PACIFIC ELECTRIC ROW/ WEST SANTA ANA BRANCH CORRIDOR

ALTERNATIVES ANALYSIS REPORT

CONNECTING COMMUNITIES BETWEEN LOS ANGELES AND ORANGE COUNTIES

February 7, 2013

SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS

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AA	Alternatives Analysis
ACTA	Alameda Corridor Transportation Authority
AQMP	Air Quality Management Plan
BNSF	Burlington Northern Santa Fe
BRT	Bus Rapid Transit
CAA	Federal Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAHSR	California High Speed Rail
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCSP	Climate Change Scoping Plan
CEC	California Energy Commission
CEDD	California Employment Development Department
CEI	Cost-Effectiveness Index
CEQA	California Environmental Quality Act
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CH_4	Methane
CNG	Compressed Natural Gas
COG	Council of Governments
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPUC	California Public Utilities Commission
CRA	California Redevelopment Agency
dB	Decibels
dBA	A-weighted decibel
DEIR	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Study
DMU	Diesel Multiple Unit
DOE	Department of Energy
DOT	Department of Transportation
EIR	Environmental Impact Report
EIS	Environmental Impact Study
EJ	Environmental Justice
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FRA	Federal Railroad Administration
GHG	Greenhouse Gas
GWP	Global Warming Potential

HOT	High Occupancy Toll Lane
HOV	High Occupancy Vehicle
HSST	High Speed Surface Transport
I	Interstate
IEPR	Integrated Energy Policy Report
IPCC	Intergovernmental Panel on Climate Change
ITS	Intelligent Transportation Systems
LACMTA	Los Angeles County Metropolitan Transportation Authority
LADWP	Los Angeles Department of Water and Power
LAX	Los Angeles International Airport
LOS	Level of Service
LRV	Light Rail Vehicle
LRT	Light Rail Transit
LRTP	Long Range Transportation Plan
Maglev	Magnetic Levitation
Metro	Los Angeles Metropolitan Transportation Authority
MIS	Major Investment Study
MOS	Minimum Operable Segment
N_2O	Nitrous Oxide
NABI	North American Bus Industries
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	Nitrogen Dioxide
NRHP	National Register of Historical Properties
NRIS	National Register Information System
OCS	Operating Control System
OCTA	Orange County Transportation Authority
OHP	California Office of Historic Preservation
OLDA	Orange Line Development Authority
O&M	Operating and Maintenance
PE	Pacific Electric
PEROW/WSAB	Pacific Electric Right of Way/West Santa Ana Branch Corridor
PM_{10}	Particulate matter less than 10 microns in diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
ROW	right-of-way
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan
SARTC	Santa Ana Regional Transportation Center
SC	Steering Committee
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments

SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SO_2	Sulfur Dioxide
SOV	Single Occupancy Vehicle
SR	State Route
TAC	Technical Advisory Committee
TAZ	Transportation Analysis Zone
TDM	Travel Demand Modeling
TGC	Southern California Gas Company
TIP	Transportation Improvement Program
TOD	Transit-oriented Development
TSM	Transportation Systems Management
UNFCCC	United Nations Framework Convention on Climate Change
UP	Union Pacific
USACE	US Army Corp of Engineers
USEPA	US Environmental Protection Agency
VdB	Vibration decibels
VMT	Vehicle Miles Traveled
WSAB	West Santa Ana Branch

1.0 PURPOSE AND NEED

The Southern California Association of Governments (SCAG), in coordination with the Los Angeles County Metropolitan Transportation Authority (Metro) and the Orange County Transportation Authority (OCTA), has completed an Alternatives Analysis (AA) study to explore opportunities for connecting Los Angeles and Orange Counties through the reuse of the Pacific Electric Right-of-Way/West Santa Ana Branch Corridor (PEROW/WSAB Corridor). The AA study also evaluated possible connections from the PEROW/WSAB Corridor north to Union Station in Downtown Los Angeles, and south to the Santa Ana Regional Transportation Center (SARTC).

Initiated in February 2010, the purpose of the AA study was to identify and assess a full range of transportation alternatives, and recommend a preferred alternative(s) that addresses Corridor mobility needs in the year 2035. The AA efforts followed the Federal Transit Administration (FTA) guidelines and standards to not only provide a reasoned basis for the selection of the Recommended Alternative, but also to ensure that the identified transportation alternative is eligible for future federal funding if available. The study process included three phases of evaluation to screen a wide range of possible alternatives to the most viable alternative that meets the identified project goals and Purpose and Need. Each screening phase incorporated technical and environmental analyses, along with community and stakeholder input. The first two evaluation phase efforts were documented in the *PEROW/WSAB Corridor AA Initial Screening Report* completed in July 2011. The third level of evaluation assessing the Final Alternatives is documented in this AA report.

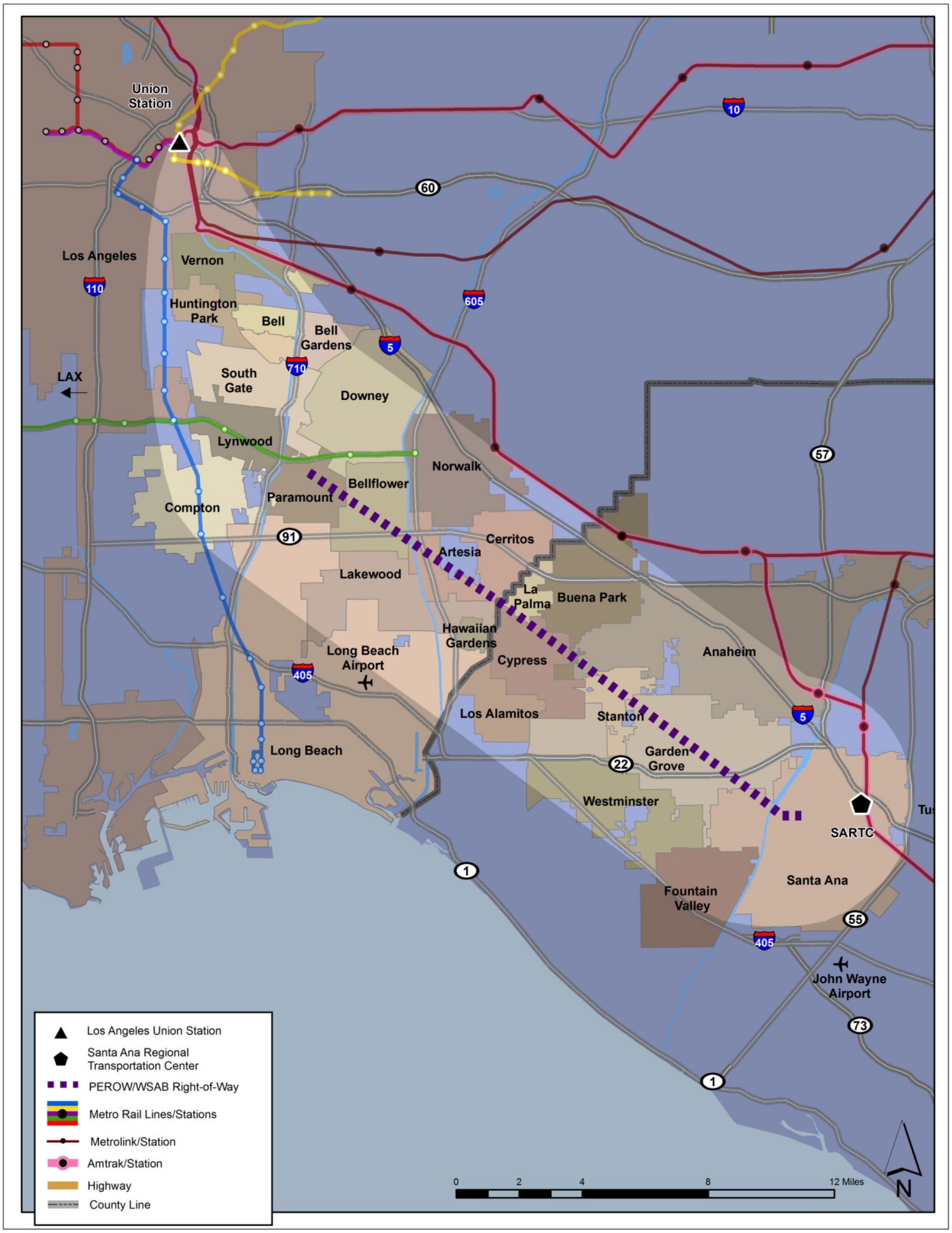
This chapter presents an overview of the Corridor Study Area and a summary of the Mobility Problem and Purpose and Need Statement as documented in the *PEROW/WSAB Corridor AA Purpose and Need Report*. The Corridor's current and projected (2035) mobility problems are presented and an overall project purpose and need for a new transportation investment strategy is defined by:

1. Providing a description of the Corridor Study Area, its characteristics, and context;
2. Identifying mobility problems and concerns in the Corridor; and
3. Relating the Corridor mobility problems and concerns to applicable transportation, land use, economic development, environmental, and other goals and objectives to identify an overall purpose and need for transportation improvements.

