the potential right-of-way. No attempt was made to determine the specific parcels that would be acquired or whether parcel acquisition would result in excess land. Acquisition of buildings was assumed if any portion of a building was found to be within the potential right-of-way. In the case of minor encroachments into large warehouse-type structures where there is potential to salvage a major portion of the building, partial building acquisition was assumed. Acquisition of buildings not within the potential right-of-way was assumed in

some cases where land acquisition was deemed to render use of the property not viable.

In some cases land used for surface parking would be acquired, thereby reducing parking available for associated buildings. Except in the case of apartment complexes where additional land or building acquisitions were assumed for provision of replacement parking, no attempt was generally made to determine the adequacy of remaining parking or methods of replacing lost parking. These impacts would be documented in detail during preparation of the environmental documents necessary to advance a project to construction. Specific property impact determinations would be made on a case by case basis during project development and right-of-way acquisition.

No attempt was made to determine right-of-way needs on the street approaches to over and under crossings of the freeway. More detailed engineering is required before these determinations can be made.

Table 4-21 presents a summary by land use type of the property acquisitions necessary for each of the build alternatives. Field observation identified the names and types of most of the non-residential properties to be impacted. No estimate was prepared for the TSM Alternative since property acquisition would be minimal and related to specific intersection improvements not fully identified as part of this study. As Table 4-21 shows, Alternative 4 has the least right-of-way impacts of the build alternatives. Alternative 4 will require the acquisition of 11 single family detached housing units. No multi-family dwelling units would be acquired for Alternative 4. Commercial buildings with footprints totaling 48,300 square feet are needed for Alternative 4. (In this report commercial buildings are defined as all non-residential buildings and include hotels.) A total of 3.7 acres of land is needed for the alternative, which total does not include land associated with the single family detached dwelling units to be acquired.

Alternatives 6 and 8a have the most impacts. They require the acquisition of 105 single family detached dwelling units and 282 multi-family dwelling units (all of which are rental apartments). Commercial buildings with footprints of 584,300 and 542,200 square feet are required for Alternatives 6 and 8a, respectively. Additionally, Alternatives 6 and 8a require 51.4 and 46.8 acres of land, respectively, in addition to the land associated with the single family detached dwelling units to be acquired.

Alternative 8 has more moderate right-of-way impacts than Alternatives 6 and 8a, reflecting the more modest freeway widening included in Alternative 8. Alternative 8 requires the acquisition of 87 single family detached dwelling units and 64 multi-family dwelling units (all of which are rental apartments). Commercial buildings with footprints of 361,000 square feet are required for Alternative 8a, as well as 26.5 acres of land in addition to the land associated with the single family detached dwelling units to be acquired.

Each of the build alternatives would require acquisition of land on the U.S. Navy's Seal Beach Naval Weapons Station located south of I-405 between Valley View Street and Seal Beach Boulevard. The land is currently used for agricultural purposes, but this is secondary to its use as a buffer between weapons storage facilities and other uses and structures. Construction of transportation facilities on land now belonging to the Navy may require the relocation of naval facilities that could become costs of a freeway construction project. During preparation of the

Table 4-21
Building and Land Acquisition Necessary for Each Alternative by Land Use Type
(buildings in square feet of footprint and land in acres unless otherwise noted)

	Alternative 4		Alternative 6		Alternative 8		Alternative 8a	
Land Use	Building	Land	Building	Land	Building	Land	Bldg	Land
Single Family Detached Dwelling Unit	11 units	0.2*	105 units	0.8*	87 units	0.4*	105 units	0.5*
Multifamily Dwelling Unit	0 units	0.0	282 units	6.5	64 units	2.2	282 units	6.5
Office	0	0.0	86,100	3.5	86,100	2.5	86,100	3.3
Retail	10,800	0.4	101,100	4.9	90,600	2.5	101,100	4.9
Restaurant	0	0.4	32,600	2.5	22,900	1.9	32,600	2.5
Entertainment	22,700	0.7	57,700	1.9	57,700	2.0	57,700	1.9
Hotel	14,900	0.2	46,400	1.7	46,400	1.0	46,400	1.0
Light Industrial and Warehouse	0	0.0	188,300	8.9	48,600	4.2	172,000	7.6
Auto Sales and Service	0	0.0	0	1.2	0	0.6	0	1.2
Park	0	0.7	0	3.4	0	1.5	0	2.8
Utility	0	0.5	0	3.9	0	1.3	0	3.4
Public Street	0	0.2	0	4.3	0	3.9	0	4.4
Federal Facility	0	0.3	0	4.8	0	1.5	0	4.8
Other	0	0.2	72,100	3.4	8,600	1.3	46,300	2.3
TOTAL***	48,300**	3.7	584,300**	51.4	361,000**	26.5	542,200**	46.8

**The acreage reported for single family detached dwelling units includes only land acquired where the dwelling unit itself is not acquired.*
***Total square footage of building footprints excludes single and multi-family residences, which are reported as dwelling units.*
****Totals may not add due to rounding.*
Source: Compiled from aerial photographs.

environmental documents necessary to advance a project to construction the Navy, OCTA, and Caltrans would work to determine project feasibility. U.S. Navy land is not subject to being taken under eminent domain by state and local agencies.

Table 4-22 shows overall building acquisitions by municipality. In Alternative 4 the single family dwelling unit (SFDU) acquisitions in Westminster are on the west side of the freeway within the limits of the Springdale Street interchange. The acquisitions in Huntington Beach are also on the west side and are within the limits of the Magnolia Street interchange. The commercial buildings to be acquired are all in Fountain Valley on the west side of the freeway between the Magnolia Street and Warner Avenue over crossings. Overall Alternative 4 has the lowest right-of-way impacts.