1.1 Corridor Description

The PEROW/WSAB Corridor is a densely developed area comprised of the most active hearts of Los Angeles and Orange counties, including Downtown Los Angeles, the Gateway Cities subregion of Los Angeles County, the growing western and central portions of Orange County, and Downtown Santa Ana as illustrated in Figure 1.1. Currently home to 4.5 million people, or approximately one-third of Los Angeles County's population and half of Orange County's residents, the Corridor's population is projected to increase with more than 500,000 residents by 2035. In 2035, 44 percent of Orange County's total employment, and approximately one-third of Los Angeles County's total jobs will be located here.

Figure 1.1 – Corridor Study Area



The PEROW/WSAB Corridor right-of-way (ROW) was formerly part of the Pacific Electric (PE) Railway, or Red Car, system that provided transit service throughout Southern California from 1901 to 1961. At its peak, the PE Railway system connected cities throughout Los Angeles, Orange, Riverside, and San Bernardino counties. Passenger service operating on the ROW ran south from Downtown Los Angeles, along the alignment currently used by the Metro Blue Line, to the Watts Station where the line turned southeast to travel along the ROW to a terminal station in Santa Ana. Passenger service to Santa Ana ceased in 1950 and to Bellflower in 1955. Now owned by Metro and OCTA, the ROW is known as the West Santa Ana Branch in Los Angeles County and the Pacific Electric ROW in Orange County. The PEROW/WSAB Corridor ROW has been primarily unused since PE service ended in 1961.

The core of the 34-mile long study area is the former PE Railway ROW that extends for 20 miles at a diagonal between Paramount in Los Angeles County and Santa Ana in Orange County. The AA effort evaluated possible transit connections 12 miles north from the termination of the PEROW/WSAB Corridor ROW in Paramount to Union Station in Downtown Los Angeles, and two miles south from the ROW terminus at the edge of Santa Ana to the SARTC. The study area is approximately eight miles in width, or four miles on either side of the ROW centerline bordered by two parallel heavily-traveled freeways – the I-5 to the north and the I-405 to the south. The approximate study area boundaries are:

- ***North*** – Union Station in Downtown Los Angeles, the east bank of the Los Angeles River, and the I-5/Santa Ana Freeway;
- ***East*** – the SARTC located in eastern Downtown Santa Ana;
- ***South*** – the I-405/San Diego Freeway; and
- ***West*** – Metro Blue Line north to Downtown Los Angeles.

The study area was divided into three sections for analytical purposes and to reflect different physical conditions, funding, and agency coordination requirements and possible phasing decisions:

1. **PEROW/WSAB Area** – This portion of the study area includes the former PE Railway ROW, with a majority (60 percent) of the alignment located in Orange County. Cities included in this area are: Anaheim, Artesia, Bellflower, Buena Park, Cerritos, Compton, Cypress, Downey, Fountain Valley (part), Garden Grove, Hawaiian Gardens, Lakewood, La Palma, Long Beach (part), Los Alamitos, Lynwood, Norwalk, Orange, Paramount, Pico Rivera (part), Santa Ana, Stanton, South Gate, Tustin (part), and Westminster (part).
2. **Northern Connection Area** – Consists of the portion of the study area extending north from where the PEROW/WSAB ROW terminates in Paramount to Downtown Los Angeles. Possible northern connections were explored in the area bounded on the west by the Metro Blue Line and on the east by several active and inactive railroad ROWs. Cities included in this area are: Bell, Bell Gardens, Compton, Cudahy, Downey, Huntington Park, Los Angeles (part), Lynwood, Maywood, Norwalk, Paramount (part), South Gate, and Vernon.
3. **Southern Connection Area** – This street-running segment extends east from where the PEROW/WSAB Corridor ends at Harbor Boulevard through the city of Santa Ana to the SARTC.

1.1.1 Activity Centers and Destinations

As Figure 1.2 shows, the Corridor contains a wide variety of civic, education, commercial, cultural, entertainment, recreational, and employment destinations that attract local, regional, and national travelers:

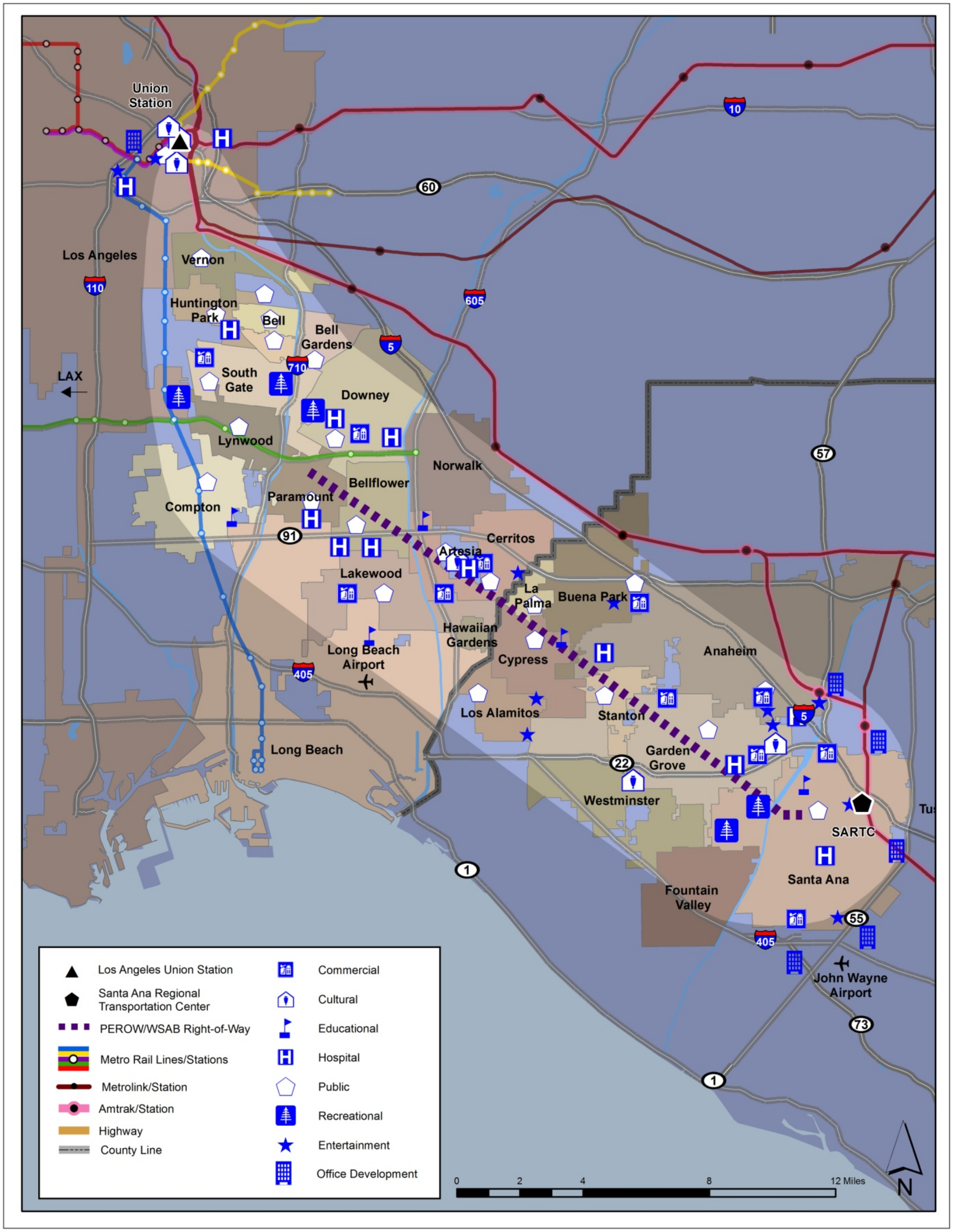
- ***Public facilities***, including civic centers, community centers, and the Anaheim and Los Angeles convention centers;
- ***Commercial areas***, including main street retail districts and regional shopping centers;
- ***Educational institutions***, including public and private schools and five community colleges;
- ***Cultural and entertainment venues***, including the Music Center, Los Angeles Live, and Staples Center in Downtown Los Angeles, the Cerritos Center for the Performing Arts, the City National Grove of Anaheim, the Honda Center, the Angel Stadium of Anaheim, Knott's Berry Farm, Disneyland, Disney California Adventure Park, Downtown Disney, and the Orange County Performing Arts Center;
- ***Ethnic cultural centers***, including Chinatown, Little Tokyo, and Olvera Street in Downtown Los Angeles, Little India in Artesia, and Little Saigon in Westminster;
- ***Medical facilities***, including many locally important and nationally-recognized health care facilities from California Hospital and Medical Center and the County/USC Hospital/Medical Center in Downtown Los Angeles to the University of California, Irvine Medical Center in Orange;
- ***Recreational facilities***, including El Dorado Regional Park, Pueblo de Los Angeles State Park, Watts Tower State Historic Park, Cerritos Regional Park, and Centennial Regional Park;
- ***Office space*** in Downtown Los Angeles, Anaheim, Santa Ana, and Orange; and
- ***Industrial, manufacturing, warehousing, and intermodal facilities*** in Bell, Bell Gardens, Cudahy, Downey, Huntington Park, Los Angeles, Lynwood, South Gate, and Vernon.