In Alternatives 6 and 8a SFDUs would be acquired in Westminster, Huntington Beach, and Fountain Valley. The largest number of SFDUs would be acquired in Westminster. The majority of these are in the area between the Valley View Street and Springdale Street interchanges, where the existing right-of-way is lined with SFDUs on both sides. In order to minimize the number of acquisitions in this area the centerline of the freeway would be shifted to the west. Thus, all of the SFDU acquisitions in this area are along the west side of the freeway. Some of the acquisitions do not currently abut the freeway but are on the west side of Milan Street, which

Table 4-22
Single Family Dwelling Units (SFDU), Multi-Family Dwelling Units (MFDU), and Commercial Building Acquisitions Necessary for Each Alternative by Municipality

	Alternative 4		Alternatives 6		Alternative 8		Alternative 8a	
Municipality	SFDU / MFDU	Comm Buildings (sq ft footprint)	SFDU / MFDU	Comm Buildings (sq ft footprint)	SFDU / MFDU	Comm Buildings (sq ft footprint)	SFDU / MFDU	Comm Buildings (sq ft footprint)
Rossmoor	0 / 0	0	0 / 0	0	0 / 0	0	0 / 0	0
Seal Beach	0 / 0	0	0 / 0	0	0 / 0	0	0 / 0	0
Westminster	5 / 0	0	88 / 18	163,100	75 / 0	54,900	88 / 18	163,100
Huntington Beach	6 / 0	0	13 / 200	134,300	10 / 0	86,100	13 / 200	134,300
Fountain Valley	0 / 0	48,300	4 / 64	207,000	2 / 64	182,100	4 / 64	207,000
Costa Mesa	0 / 0	0	0 / 0	80,000	0 / 0	37,900	0 / 0	37,900
TOTAL*	11 / 0	48,300	105 / 282	584,300	87 / 64	435,200	105 / 282	542,200

**Totals may not add due to rounding.*

abuts the freeway. The street itself must be acquired for the freeway and the residences must be acquired to replace the street, which provides access to a number of cul-de-sacs.

Acquisitions of multi-family residences for Alternatives 6 and 8a are located in Westminster, Huntington Beach, and Fountain Valley. The largest number is in Huntington Beach between Edinger Avenue and Newland Street where apartments currently line both sides of the freeway.

Commercial building acquisitions for Alternatives 6 and 8a take place south of Valley View Street in all of the jurisdictions along the freeway. In Costa Mesa all of these potential acquisitions are on the east side of the freeway between Harbor Boulevard and the Santa Ana River. In Costa Mesa the acquisitions required for Alternative 6 are approximately twice as great as those for Alternative 8a. In the other jurisdictions the acquisitions for these two alternatives are identical.

Acquisitions of commercial buildings for Alternatives 6 and 8a in Fountain Valley would occur on the east side of the freeway between Euclid Street and Talbert Avenue and on the west side of the freeway between Magnolia Street and Warner Avenue, as well as between Brookhurst Street and Talbert Avenue. Acquisitions of commercial buildings in Huntington Beach would occur on the west side of the freeway between the Southern Pacific Railroad under crossing and the ramps at Center Avenue. Acquisitions of commercial building in Westminster would occur on both sides of the freeway. On the east side acquisitions would occur between the Southern Pacific Railroad under crossing and Bolsa Avenue and also between Edwards Street and Westminster Boulevard. On the west side of the freeway acquisitions of commercial buildings would occur between Springdale Street and Westminster Boulevard, between Willow Lane and the U.S. Navy Railroad under crossing, between Goldenwest Street and Bolsa Avenue, and between the Southern Pacific Railroad under crossing and the Central Avenue ramps. The total square footage of the footprint of commercial buildings to be acquired for Alternatives 6 and 8a is

shown in Table 4-22.

As in Alternatives 6 and 8a, the largest number of SFDUs to be acquired for Alternative 8 is located in Westminster. The majority of these are in the same locations as for Alternative 6. The number to be acquired is slightly lower because of the narrower width of Alternative 8.

Acquisitions of multi-family residences for Alternative 8 are substantially lower than for Alternatives 6 and 8a. All of the potential acquisitions are in Fountain Valley at the Corte Bella Apartments on the west side of the freeway between Bushard Street and Slater Avenue.

The acquisitions of commercial buildings for Alternative 8 are generally in the same locations as for Alternative 6. No acquisitions are required between the U.S. Navy Railroad and Edwards Avenue on the west side of the freeway in Westminster or on the east side between the Southern Pacific Railroad under crossing and Bolsa Avenue. The amount of commercial building acquisition required for Alternative 8 is about three-quarters of what is required for Alternative 6, as shown in Table 4-22.

In summary, Alternative 4 is the narrowest of the build alternatives and consequently has the fewest right-of-way acquisition impacts. Alternatives 6 and 8a are the widest and have the greatest impacts. They require the acquisition of 18 more single family dwelling units than Alternative 8, four times as many multi-family units, and about one-third more square feet of commercial buildings.

4.7.2 Environmental Justice Population Impacts

An analysis of census tracts with protected environmental justice populations was completed. Table 4-23 lists the census tracts that have a minority and/or low-income population from which right-of-way would be required, the type of right-of-way that would be required, and the alternative that would directly impact the census tract. The table shows that Alternative 4 has no apparent impact on environmental justice populations. Alternatives 6, 8, and 8a have potential environmental justice impacts in three or four census tracts, as shown in the table. However, none of the alternatives would require right-of-way from residential areas or other particularly sensitive land uses in these census tracts. A more complete explanation of the method used to develop the data in Table 4-23 is provided in the Preliminary Environmental Assessment Report (PEAR), which is presented in Appendix 6.4.

4.7.3 Archaeological Sites

Three archaeological sites may be impacted by the alternatives as shown in Table 4-24. Alternatives 6 and 8a potentially impact all three sites, while Alternatives 4 and 8 would only impact a single site. A more complete explanation of the archaeological sites in the corridor is provided in the Preliminary Environmental Assessment Report (PEAR), which is presented in Appendix 6.4.