1.1.2 Demographic Characteristics

The PEROW/WSAB Corridor was recommended for study because of the following characteristics:

- ***High population growth*** – Currently home to 4.5 million people, the Corridor's population is projected to grow by 12 percent or more than 500,000 residents by 2035.
- ***High population density*** – The population density is and will remain 1.5 to 3.0 times higher than the Los Angeles and Orange county averages respectively. By 2035, study area population density is forecasted to increase by 12 percent to an average of just under 12,000 people per square mile, with portions exceeding 14,000 residents per square mile.
- ***High level of employment*** – In 2035, with more than 2.3 million jobs, the study area will remain a major employment destination containing 29 percent of Los Angeles County jobs and 44 percent of Orange County's total employment.
- ***Increasing employment density*** – Similar to current conditions, future employment density will be 1.6 to 2.2 times higher than the Los Angeles and Orange County averages respectively.

Figure 1.2 – Corridor Activity Centers and Destinations



- ***High number of low-income households*** – Currently, more than 36 percent of all study area households are designated as low-income – twice the Orange County average and 20 percent higher than the urbanized Los Angeles County average. Low-income households are distributed throughout both county portions of the study area, with the highest number (45 percent) located in the northern Los Angeles County portion of the study area.
- ***High number of transit-dependent households*** – Today, sixteen percent of Corridor households lack access to an automobile – three times the Orange County average and 20 percent higher than the urbanized Los Angeles County average. A growing percentage of the Corridor's population will be reliant on transit in the future based on factors including an aging population and a forecast loss of jobs in the northern portion of the study area.

1.1.3 Economic Trends

While employment rich, with four times the jobs of San Diego – California's second largest city, the study area faces significant employment changes and challenges. Future forecasts show the northern Los Angeles County portion of the Corridor continuing to experience the loss of manufacturing and warehousing jobs, while the Orange County section will experience increased employment.

During the last two decades, most metropolitan economies have been shifting away from manufacturing to service sector jobs as part of long term structural changes to the U.S. economy. With its concentration of industrial and warehousing uses, the Los Angeles County portion of the study area once was the manufacturing heartland of Southern California. Employment in this portion of the study area has suffered disproportionately from the economic restructuring as reflected by the following:

- A large number of manufacturers have moved out of Southern California to lower production cost areas such as the southeastern U.S. and to developing countries in order to remain viable in an increasingly competitive global economy.
- Distribution firms have relocated from this area to avoid the increasing freeway and arterial congestion impacts on trucking activities. Major distribution centers have been developed in Southern California's Inland Empire replacing the functions that were once performed here.

Short term projections (for 2008 to 2018) prepared by the California Employment Development Department (CEDD) for both Los Angeles and Orange counties show a continued decline in manufacturing employment, with the decline being sharper for Los Angeles County. This is a long term trend that is expected to continue. In the future, while continuing to contain 29 percent of Los Angeles County's total employment, the northern portion of the Corridor is projected to lose four percent of its current jobs due to the ongoing economic restructuring. The projected decline in employment will have a significant impact on the communities in this area, which already have a high percentage of unemployment (ranging between 15 and 25 percent in half of the communities located in the Gateway Cities portion), and correspondingly, low-income (45 percent) and transit-dependent households (23 percent). Providing study area residents with improved access to employment opportunities elsewhere in the region will become of increasing importance.

Conversely, the Orange County portion of the Corridor is forecasted to experience a 19 percent growth to 44 percent of the county's total employment by 2035. Currently, this portion of the study area is attractive to the development of new service industry employment due to factors including the availability of a professional workforce and land to build new office space, along with better peak period access due to the on-going investment in the county's highway system. As the Orange County portion of the Corridor attracts an increasing number of jobs, maintaining ease of peak period travel access will be the key to maintaining this area's attractiveness for job development.

1.1.4 Travel Markets and Characteristics

The Corridor contains a wide variety of activity centers and destinations resulting in a diverse set of travel markets with the following primary travel markets:

- Commuters accessing major office employment areas located in Los Angeles, Anaheim, Orange, and Santa Ana;
- Commuters accessing industrial, manufacturing, warehousing, and intermodal facilities in Los Angeles, Bell, Cudahy, Downey, Huntington Park, Lynwood, South Gate, and Vernon;
- Students, teachers, and employees traveling to public and private educational institutions, including five existing and one planned community colleges;
- Visitors, including residents and tourists, accessing entertainment centers and special event generators such as Staples Center, Disneyland, and Knott's Berry Farm;
- Residents and visitors traveling to the performing arts centers in Los Angeles and Cerritos;
- Shoppers traveling to the Corridor's main street retail districts, such as Pacific Boulevard in Huntington Park and Downtown Santa Ana, and regional shopping centers;
- Residents and visitors traveling to shop or attend special events in one of the Corridor's ethnic cultural centers;
- Patients, visitors, and employees traveling to the Corridor's many hospitals and medical facilities;
- Out-of-town visitors traveling to the Anaheim and Los Angeles convention centers, and adjacent hotels, food, shopping, and entertainment activities;
- Residents and visitors traveling to recreational facilities, including state, regional, and local parks; and
- Transit-dependent residents, including senior, student, disabled, and low-income travelers, making transit connections to the regional and local bus and rail systems.

Many of these destinations attract local and regional trips from throughout Los Angeles and Orange counties, and beyond. The wide range of destinations results in a significant number of non-work trips, including entertainment, cultural, and recreational travel. As demonstrated by other cities, including San Diego and Portland, a diverse set of trip types would widen and strengthen the utilization and viability of a transit system investment.

The most frequent type of Corridor trip is travel to work. This trip type occurs during a limited, but lengthening, window of time (morning and evening peak periods) and results in significant congestion on a majority of the study area's highway system. Reflecting the predominant current transportation investment in the Corridor's highway system, travel to work is characterized by a high level of automobile use – 86 percent in 2006 – as documented in the *PEROW/WSAB Corridor AA Purpose and Need Report*.

Given the projected future growth in the Corridor's population and employment, there will be a corresponding significant increase in daily travel. By 2035, 12.8 million new daily trips will be added to the Corridor's constrained highway system. Of those trips, 20 percent or 2.6 million daily trips will both originate in and remain in this 34-mile by eight-mile Corridor. Even with implementation of the planned and funded highway improvements, the Corridor's freeway and arterial system will experience worsening operations. Implementation of a high-capacity transit system could accommodate a portion of the future travel demand, and reduce future impacts on the Corridor's congested highway system, and provide another travel option.

1.2 Corridor Transportation System

At first glance, the study area appears to be well served by the regional transportation system illustrated in Figure 1.3 with seven freeways in or framing the study area, an extensive arterial street system, bus transit service provided by five operators, and city-based circulator services, but the system serving this densely-populated Corridor faces significant transportation challenges. The Corridor's transportation infrastructure is severely congested, and there is a limited range in transportation alternatives. Currently, travel demand on the freeway and arterial network exceeds the system's capacity in many places, resulting in considerable congestion during peak periods.

Even with the planned highway system improvements, study area travelers are projected to experience continuing and worsening freeway and arterial congestion through 2035. Although a wide range of bus are provided, including local, limited, express, and rapid lines, buses must operate on the same congested highway system as auto travel. Residents have limited access to the regional and Metro rail system in Los Angeles County. A single connection to the Los Angeles County rail system exists through the east-west running Metro Green Line. This Light Rail Transit (LRT) line operates in the northern portion of the study area, but does not serve the Corridor's primarily north-south travel patterns. Regional intercity service provided by Metrolink and Amtrak rail service is available only at the northernmost and southernmost ends of the study area, and does not operate through the study area.

Figure 1.3 – Corridor Transportation System

While highway system improvements are planned to improve flow and travel speeds, minor investments are proposed for the study area's bus transit service, and no improvements are proposed for rail service improvements. Study area residents will continue to have limited travel options – private automobile or bus transit – both using the same congested highway system. Minor investments are planned for the area's bus transit service which may improve mobility, but only in limited portions of the study area. With the forecast population and employment growth, the lack of investment in the area's transit infrastructure will limit mobility and transportation choices, adversely affecting future Corridor travel and economic vitality.