4.7.4 Public Facilities

There are thirteen public facilities shown in Table 4-25 that may be impacted by the build alternatives. Alternative 4 could potentially impact four of these public facilities. Alternative 6 could potentially impact all thirteen of these public facilities. Alternatives 8 and 8a could impact as many as twelve and seven, respectively. The data for the table is derived from the Preliminary

Table 4-23
Census Tracts Adjacent to the Freeway from which Right-of-Way is Needed and which have Protected Environmental Justice Populations

Census Tract	Environmental Justice Qualifier	Type of ROW Acquisition	Alternative			
			4	6	8	8a
996.01	15% below poverty line 73% minority	Commercial/Industrial		X	X	X
995.09	28% below poverty line	Seal Beach Reservoir		X	X	X
992.51	52% minority	Commercial/Industrial		X	X	X
639.02	12% below poverty line	Park/Utilities		X		X

Table 4-24
Potential Archaeological Sites Impacted

Site	Alternative	General Location	Description
1352	6 8a	North side of freeway Los Alamitos	Shell midden
113	4 6 8 8a	Freeway ROW Westminster	Midden site with shell; choppers, scrapers, and bone
162	6 8a	North side of freeway Westminster	Midden

Environmental Assessment Report (PEAR), which is presented in Appendix 6.4.

4.7.5 Parks and Recreation

In addition to being vital community resources, parks and recreational lands are protected by federal statute commonly referred to as "Section 4(f)". Table 4-26 shows the potential impacts of each of the build alternatives on parks and recreational land in terms of acquisition. (In addition to acquisition, Section 4(f) protects parks and recreational land against temporary occupancy and against transportation impacts that substantially impair the park or recreational land.) Alternative 4 potentially impacts three such sites with a potential acquisition of less than an acre of land. Alternative 6 potentially impacts six such sites with a potential acquisition of 3 acres of park land. Alternative 8 potentially impacts three parks with a potential acquisition of 2 acres. Alternative 8a potentially impacts five parks and would acquire 3 acres of park land. A more complete explanation of the park and recreational impacts in the corridor and Section 4(f) is provided in the Preliminary Environmental Assessment Report (PEAR).

Table 4-25
Public Facilities Potentially Impacted

Facility	Alternative			
	4	6	8	8a
Seal Beach Reservoir	X	X	X	X
Mesa Consolidation Water District		X		X
Overhead Transmission (Magnolia Street)		X	X	X
Overhead Electric (Harbor Boulevard)		X	X	X
Santa Ana River Trail		X	X	X
Cascade Park	X	X		X
Los Alamos Park		X		X
Pleasant View Park	X	X	X	X
Gisler Park		X		
Fountain Valley School District	X	X	X	X
Town & Country Preschool		X		X
University of Phoenix		X	X	X
Medical Center		X		X

4.7.6 Hazardous Materials

A search of available databases reveals that six properties to be acquired for Alternatives 6 and 8a may contain hazardous materials. Four properties with hazardous materials may be acquired for Alternative 8 and no such properties are to be acquired for Alternative 4. Table 4-27 shows the properties to be acquired under each alternative that may contain hazardous materials. A more complete explanation of the hazardous materials impacts in the corridor is provided in the Preliminary Environmental Assessment Report (PEAR), which is presented in Appendix 6.4.

4.7.7 Biological

The area immediately adjacent to I-405 and within the one mile of the freeway is highly urbanized. Sensitive plant and animal species potentially occurring within a 1-mile radius of the study corridor include the mud nama, southern tarplant, salt spring checkerbloom, Coulter's goldfields, Los Angeles sunflower, and the Coast (San Diego) horned lizard. Due to the highly developed nature of the I-405 corridor, it is not anticipated that these species occur within the study area. Southern Cottonwood Willow Riparian Forest, a sensitive habitat type, potentially occurs along the course of the Santa Ana River within the study area but was not observed during a windshield survey.

Table 4-26
Potential Impacts on Parks and Recreation Sites

Facility	Alternative	Impact (acres/hectares)
Cascade Park	4	0.03/0.01
	6	0.27/0.11
	8a	0.27/0.11
Santa Ana River Trail	6	–[1]
	8	–[1]
	8a	–[1]
Los Alamos Park	6	0.43/0.17
	8a	0.43/0.17
Gisler Park	6	0.54/0.21
Fountain Valley Unified School District	4	0.53/0.22
	6	1.89/0.77
	8	1.23/0.50
	8a	1.89/0.77
Pleasant View Park	4	0.09/ 0.03
	6	0.32/ 0.13
	8	0.28/ 0.11
	8a	0.32/ 0.13

[1] *Unknown until further engineering refinements are completed.*

Focused surveys and detailed biological studies assessing the presence of sensitive species and habitats would occur when a specific project is proposed. Some additional information regarding biological resources is provided in the Preliminary Environmental Assessment Report (PEAR), which is presented in Appendix 6.4. No information has been developed which would differentiate among the alternatives.

4.8 EVALUATION FINDINGS

The final alternatives were evaluated and compared with the Baseline (or No Build) condition to assess the relative benefits, costs, and impacts of each. The alternatives with the wider cross sections generally address freeway congestion and travel delay forecast for year 2025 more than the alternatives with narrower cross sections. Alternatives 6 and 8a are the widest as shown in Table 4-20 and Figure 3-5. Table 4-5 shows that Alternatives 6 and 8a provide the most reduction in region-wide person vehicle hours of delay and the largest percentage reductions in freeway corridor travel time. The TSM Alternative and Alternative 4 are the narrowest alternatives and provide the least amount of reduction in person vehicle hours of delay and freeway corridor travel time. Alternative 8 represents a moderate freeway widening between the narrowest and widest alternatives. It has corresponding reductions in person vehicle hours of

Table 4-27
Potential Hazardous Materials Sites to be Acquired

Property	Database	Alternative			
		4	6	8	8a
All American Asphalt 14490 Edwards Street, Westminster	Cortese UST CA WDS EMI		X		X
Westminster Mall 195 Westminster Mall, Westminster	CA FID UST		X	X	X
Storage USA 7531 McFadden, Huntington Beach	UST		X		X
Boomers 9063 Recreation Circle, Fountain Valley	HAZNET LUST Cortese CA FID UST		X	X	X
Hyundai 10550 Talbert Avenue, Fountain Valley	RCRA-SQG		X	X	X
Custom Enamelers, Inc. 18340 Mount Baldy Circle, Fountain Valley	RCRA-SQG FINDS EMI		X	X	X

delay and freeway corridor travel time that are less than those of Alternatives 6 and 8a but more than those of Alternative 4 and the TSM Alternative. Similarly, the wider alternatives have less congestion, as can be seen in Table 4-5. However, none of the alternatives completely eliminates congestion.

Similarly, the freeway alternatives with the widest cross sections address arterial mobility more than the narrower alternatives. Alternatives 6 and 8a, the widest alternatives, reduce arterial vehicle miles of travel (VMT) forecast for year 2025 more than the narrower alternatives (Alternative 4 and the TSM Alternative). The overall reductions of arterial traffic are approximately 3 percent. Improvements to the freeway are expected to attract traffic to arterials in the vicinity of arterial freeway interchanges, while reducing arterial traffic overall.

There are currently two locations where the number of general purpose lanes drops and creates substantial bottlenecks: at Brookhurst Street and at Euclid Street. Alternative 8a removes both of these bottlenecks. Alternatives 4 and 8 remove only the bottleneck at Brookhurst Street. Alternative 6 and the TSM Alternative remove neither of these existing bottlenecks. Alternatives 8 and 8a introduce a similar bottleneck at the SR-22 interchange near Valley View Street where three HOV lanes are reduced to two. The new express lanes in Alternative 6 will merge into existing lanes at either end of the study area.

Alternative 8 addresses transit options more strongly than any of the other alternatives through its inclusion of a BRT service in the freeway HOV lanes with stations at arterial crossings similar to those shown in Figure 3-8. Alternatives 8 and 8a, as well as the TSM Alternative, provide BRT service in mixed traffic on major arterials crossing I-405. Alternatives 4 and 6 increase levels of regular transit bus services. Alternative 8 is forecast to have the largest increase in transit ridership (9.9%) and Alternatives 4 and 6 the smallest.

The wider alternatives cost more and have more right-of-way impacts than the narrower alternatives as shown in Table 4-5. Alternatives 6 and 8a (the widest alternatives) have estimated capital costs in excess of $2 billion and would potentially require the acquisition of 105 single family detached dwelling units, 282 multi-family units, and more than 500,000 square feet of commercial building footprint. Alternative 4, the narrowest build alternative, would cost $490 million, about one-quarter the cost of the widest alternatives. Alternative 4 would potentially require about one-tenth of the single family detached dwelling units (11), no multi-family units, and about one-tenth of the commercial building footprint (48,300 square feet) of Alternatives 6 and 8a. The TSM Alternative would cost even less ($130 million) and would require very limited property acquisition. At $1.57 billion the moderate width alternative, Alternative 8, would cost less than the widest alternatives, require fewer single family dwelling units (87), fewer multi-family units (64), and less commercial building footprint (361,000 square feet).

In terms of cost effectiveness Table 4-5 shows that the TSM Alternative is the least cost effective of the alternatives at $26.02 per person hour of auto travel saved. Alternative 4 has an annualized cost very similar to the TSM Alternative but over twice the savings in person hours. The result is the lowest cost per hour saved among all of the alternatives at $11.72 per person hour of travel saved. Alternatives 6 and 8 are the least cost effective with costs per hour saved of $21.34 and $20.28, respectively. Alternative 8a is a bit more cost effective than Alternatives 6 and 8 with a cost per hour saved of $18.38.

5 LOCALLY PREFERRED STRATEGY

This section presents the Locally Preferred Strategy (LPS) adopted by the Orange County Transportation Authority (OCTA) for improvements to the I-405 corridor from I-605 to SR-73. Adoption of an LPS was a principal purpose for conducting the I-405 Major Investment Study (MIS). The formal process of adopting an LPS started with consideration of draft results from the evaluation of alternatives presented in the previous section. As the process of developing the LPS advanced, additional analyses were undertaken in response to suggestions and requests by those participating in developing the LPS. This section of the report provides a narrative of the LPS adoption process starting with a presentation of draft alternative evaluation results to the Project Technical Advisory Committee (PTAC) and culminating in the formal adoption of an LPS by the OCTA Board of Directors.

5.1 LPS DECISION PARTICIPANTS

In reaching a decision on the LPS for the corridor, the OCTA Board of Directors relied on a committee structure for review and recommendations. The PTAC included transportation engineers and other technical staff from the municipalities along the study corridor and Caltrans. The City Managers Group (CMG) consisted of the city managers from each of the cities in the study corridor: Seal Beach, Los Alamitos, Westminster, Garden Grove, Costa Mesa, Fountain Valley, and Huntington Beach. The I-405 Policy Working Group (PWG) included elected representatives of municipalities along the corridor. The OCTA Board Subcommittee on the I-405 Major Investment Study included OCTA Directors some of whom represented areas along the study corridor. The OCTA Committee on Regional Planning and Highways, a permanent OCTA standing committee whose members are OCTA Directors from around the county, also

voted on the LPS.

The general public participated in the LPS process through a series of six public meetings held in the different jurisdictions along the corridor and through the opportunity to speak at all of the meetings held during the process. There was a very substantial and organized public participation.

Additionally, a Stakeholders Working Group (SWG) included representation from about 25 interested parties along the corridor. Parties represented included the Coast Community College District, the Orange County Water District, the Bolsa Chica Foundation, the Rossmoor Community Services District, the South Coast Metro Alliance, the American Automobile Association, C.J. Segerstrom and Sons, John Wayne Airport, the Westminster and Huntington Beach shopping malls, a number of Chambers of Commerce, and some residential communities.

5.2 LPS DECISION PROCESS

The draft evaluation results were first presented to the PTAC. The PTAC reviewed the draft evaluation results for the TSM Alternative and Alternatives 4, 6, and 8. The review took place at two meetings at which committee members asked that additional information be included in the evaluation. The PTAC did not make a recommendation for an LPS but did agree that the TSM Alternative was not viable as a stand-alone alternative. There was sentiment for consideration of an additional build alternative (later designated as Alternative 8a) that would generally have the same right-of-way footprint as the widest alternative (Alternative 6). Alternative 8a would remove the existing lane continuity problems at both Euclid Street and Brookhurst Street and would provide two HOV lanes in each direction on the freeway throughout the study area. It would not include express lanes.

In preparation for a joint meeting of the PWG and the OCTA Board Subcommittee on the I-405 Major Investment Study, a meeting of the CMG was convened. The CMG reviewed the presentation of the draft evaluation and suggested several improvements. The CMG made no recommendation for the LPS.