1.3 Mobility Problem

The ability to move quickly and efficiently in the PEROW/WSAB Corridor can be expressed in terms of freeway and arterial congestion, along with transit system accessibility and choice. This densely populated Corridor faces significant mobility challenges today and in the future with the forecasted growth in travel demand due to population and employment growth. As documented in the *PEROW/WSAB Corridor AA Purpose and Need Report,* by 2035 more than 12.8 million additional daily trips will occur in the Corridor straining the existing transportation network and without transportation system improvements, the Corridor's mobility problem can be described in terms of:

- **Freeway and arterial congestion** – The freeway system serving the Corridor is currently highly congested resulting in travel time delays for a significant portion of each day. Correspondingly, a large percentage of the study area's major arterial intersections currently operate at or beyond capacity during both peak travel periods.
- **Transit system constraints** – Travelers in the study area lack transit system options and connections both within the Corridor, and beyond the Corridor to the regional transit system.
- **Limited travel options** – The Corridor has limited travel options available to residents, with a current average of 86 percent of daily work trips made by automobile.

The Corridor's congested freeway and arterial street system, together with the limited bus and rail service, offer insufficient capacity and travel options to accommodate the forecast increase in daily trips. Development of an effective multi-modal transportation network is essential to meet the future mobility needs of Corridor residents and businesses by providing vital Corridor linkages.

1.3.1 Freeway and Arterial Congestion

Currently, a majority of the area's freeway and arterial system experiences severe congestion and operates near or at capacity during the morning and evening peak periods. Even with the planned highway system improvements, study area travelers are projected to experience:

- ***Continuing freeway congestion*** – In 2035, six of the study area's seven freeways are projected to operate at Level of Service (LOS) E or F along 80 to 100 percent of their study area lane miles during the evening peak period, and five of the seven freeways will be similarly constrained during the morning peak.

- ***Increasing arterial congestion*** – In 2035, arterial congestion is projected to increase to 90 to 100 percent of capacity on key routes, with many arterials forecasted to decline to LOS F.

1.3.2 Transit System Constraints

In the study area, bus service is the predominant transit option currently available to Corridor residents. The regional Metrolink commuter rail system is accessible only at the northernmost and southernmost ends of the study area. While the Metro Green Line is located in the Los Angeles County portion of the study area, its east-west operations do not adequately serve the Corridor's primarily north-south travel patterns, or its destinations and activity centers. No transit infrastructure improvements are planned beyond minor bus service increases, which will improve mobility, but only in limited portions of the study area. With the forecast growth in population, employment, and daily travel, along with the high level of low-income and transit-dependent households, and without future transit system improvements, study area mobility will be negatively impacted by:

- ***Limited modal choices*** – Corridor travelers must choose between the private automobile and bus transit for travel; both modes operate on an increasingly congested highway system.
- ***Constrained bus transit service*** – Congested highway conditions negatively impact schedule adherence, making bus travel slow and unattractive to both transit-dependent and choice riders.
- ***Lack of transit service coordination*** – The study area covers portions of two counties and the multiple bus and circulator services are not planned or operated to accommodate seamless travel across the county line. The resulting service is fragmented with gaps in the study area's transit network.

1.3.3 Regional Transit System Connectivity

Today, the regional transit system is comprised of two services – the Los Angeles County Metro urban rail system and the six-county Metrolink commuter rail system. Study area residents have poor connections to the regional transit system with access to only one Metro urban rail line, and two points of access to Metrolink commuter rail service. The only connection to the Metro rail system exists through the east-west running Metro Green Line. While this LRT line operates in the northern portion of the study area, it does not serve the Corridor's primarily north-south travel patterns. The Metro Blue Line, running between downtown Los Angeles and Long Beach, is accessible through a connection to the Green Line, but does not serve the Corridor.

Access to regional intercity Metrolink service is available only at the northernmost and southernmost ends of the 34-mile long Corridor at Union Station and the SARTC, and operates beyond the study area's northern boundary. This poor level of connections to the regional system limits mobility and travel choices, and will become more detrimental to future Corridor travel and economic vitality as the study area's population, employment, and correspondingly travel needs continue to grow. Reuse of the former PE Railway ROW offers a unique opportunity to implement high-capacity transit service in a dedicated ROW for approximately 60 percent of the proposed project length.

1.4 Purpose and Need

Development of an effective multi-modal transportation network within the PEROW/WSAB Corridor is necessary to meet the future mobility needs of residents and businesses by providing vital linkages both within the Corridor and beyond to the expanding regional transit system. By the year 2035, the magnitude and nature of the Corridor's population and employment growth trends are projected to result in continuing transportation challenges as evidenced by the following:

- ***Increasing travel*** – By 2035, more than 12.8 million additional daily study area trips will occur with 2.8 million daily trips both originating and remaining in the Corridor. The growth in trips within, to, and from the study area will strain the available transportation network.
- ***Continuing highway system congestion*** – Even with planned highway system improvements, travelers are forecasted to experience continuing freeway and arterial congestion. In 2035, a majority of the study area's freeways and major arterials are projected to operate at or nearing capacity during both peak periods.
- ***Limited travel options*** – Currently, Corridor residents must choose between the private automobile and bus transit for travel, with both modes operating on an increasingly congested highway system.
- ***Poor connections to the regional transit system*** – Residents currently have access to only one Metro urban rail line, and limited access to Metrolink service. The lack of high-capacity transit connections to the regional transit system constrains study area mobility and travel choices.
- ***Continued poor linkages to and from Corridor destinations and activity centers*** – The study area contains a diverse and unique set of local, regional, and national destinations and activity centers. Access to these destinations will become increasingly constrained as future highway congestion worsens negatively impacting their economic vitality.
- ***Growing transit-dependent population*** – With 16 percent of the study area's households currently lacking access to an automobile, along with a large number of low-income households, a forecast loss of jobs in the northern portion of the study area, and an aging population, an increasing percentage of the Corridor's population will be reliant on transit service in the future.

Implementation of a high-capacity transportation system in the Corridor is vital to address future connectivity and mobility challenges. The underlying needs supporting transportation improvements in the study area include:

- **The Corridor houses a major and diverse set of activity centers and destinations.**
  The PEROW/WSAB Corridor is a densely-developed comprised of the most active hearts of Los Angeles and Orange counties that has a diverse and unique combination of local, regional, and national destinations. The Corridor contains many local residential neighborhoods, community civic centers, shopping districts and centers, educational institutions, and medical facilities. There are concentrations of employment centers ranging from industrial uses in the northern portion of the study area to office employment centers in Downtown Los Angeles, Anaheim, and Santa Ana. In addition, this densely-developed Corridor is home to a significant number of regional and

national destinations ranging from Staples Center in Downtown Los Angeles at one end of the Corridor to Disneyland and Knott's Berry Farm at the other. Current and future congested travel conditions and poor transportation system connectivity make the Corridor's destinations and activity centers less attractive to residents and visitors negatively impacting the Corridor's quality of life and economic vitality.

- **The study area will continue to capture a large share of regional population and employment.**
  Currently home to 4.5 million people, the Corridor's population is projected to increase by more than 500,000 new residents by 2035. The study area's high percentage of regional employment will continue with 44 percent of Orange County's total employment, and approximately one-third of Los Angeles County's total jobs located here.

- **There will be a high level of future travel demand.**
  By 2035, total daily travel originating and remaining in the Corridor will increase by 36 percent with 12.8 million new daily trips straining the existing transportation network. A significant number of the projected trips – an additional 2.6 million daily trips – will both originate and remain in the Corridor.

- **The current and future Corridor highway system operates at capacity and beyond.**
  Today, the freeway and arterial system serving the Corridor is highly congested resulting in travel delays with many segments of freeways and major arterials operating at or near capacity during peak periods. Even with implementation of the planned highway improvements, increasing daily travel will adversely impact highway system capacity, and the level of service on the already congested highway network will continue to decline.

- **Corridor residents have limited travel options.**
  Currently, Corridor residents have two travel options – private automobile and bus transit – both of which operate on an increasingly congested highway system. Automobile travel remains more attractive with 86 percent of Corridor work trips made by car. Bus transit is constrained in effectiveness and patron convenience by traffic congestion and poor coordination across the county line between service providers.

- **Corridor residents have poor connections to the regional rail system.**
  The study area has weak connections to the expanding regional transit system. Currently, the Corridor has only one connection to the Metro urban rail system, and two points of access to the regional Metrolink commuter rail system. The only connection to the Metro rail system exists through the east-west running Metro Green Line, which does not serve the Corridor's primarily north-south travel patterns. Access to regional intercity Metrolink service is available only at the northernmost and southernmost ends of the 34-mile long Corridor at Union Station and the SARTC, and operates beyond the study area's northern boundary. This poor level of regional transit system linkages will become more detrimental to future Corridor travel and economic development as study area population and employment continue to grow.