Subsequently, the draft evaluation results were presented to a joint meeting of the PWG and the OCTA Board Subcommittee on the I-405 Major Investment Study. The joint committee requested more detailed information on the costs, impacts, and benefits of each of the alternatives. They also asked for a review of all thirteen initial conceptual alternatives particularly with respect to the need to revisit the elimination of the alternatives that included viaduct as a means of reducing land acquisition impacts. The joint committee endorsed the need for a more extensive evaluation of Alternative 8a.

At the second joint committee meeting there was extensive discussion of the need for additional freeway capacity and the resulting impacts. Discussion of the potential for an elevated viaduct to provide the additional capacity and minimize land acquisition impacts resulted in the group requesting further consideration of Alternative 10, a viaduct alternative that had been eliminated from further consideration at the time that the initial conceptual alternatives were reduced to three final alternatives. The committee specifically asked that renderings be prepared to show the visual aspects of the viaduct.

No detailed evaluation data had been prepared for Alternatives 8a or 10 since they were not among the alternatives selected for further consideration at the end of the initial screening process. (See the *Interstate 405 Major Investment Study Initial Screening Report.*) Consequently, a set of data on Alternative 8a was developed which included most of the same information reported for Alternatives 4, 6, and 8. That information is reported above in Section 4.

For Alternative 10, data from the *Interstate 405 Major Investment Study Initial Screening Report* were refined with sketch planning techniques through comparative evaluation with the other alternatives. Alternative 10 adds two express lanes in each direction from the I-605 interchange to the SR-73 interchange and a single general purpose lane in each direction between the I-605 interchange and Brookhurst Street. These improvements are illustrated in Figure 5-1. The express lanes are provided on an elevated viaduct thereby reducing the amount of land acquisition required for the alternative. Renderings of the viaduct are shown in Figure 5-2. South of Springdale Street the viaduct would be two levels above the ground in order to cross over bridges carrying arterial roadways over the freeway.

The information developed for Alternative 10 found that the alternative would:

- cost about $2.2 billion, which is slightly more than Alternative 6 because the viaduct costs were slightly more than the savings in land acquisition costs resulting from elevating the express lanes rather than providing them at grade;
- reduce regional travel delay and local arterial travel more than Alternative 6 and less than Alternative 8a because Alternative 10 provides a little more capacity than the former alternative and a little less than the latter;
- increase I-405 speeds in the study area during peak periods less than Alternative 6 and more than Alternative 8a because Alternative 10 provides a little more capacity than the former alternative and a little less than the latter;
- be very similar to Alternatives 6 and 8 in cost effectiveness;
- require acquisition of 15 single family detached dwelling units and 194 multi-family units; and
- require the same acquisition of three commercial buildings with 48,000 square feet of footprint as Alternative 4.

A meeting of the SWG was held between the first and second joint committee meetings. The draft evaluation findings were presented. The SWG made no recommendation for an LPS.

Following the second joint meeting of the PWG and the OCTA Board Subcommittee on the I-405 Major Investment Study a round of public open house meetings was held. The purpose of the public meetings was to gather public comment on the alternatives. Those comments would be used to assist the joint committee in reaching a recommendation on the LPS. Five alternatives were presented at the public meetings. Right-of-way layouts, the viaduct renderings in Figure 5-2, and information on the costs, impacts, and benefits of Alternatives 4, 6, 8, 8a, and 10 were

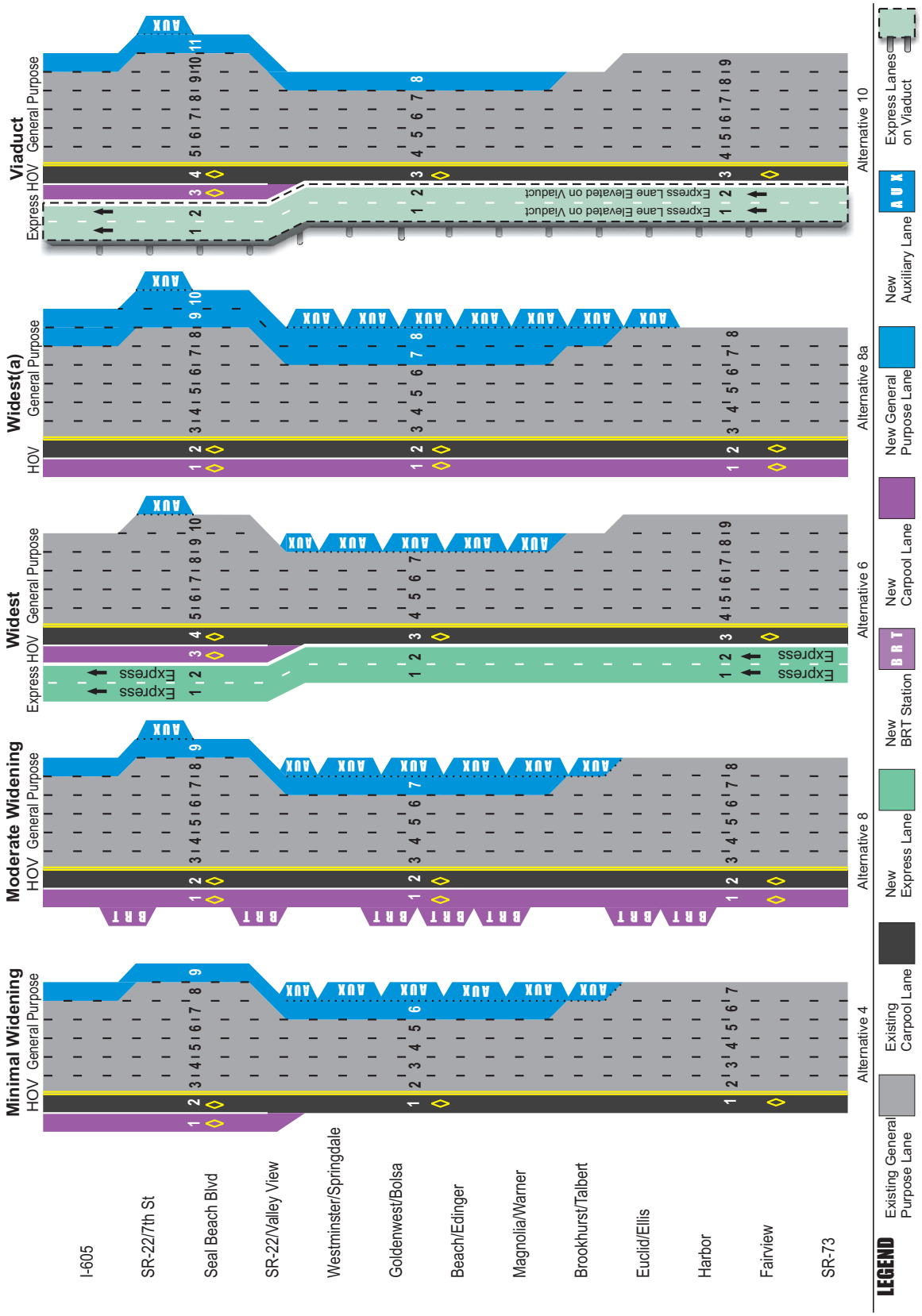


Figure 5-1 Lane Schematic of Alternatives Presented at Public Meetings

Figure 5-2 Viaduct Renderings – Upper: Viaduct at Two Levels above Grade to Clear a Nearby Arterial Over Crossing of the Freeway as seen from Laura Way in Westminster – Lower: Viaduct at a Single Level above Grade as seen from Duncannon Avenue in Westminster

presented at six public meetings. A lane schematic of these alternatives is presented in Figure 5-1. The meetings were held at six different locations along the corridor. Five of the meetings had attendance of less than 100 people. At the meeting held in the City of Westminster over 500 people turned out in response to publicity by the City and others concerned about the land acquisitions required for the alternatives.

Following the public meetings a third joint meeting of the PWG and the OCTA Board Subcommittee on the I-405 Major Investment Study was convened. The viaduct alternative (Alternative 10) was rejected by the joint committee based on the extent of its visual impact. The bulk of the remaining discussion at the meeting focused on minimizing land acquisition impacts. The two widest alternatives (Alternatives 6 and 8a) were not discussed extensively due to the extent of their land acquisition requirements. The discussion centered on Alternatives 4 and 8. There was strong support in the joint committee to recommend Alternative 4 as the LPS but some members were reluctant to proceed with such a recommendation without investigating the extent to which removal of the BRT stations from Alternative 8 might result in reductions of the required land acquisition for that alternative. The joint committee asked that Alternative 8 be investigated for potential land acquisition reductions.

At the fourth and final joint meeting of the PWG and the OCTA Board Subcommittee on the I-405 Major Investment Study the committee was presented with an option to reduce the residential acquisitions of Alternative 8, Alternative 8b. The committee was informed that removing the BRT stations would result in little change to acquisitions of residential property. Reductions in acquisition of commercial property were identified.

Alternative 8b reduces the cross section of the freeway in its narrowest existing section between Valley View Street and Springdale Street where the acquisition of 48 single family residences would be required for Alternative 8. The variation, shown in Figure 5-3, removes the auxiliary lanes between the Valley View Street and Springdale Street/Westminster Boulevard interchanges and narrows the buffer between the HOV lanes and the general purpose lanes. Alternative 8b fits within the existing right-of-way along most of the section between Valley View Street and Springdale Street and reduces the acquisition of single family residences in that area from 48 to 1.

Alternative 8b also shifts the centerline of Alternative 8 north of the interchange at Magnolia Street and reduces the acquisition of single family residences in that area by 10. Alternative 8b requires the potential acquisition of 30 single family residences compared to 87 under Alternative 8. Other potential acquisitions remain the same.

Other data on Alternative 8b were developed with sketch planning techniques through comparative evaluation with the other alternatives. The information developed for Alternative 8b found that the alternative would:

- cost about $1.5 billion, which is slightly less than Alternative 8 because of the reduction in land acquisition costs and a slight reduction in construction costs for the narrower section between Valley View Street and Springdale Street;

- reduce regional travel delay and local arterial travel slightly less than Alternative 8