- **There is a strong need to serve changing employment patterns.**
  While remaining a major employment center with 1.1 million jobs in 2035, the northern Los Angeles County portion of the Corridor, once the manufacturing heartland of Southern California, will continue to suffer disproportionately from long term economic structural changes. Since 1990, this section of the study area has lost approximately half a million jobs, and future projections show a continuation of this trend. Providing Northern Connection Area residents with fast, direct transit access to employment opportunities elsewhere in the region will become of increasing importance. Conversely, the Orange County portion of the Corridor is forecasted to experience a 19 percent growth in total employment by 2035. As this portion of the Corridor attracts an increasing number of jobs, forecasted to be 44 percent of the county's total employment, accommodating increased peak period travel access will be key to maintaining this area's attractiveness as an employment destination.

- **Existing and future high population and employment densities support transit.**
  The Corridor's land use patterns result in high levels of residential and employment densities that are supportive of high-capacity transit service. By 2035, the average study area population density will be an average of approximately 12,000 residents per square mile, with portions such as Northern Orange County, Gateway Cities North, and Downtown Los Angeles exceeding that average. Population densities of areas currently served by the Los Angeles County Metro rail system range from 10,100 (LRT) to 22,400 (subway) people per square mile.

  Corridor employment densities serve as indicators of the level of economic activity and as future support for a high-capacity transit system. In 2035, the average Corridor employment density is forecasted to be 5,400 jobs per square mile, with areas such as Downtown Los Angeles (14,000) and Northeast Orange County (9,500) exceeding that average. In comparison, employment densities of areas currently served by the Metro rail system range from 2,500 (LRT) to 14,000 (subway) jobs per square mile.

- **The study area has, and will continue to have, a large transit-dependent population.**
  Today, a Corridor-wide average of 16 percent of all households was identified as without access to an automobile. This is three times the Orange County average and 20 percent higher than that of urbanized Los Angeles County. The number of transit-dependent residents is expected to increase in the future reflecting the large number of low-income households, the continued loss of jobs in the northern portion of the study area, and an aging population. All of these factors will contribute to a growing reliance on the Corridor's transit system in the future.

2.0 ALTERNATIVES CONSIDERED

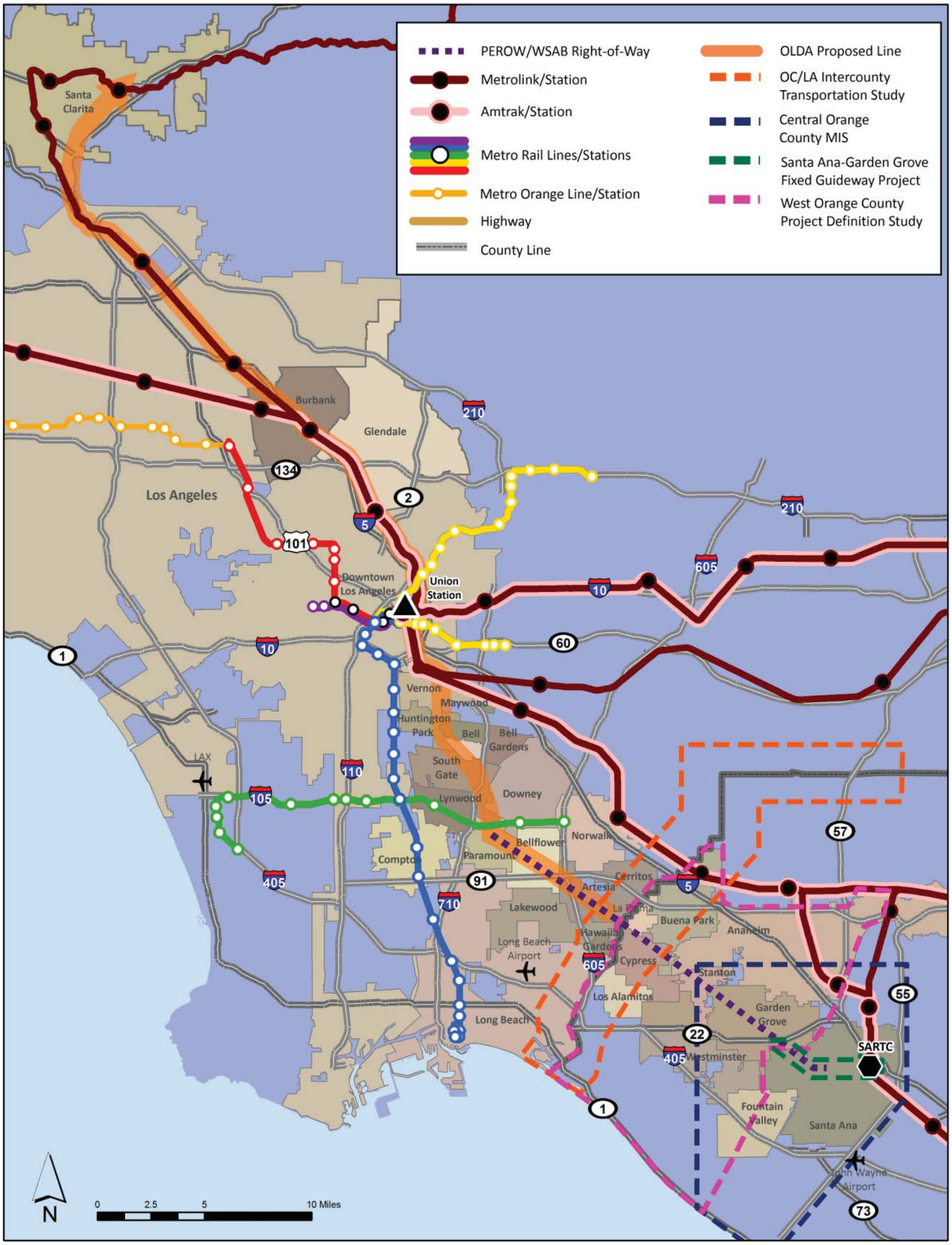
This chapter documents the development of the Recommended Alternative(s) for the PEROW/WSAB Corridor. A wide range of possible transportation alternatives was identified based on past corridor studies and in consultation with elected officials, stakeholders, city and agency staff, and the community during the project initiation phase. The resulting transit options were evaluated and refined through a three-step screening process to identify the Recommended Alternative(s) that best meets the mobility needs and goals for transit improvements in the Corridor. The first two screening efforts were documented in the *PEROW/WSAB Corridor AA Initial Screening Report* completed in July 2011. The final level of evaluation of the Final Alternatives is documented in this AA report.

2.1 Previous Study Efforts

Starting in 1996, numerous studies have identified the need for improved travel connections between Los Angeles and Orange counties, including the reuse of all or portions of the PEROW/WSAB Corridor for transit purposes once again. The studies concluded that travel between the two counties, as well as within the study area, was constrained and strongly in need of capacity improvements. As illustrated in Figure 2.1, the most recent studies evaluating reuse of the Corridor are:

- **West Orange County Project Definition Study (2003)** – This OCTA study evaluated potential rail options in the western portion of Orange County. The final study recommendation proposed use of the Orange County portion of the PEROW/WSAB Right-of-Way (ROW) with a Light Rail Transit (LRT) system.
- **Orangeline High Speed Magnetic Levitation Project (2005-2006)** – The Orangeline Development Authority (OLDA), a joint powers agency, prepared preliminary planning and engineering reports for a high speed magnetic levitation (maglev) system between the cities of Palmdale and Santa Ana using various alignments including the PEROW/WSAB ROW.
- **Orange and Los Angeles Intercounty Transportation Study (2008)** – This joint study by OCTA and Metro evaluated alternatives for improving transportation infrastructure and services between the two counties, including possible reuse of the PEROW/WSAB ROW with Bus Rapid Transit (BRT), LRT, and other transit service options. The study demonstrated the need for and feasibility of transit system improvements along the ROW.
- **Central County Corridor Major Investment Study (2010)** – This OCTA study assessed the need for transportation improvements in central Orange County. One proposed transit project, identified for further study, recommended reuse of the Orange County portion of the PEROW/WSAB Corridor for Street Car or BRT service.
- **Santa Ana-Garden Grove Fixed Guideway Corridor Study (2009-Present)** – The City of Santa Ana is evaluating the feasibility of Street Car service connecting the Santa Ana Regional Transportation Center (SARTC), the Lacy Neighborhood, downtown Santa Ana, and the Civic Center area. Future expansion of the system from the Civic Center area would use the PEROW/WSAB ROW to extend service to Bristol Boulevard in Santa Ana as a Phase I terminus,

Figure 2.1 – Previous Studies in Corridor Study Area



and then to Harbor Boulevard in Garden Grove as a Phase II terminus. Proposed system information from this study has been reflected in this AA study.

The West Santa Ana Branch corridor was identified in the Measure R transportation sales tax program approved by Los Angeles County voters in November 2008. A future project was included in the Recommended Plan portion of Metro's *2009 Long Range Transportation Plan* (LRTP). Adopted in October 2009, Metro's 2009 LRTP was forwarded to SCAG, and a future project placeholder was included in the *2008 Regional Transportation Plan* (RTP) and is included in the draft *2012 RTP*.

2.2 Screening and Selection Process

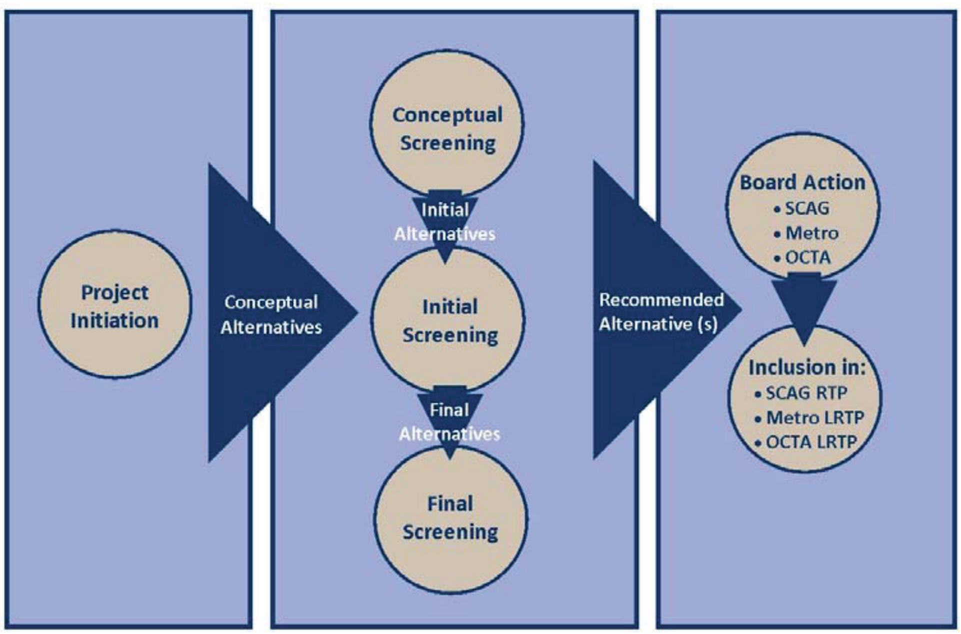
During the AA efforts, transportation alternatives were identified and evaluated through a three-step screening process incorporating technical and environmental analysis, along with community and stakeholder input. The screening efforts were based on project goals identified based on feedback received from the public, stakeholders, and the project's Steering Committee and Technical Advisory Committee (TAC) during project initiation efforts as documented in the *PEROW/WSAB Corridor AA Evaluation Methodology Report*. In addition, the resulting goals and evaluation criteria reflected the project's Purpose and Need, as presented in the *PEROW/WSAB Corridor AA Purpose and Need Report*. The resulting major goals are presented below in the following five main categories corresponding to the federal project evaluation categories:

1. **Public and Stakeholder Support**
   - Provide a desirable solution to the community and stakeholders.
2. **Mobility Improvements**
   - Provide another travel option.
   - Connect to the regional transit system.
   - Serve both community and regional trips.
   - Increase access to and from Corridor destinations and activity centers.
   - Provide a fast travel speed.
   - Provide related pedestrian and bicycle facilities.
3. **Cost-Effectiveness**
   - Provide a cost-effective solution.
4. **Land Use/Economic Plans**
   - Provide station location and spacing that supports local economic development and revitalization plans and goals.
5. **Environmental and Community Impacts**
   - Identify a project that results in no or minimal environmental impacts to adjacent communities.

Using the project goals, a detailed set of evaluation criteria with related performance measures was developed to provide the public and decision-makers with comparative information on the benefits and impacts, as well as the differences between the alternatives. Each evaluation phase refined the results of the previous effort using increasingly detailed engineering, operational, and environmental analysis, along with continued public input. The screening process followed the three-step process summarized below and illustrated in Figure 2.2:

1. ***Conceptual Alternatives Screening*** – A set of nine Conceptual Alternatives, representing a wide range of possible technologies, was identified during the project initiation process based on public and stakeholder input and previous studies. Alternatives were evaluated based on a "meets-does not meet" level of policy and technical assessment, along with stakeholder input. This effort led to the identification of eight Initial Alternatives.
2. ***Initial Screening*** – The Initial Alternatives were assessed based on a comparative initial evaluation of technical and environmental benefits and impacts, along with additional stakeholder and public feedback. This evaluation step resulted in the identification of the Final Alternatives which included four build options offering new transit solutions, along with the No Build and Transportation System Management (TSM) alternatives.
3. ***Final Screening*** – The Final Alternatives were studied and evaluated based on conceptual-level engineering and related technical and environmental information, along with stakeholder and public input, to identify a Recommended Alternative(s).

Figure 2.2 – Screening Process



The Recommended Alternative(s) will be presented to the SCAG Regional Council and Metro and OCTA Boards. The final AA recommendation may be included by SCAG action in the *2012 Regional Transportation Plan (RTP)*, and by Metro and OCTA Board actions in their respective LRTPs. As the owners of the PEROW/WSAB ROW, Metro and OCTA have the option to move the Recommended Alternative(s) forward into the preliminary engineering design and environmental review phase.

2.2.1 Conceptual Set of Alternatives

As documented in the *PEROW/WSAB Corridor AA Initial Screening Report*, Conceptual Alternatives were identified from previous studies, and in consultation with elected officials, stakeholders, city and agency staff through briefings and advisory committee meetings, and with the public through a series of six community meetings. The Conceptual Set of Alternatives included eight built options:

- **BRT** – Two alternatives, including Street-Running and HOV Lane-Running BRT alternatives;
- **Urban Rail** – Three rail options, including Street Car, LRT, and Diesel Multiple Unit (DMU) service; and
- **High Speed Service** – Three High Speed Service (HSS) options, including Commuter Rail Service, Conventional Steel Wheel High Speed Rail, and Magnetic Levitation High Speed Service.

During the first screening phase, the alternatives were evaluated on a “meet-does not meet” level assessment of technical viability, purpose and policy fit, and public support. The conceptual screening effort identified each option’s ability to address the locally-defined goals, and the identified Purpose and Need. A comparative summary of the conceptual screening effort was prepared based on the following criteria and factors:

- **Public Support** – Input was solicited through a series of elected official and stakeholder briefings, Project Steering Committee and TAC meetings, and six community meetings.
- **Trip Types** – Each alternative’s trip-serving capability was assessed based on whether it could serve both local and regional trips based on station spacing, resulting operational speeds, and Southern California experience.
- **Speed** – As identified by Corridor stakeholders and the public, the two criterion used to determine whether an alternative would provide improved travel speed were: the average Metro Blue Line travel speed of 25 miles per hour (mph) as the one transit line most people were familiar with; and the average peak period travel speed for the I-5 Freeway (35 mph or less) in and adjacent to the study area.
- **Station Spacing** – Many Corridor cities have adopted transit-supportive economic development and revitalization plans supporting for their proposed station areas. Alternatives with more frequent station spacing were seen as providing a higher level of support for local development goals than those with wider spacing required due to operational parameters.
- **Service Capacity and Flexibility** – Anticipated ridership levels were identified based on previous Corridor Study Area studies and compared to the passenger capacity provided by typical vehicles for each of the proposed alternatives. Cost-effective service flexibility was identified based on the ability of each of the typical vehicles to be reconfigured to serve peak and non-peak services. For example, LRT service can be scaled from a single car to a three car train to match operational needs.
- **Compatibility with Current Transit Operations** – Compatibility was assessed based on whether there was an existing transit service provider, with previous operational experience, that could

construct, operate, and maintain the proposed alternative, or whether a new service entity would be required with a related learning curve.

- **Fit with Freight Rail Operations** – Freight rail operations fit was assessed based on the alternative's ability to share the existing freight rail right-of-ways (ROWs) from terminus of PEROW/WSAB ROW north to downtown Los Angeles based on FRA rulings and requirements related to shared-operations and crash-compliant vehicles.

A comparative summary of the conceptual screening results are presented in Table 2.1. Reflecting the initial level of assessment, alternatives were identified as either meeting (yes or ✓) or not meeting (no or •) the identified goals and criteria. In some cases, insufficient information was available at this stage in the planning process, and areas that are dependent on factors, such as the final station spacing, the type of vehicle selected, and operational decisions ultimately made, were identified as requiring additional information (▫). For example, if the decision were made to operate the BRT Alternative in a dedicated ROW, it would be capable of providing faster travel service than a street-running alternative.