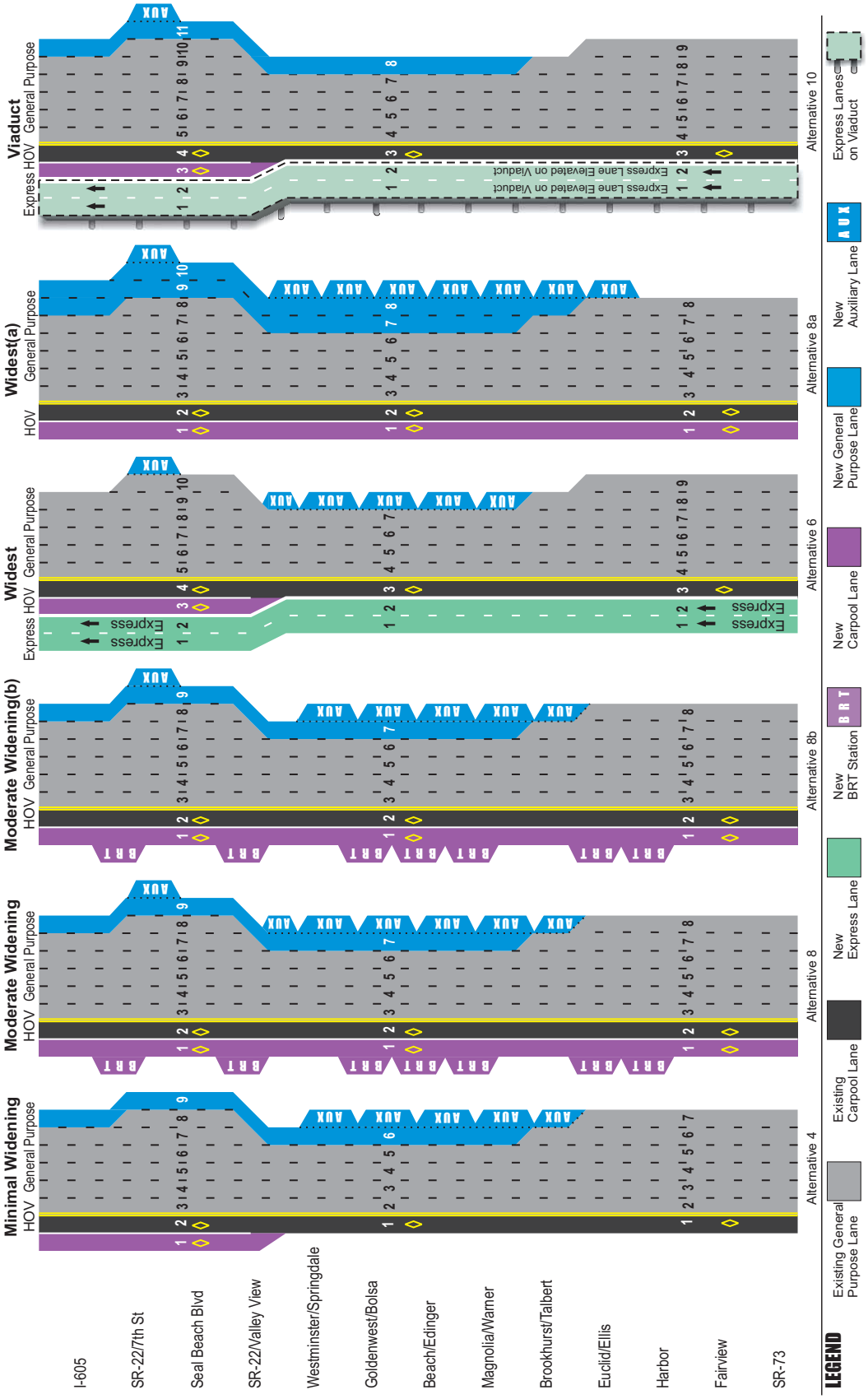


Figure 5-3 Final Alternatives Considered by OCTA Board of Directors and RP&H

because Alternative 8 provides a little more capacity between Valley View Street and Springdale Street;

- increase I-405 speeds in the study area during peak periods slightly less than Alternative 8 because Alternative 8 provides a little more capacity between Valley View Street and Springdale Street;
- be very similar to Alternative 8 in cost effectiveness; and
- require the same acquisition of 15 commercial buildings with 361,000 square feet of footprint as Alternative 8.

Following extensive comments from the public and a committee discussion on the merits of including both Alternative 4 and Alternative 8b in the LPS, the joint committee recommended Alternative 4 as the LPS on August 10, 2005. It was noted that the LPS recommendation was for the right-of-way footprint of Alternative 4 and that the specific future transportation improvements to be implemented within that right-of-way could be different than those included in Alternative 4.

At its September 19, 2005 meeting the OCTA Committee on Regional Planning and Highways (RP&H) reviewed all of the final alternatives shown in Figure 5-3. There was substantial public comment taken at the meeting. The committee passed a resolution recommending Alternative 4 as the LPS for the corridor and forwarded that recommendation to the OCTA Board of Directors for its action.

On October 14, 2005 the OCTA Board of Directors met to consider the LPS for the I-405 corridor from the Los Angeles County line at the I-605 interchange to SR-73. The committee reviewed the alternatives and the RP&H recommendation. The Board heard numerous public comments on the alternatives. The OCTA Board of Directors adopted a resolution identifying Alternative 4 as the Locally Preferred Strategy for the I-405 corridor.

5.3 LOCALLY PREFERRED STRATEGY: ALTERNATIVE 4

Alternative 4 is the Locally Preferred Strategy (LPS) for improvements to I-405 between I-605 and SR-73. The LPS provides for an additional general purpose lane in each direction on the freeway between I-605 and Brookhurst Street. It includes auxiliary lanes linking on-ramps to downstream off-ramps at numerous locations in the corridor as shown in Figure 5-4. Other layouts within the same right-of-way footprint as Alternative 4 could be evaluated when the project advances and be consistent with the LPS. The LPS also provides for improvements to the arterial transit service in the corridor. A complete description of Alternative 4 is provided in Section 3.3.

5.4 NEXT STEPS

The next step toward implementation of improvements on the I-405 corridor is the preparation of environmental documents including an Environmental Impact Report and an Environmental Impact Statement. Their preparation will require an increase in the level of engineering detail over and above what was undertaken for the Major Investment Study. There is no funding