Table 2.1 – Summary of Conceptual Screening Results

Criteria	Conceptual Alternatives					
	BRT	STCR	LRT	DMU	CR	HSS
Community/stakeholder support and/or interest	•	✓	✓	✓	•	✓
Serves community and regional trips	✓	•	✓	✓	•	•
Provides fast travel service	▫	▫	✓	✓	✓	✓
Station spacing supports local economic development/revitalization goals	✓	✓	✓	✓	•	•
Accommodates peak and non-peak service needs	✓	✓	✓	✓	•	•
Compatible with current transit systems/plans	✓	▫	✓	•	✓	▫/•[1]
Compatible with freight rail operations	•	▫	▫	▫	✓	▫

Notes: STCR – Street Car; CR – Commuter Rail; and HSS – High Speed Service options, Conventional Steel Wheel High Speed Rail Alternative and Magnetic Levitation High Speed Service Alternative.
✓ Yes • No ▫ Dependent on station spacing, vehicle selected, and operational decisions.
[1] The first symbol (▫) represents the finding for the Conventional Steel Wheel High Speed Rail Alternative; the second symbol (•) is for the Magnetic Levitation High Speed Service Alternative.

The resulting information was presented for stakeholder and public input through a series of briefings, meetings, and work sessions. Six community meetings were held at locations throughout the study area and a summary of the outreach efforts and results is presented in Chapter 6.0, Public Input of this report. On July 14, 2010, the Project Steering Committee recommended the deletion of the Commuter Rail Alternative and further study of the remaining seven build alternatives described below.

2.2.2 Initial Set of Alternatives

The Initial Set of Alternatives included the seven build options, which provide a new transit solution, listed below. During this phase, the No Build and Transportation System Management (TSM) options were not evaluated, but the projects to be included in the No Build Alternative, and a list of possible Corridor projects to be included in the TSM Alternative, were presented for public discussion.

1. **Bus Alternative**
   - ***BRT*** – Provide high speed bus service operating in dedicated lanes along the PEROW/WSAB ROW, and connecting north to the Metro rail system in downtown Los Angeles via either freeway high occupancy vehicle (HOV) lanes or street-running operations; and connecting south from the PEROW/WSAB Corridor via street-running operations through downtown Santa Ana to the SARTC.
2. **Urban Rail Alternatives**
   - ***Street Car*** – Build a community-oriented rail system similar to that being considered by the cities of Santa Ana and Garden Grove.
   - ***LRT*** – Build a LRT rail system similar to the Gold and Blue Lines operated by Metro in Los Angeles County.
   - ***DMU*** – Build a self-powered, clean diesel DMU rail system similar to the Sprinter service operated by the North County Transit District in San Diego County.
3. **High Speed Service Alternatives**
   - ***Conventional Steel Wheel High Speed Rail*** – Implement high speed rail service similar to the service being planned by the California High Speed Rail Authority, and operated by Amtrak in the eastern U.S. and by others throughout Europe and Asia.
   - ***Magnetic Levitation High Speed Service*** – Provide high speed maglev service similar to systems operating in Asia.

Initial Screening Efforts and Results

The Initial Set of Alternatives was evaluated based on an initial assessment of technical and environmental benefits and impacts to identify the alternatives that best met the project goals and identified Corridor Purpose and Need, were technically viable, and had stakeholder and community support. At this level of evaluation, technical analysis was based on order-of-magnitude information identified from similar existing transit projects in Southern California and other locations as presented in Table 2.2.

Conceptual definitions of the build alternatives were developed to support this phase's analytical efforts and included: the horizontal alignment, or how each option would travel through the PEROW/WSAB Corridor; the vertical alignment, or whether the alternative would operate at-grade, above-grade, or below-grade; and conceptual station locations identified in working sessions held with the Corridor cities.

Table 2.2 – Existing Transit Systems used for Initial Screening Efforts

PEROW/WSAB ROW Corridor Initial Set of Alternatives	Local or Other Peer System
Bus Rapid Transit (BRT)	Metro Orange Line
Street Car	Portland Street Car
Light Rail Transit (LRT)	Metro Gold and Blue Lines
Diesel Multiple Unit (DMU)	NCTD Sprinter System
Conventional Steel Wheel High Speed Service	California HSR
Magnetic Levitation High Speed Service	Asian maglev systems

The Initial Set of Alternatives was assessed based on a comparative analysis of technical and environmental benefits and impacts to support informed decision-making on a final set of the most viable alternatives for further study. The resulting alternative definition information, along with technical and environmental analyses, is presented in the *PEROW/WSAB Corridor AA Initial Screening Report.* While a full set of evaluation criteria was used to assess the alternatives, Table 2.3 presents a summary of the Initial Screening results based on the following key goals and criteria that were identified by stakeholders and the public:

1. **Public and Stakeholder Support**
   - Provide a desirable solution to the community and stakeholders.
2. **Mobility Improvements**
   - Serve both community and regional trips.
   - Make transit a viable alternative – attracts and serves a high level of daily ridership.
3. **Cost-Effectiveness**
   - Provide a cost-effective solution – balances project costs with expected benefits; resulting construction and operating costs are balanced by strong ridership (cost-effectiveness).
4. **Land Use/Economic Plans**
   - Provide station spacing that supports local economic development and revitalization plans.
5. **Project Feasibility**
   - Fit with current local transit system operations or plans.
   - Has state and federally approved vehicles, and is operational in the U.S.
6. **Environmental and Community Impacts**
   - Minimize the number of properties to be acquired.
   - Result in air quality benefits.

Table 2.3 – Initial Screening Results Summary

Criteria	BRT	Street Car	LRT	DMU	HSS	
					Steel Wheel	Maglev
Serves: Local trips **Regional trips**	✓ ✓	✓	✓ ✓	✓ ✓	 ✓	 ✓
Provides support for local plans	*	✓	✓	*	*	*
Requires minimal property acquisition	Less than 10	Less than 10	10-25	10-25	More than 125	More than 125
Has air quality benefits	Yes	Yes	Yes	No**	Yes	Yes
Fits with local transit system plans	✓	✓	✓	No	No	No
Has State and Federally approved vehicles and U.S. operating system	✓ ✓	State no ✓	✓ ✓	✓ ✓	✓ ✓	Not yet Not yet
Range of conceptual daily ridership	19,200-32,400	26,000-39,000	26,000-57,600	26,000-57,600	2,400-4,800	2,400-4,800
Conceptual cost to build ($2010, billions)	$0.6-2.2[1]	$1.3-4.0[1]	$1.6-4.2[1]	$1.2-4.1[1]	$4.9	$5.9
Conceptual annual cost per rider	$20-50	$10-40	$10-50	$10-50	$460-920	$580-1,150

Notes: * Proven nationally and/or internationally
** Some regional benefits
1 A range of construction costs was identified reflecting at-grade operations at the low end and grade-separated (subway) at the high end; aerial operations would fall mid-range. A single cost is provided for the HSS alternatives as Maglev operations require and Steel Wheel systems work best with grade-separated operations.

Initial Screening results were presented to and discussed through: briefings held with elected officials and stakeholders from each Corridor Study Area city; public presentations to community and stakeholder groups; six community workshops; and study advisory committee briefings, including five TAC meetings, and three Steering Committee meetings. During advisory committee meetings held in March and April of 2011, the following recommendations were developed by the TAC and approved by the Steering Committee:

1. Remove the following three alternatives from further study:
   - **DMU Option**; and
   - **High Speed Service Alternatives**, including both the Conventional Steel Wheel High Speed Rail and Magnetic Levitation High Speed Service options.
2. Add a **Low Speed Magnetic Levitation Alternative** to the study.

2.2.3 Final Set of Alternatives

On April 27, 2011, the following Final Alternatives were approved by the Steering Committee for further study:

1. No Build Alternative
2. Transportation System Management (TSM) Alternative
3. BRT Alternative – Street-Running and HOV Lane-Running options
4. Street Car Alternative
5. LRT Alternative
6. Low Speed Magnetic Levitation Alternative.

2.3 Definition of Final Alternatives

The Final Alternatives were studied and evaluated based on conceptual-level engineering and operating design and technical information, including capital and operating cost estimates, ridership forecast modeling information, land use and development support, environmental impact analysis, and other AA study-related evaluation efforts. The study results are documented in the following chapters and summarized in Chapter 7.0, Comparison of Alternatives. This section describes the Final Set of Alternatives in detail.

For the No Build and TSM alternatives, the following information is presented below:

- **No Build Alternative** – This option included identified Corridor transportation projects that have approved local, county, state, and federal funding. No Build included projects beyond the study area that will expand the regional transit system and may have benefits for Corridor travel.
- **TSM Alternative** – This option addressed the same mobility needs as the build alternatives by maximizing the use and effectiveness of the existing transportation system. TSM included all of the No Build Alternative projects, along with a set of lower capital cost transit and arterial system projects identified with Metro and OCTA for Los Angeles and Orange counties respectively.