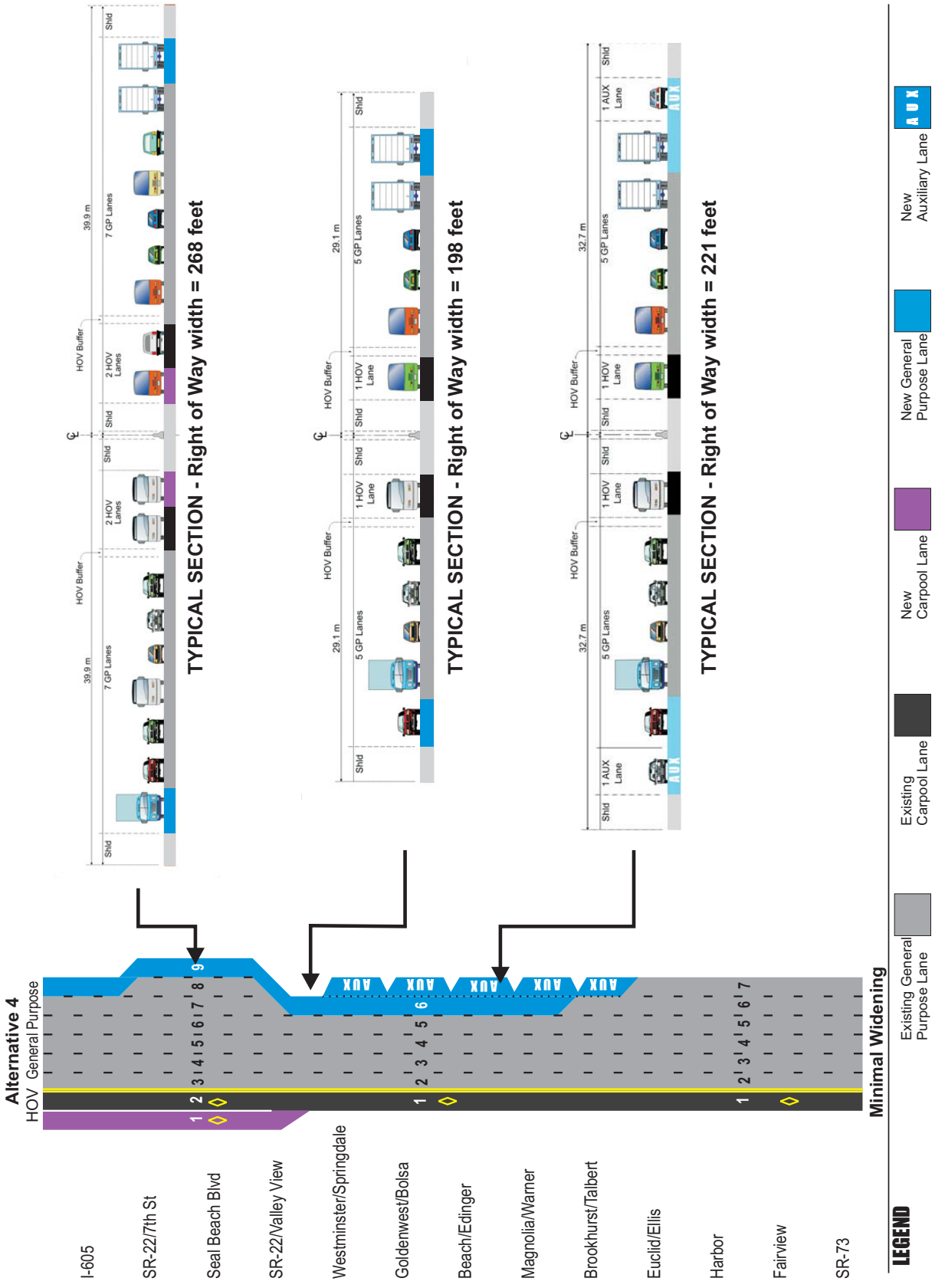


Figure 5-4. Locally Preferred Strategy: Alternative 4

currently identified for completion of the environmental documents. The preparation of the environmental documents is likely to take 2-3 years once fully funded.

The preparation of the environmental documents and the associated engineering will revisit in substantially more detail many of the same topics included in the Major Investment Study. The environmental documents will be prepared in light of the OCTA identification of Alternative 4 as the LPS. However, environmental law requires that all reasonable project alternatives be examined. As a consequence, it is likely that some of the alternatives studied and rejected as the LPS will be examined in more detail.

Major roadway improvements generally include upgrades to meet the latest design standards to improve safety and mobility. All of the alternatives considered in the I-405 Major Investment Study were evaluated based on cross sections that meet all federal and state design standards. At numerous times in the LPS decision process questions were raised with respect to adopting a design with non-standard features in order to increase freeway capacity and reduce impacts. For example, narrowing shoulders was cited as a means of reducing the overall cross section of an alternative and reducing land acquisition impacts.

Before the Federal Highway Administration and Caltrans will consider decisions to accept non-standard features to reduce impacts, impacts must be more thoroughly identified. This requires substantially more engineering detail than is possible in a Major Investment Study. The level of engineering and analysis of impacts necessary to fully assess whether impact mitigation merits adoption of non-standard features are core purposes of the environmental process. Development of the information necessary to prepare the Environmental Impact Report and Environmental Impact Statement includes a level of engineering necessary to definitively identify project impacts. Potential mitigation of impacts requires an assessment of alternative projects and the trade offs between full design standards with their consequential impacts and reduced standards with their consequential impacts including increased safety risks.

Thus, alternatives other than Alternative 4, including wider and higher capacity alternatives that could ultimately incorporate reduced standards, are likely to be studied during the environmental process. It is clear from the process used to identify Alternative 4 as the LPS that the selection of Alternative 4 was predicated upon a balance between its benefits and its impacts, especially its right-of-way impacts. The environmental process, including preparation and approval of the Environmental Impact Report and Environmental Impact Statement, will more fully explore achieving the appropriate balance in light of OCTA's decision that Alternative 4 and its right-of-way footprint achieved that balance better than the other alternatives evaluated in the Major Investment Study.

Although the cross section of Alternative 4 meets current design standards, some other features of Alternative 4 may not meet current design standards. Selected mandatory and advisory design standards appropriate for the level of plans developed for the I-405 MIS were applied to Alternative 4, the LPS. The standards applied included horizontal geometry, interchange spacing, ramp and interchange configuration, and access control. Design standards were applied to the plan view only. Vertical alignments were not developed for the MIS. A summary of the potential non-standard features in Alternative 4 is provided in Table 5-1 and a more complete list in Appendix 6.10. Many are existing non-standard features whose modification would require

engineering beyond the scope of a Major Investment Study.

Non-standard features will be evaluated during the environmental process. Some of the non-standard features identified in Table 5-1 may ultimately require designs that meet full standards, while others may ultimately be approved as design exceptions. All of them will be considered during the environmental process in terms of the impacts that meeting the full standards would entail. Completion of the environmental process will result in the approval of a project to be constructed along with that project's design, impacts, and mitigations.

Table 5-1
Potential Non-Standard Features in Alternative 4

Highway Design Manual Section	Type of Standard	Approximate Number of Non-Standard Occurrences
501.3	Minimum Interchange Spacing – Distance between ramps is too short	20
502.2	Local Street Interchanges – Ramps do not terminate at the major local street	4
504.3(8)	Loop Ramps – Radii are too short	3
504.3(3)	Ramps – Local street intersections are too close to ramp termini	12
504.7	Weaving Sections – Weaving zones are too short	5
504.8	Access Control – Local streets or driveways terminate opposite ramp termini	5

6 APPENDICES

The Appendices to this report are provided exclusively on the *I-405 Major Investmenst Study Final Report* CD-ROM, which contains the entire Final Report including the Executive Summary. The Appendices are listed in the Table of Contents at the beginning of this report. The CD-ROM contains a "readme" file which identifies the contents of the files on the CD-ROM and their file names.