For the four build alternatives, the BRT, Street Car, LRT, and Low Speed Magnetic Levitation options, the following alternative-specific information was developed and is presented below:

- **Alternative Description** – an overview of each proposed alternative's modal information;
- **Operational Description** – a conceptual description of the horizontal and vertical alignments, and station locations; and
- **Design and Operational Issues** – As part of this effort, the alternatives were examined to identify engineering, operational, and environmental issues to be resolved during possible future preliminary engineering and environmental review efforts.

The description of the build alternatives was divided into three alignment sections for analytical purposes and to reflect different coordination requirements and possible phasing decisions:

1. **Northern Connection Area** – consists of the approximately 12-mile long study area extending north from the PEROW/WSAB Corridor terminus in Paramount north to downtown Los Angeles. Possible alignments were explored to Union Station in the area from the Metro Blue Line on the west to several active and inactive railroad ROWs adjacent to the Los Angeles River on the east.
2. **PEROW/WSAB Area** – includes the PEROW/WSAB ROW now owned by Metro and OCTA. It is approximately 20 miles long, with 12 miles of the alignment located in Orange County, and the remaining eight miles in Los Angeles County.
3. **Southern Connection Area** – consists of an approximately two mile long area extending southeast from the southern PEROW/WSAB ROW terminus at Raitt Street in Santa Ana east through the city's civic center and downtown areas to the SARTC.

2.3.1 No Build Alternative

The No Build Alternative represents completion of Corridor transportation improvements which have committed local, county, state, and federal funding as identified in constrained plans of the adopted Metro and OCTA LRTPs. This option was used for comparison purposes to assess the relative benefits and impacts of constructing a new transit project in the Corridor Study Area versus implementing only currently planned projects. In addition to providing a comparative basis for the build options, the No Build Alternative was identified as a preferred alternative by some Orange County cities and community members.

Currently planned projects in the Corridor Study Area have been identified from transportation tax measure programs approved by voters in Los Angeles County (Measure R) and Orange County (Measure M2), adopted Metro and OCTA LRTPs, and the SCAG RTP and Regional Transportation Improvement Plan (RTIP). The adopted 2008 RTIP and amendments incorporate approved transportation programs and projects with committed, available, or reasonably available resources. The major approved highway and transit projects located in the study area are presented in Table 2.4 and illustrated in Figures 2.3 and 2.4. The adopted Metro 2009 LRTP includes a future West Santa Ana Branch project for the Los Angeles County section of the PEROW/WSAB ROW, and the OCTA 2010 LRTP includes the Santa Ana-Garden Grove Fixed Guideway Project utilizing a portion of the Orange County section of the ROW.

Table 2.4 – Approved Transportation Improvements in Corridor Study Area (2035)

Project Name	Project Description
Freeway Improvements	
I-5	Construction of mixed-flow and HOV lanes, reconfiguration of interchanges, and widening of bridges
I-405	Construction of mixed-flow lanes and HOV connectors, interchange improvements, and widening of bridges

Figure 2.3 – Approved Highway Projects in Corridor Study Area (2035)

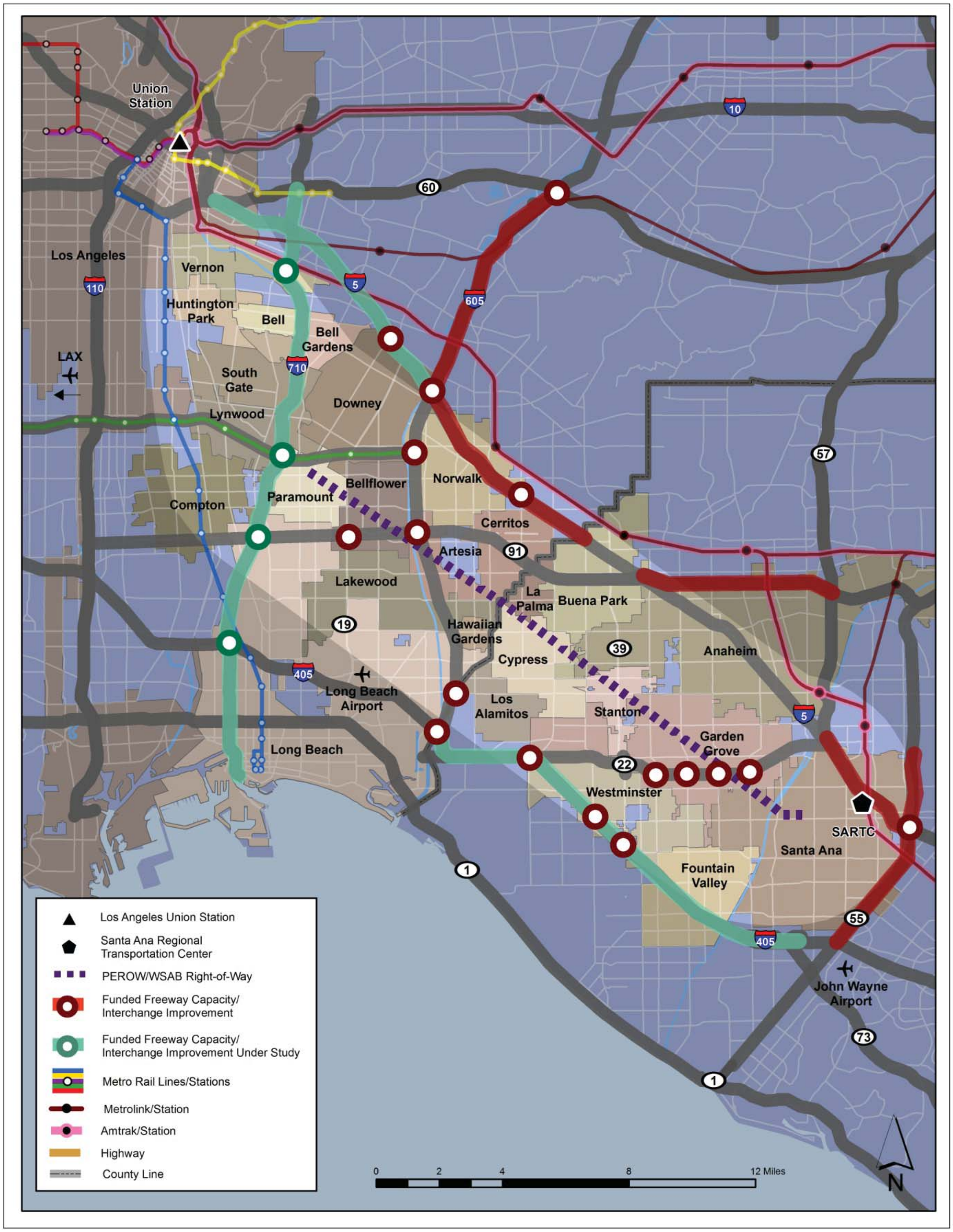


Table 2.4 – Approved Transportation Improvements in Corridor Study Area (2035)

Project Name	Project Description
Freeway Improvements	
I-605	Construction of HOV connectors and improvements to interchanges.
I-710	Construction of mixed-flow and truck-only lane and improvements to interchanges.
SR-22	Construction of HOV lanes, improvements to interchanges, and lengthening of bridges.
SR-55	Construction of additional travel lanes.
SR-91	Provision of mixed flow lane.
Arterial Improvements	
Los Angeles County	$1.5 billion for various arterial projects.
Orange County	$2.0 billion for various arterial projects.
Transit Projects	
Regional Connector Transit Corridor	Downtown Los Angeles LRT connection between Union Station and 7th/Metro Center.
Santa Ana-Garden Grove Fixed Guideway	New fixed guideway project providing regional rail feeder service between the SARTC and Harbor Boulevard.
Long Beach Transit	Increase service frequency on bus routes connecting Long Beach with Orange County.

In addition to the corridor-specific projects identified above other regional transportation system projects anticipated to be implemented by 2035, the following transit, commuter rail service, and goods movement projects will expand and enhance the regional transit system and may have benefits for PEROW/WSAB Corridor travel:

1. **California High Speed Rail Project (CHSR)** – Palmdale to Los Angeles (Union Station) and Los Angeles to Anaheim segments;

2. **Los Angeles County LRTP Projects**
   - Exposition Transit Corridor, Phases 1 and 2
   - Crenshaw/LAX Transit Corridor
   - Metro Green Line to LAX
   - South Bay Metro Green Line Extension
   - Westside Subway Extension
   - BNSF Grade Separation improvements in the Gateway Cities subregion.

3. **Orange County LRTP Projects**
   - Anaheim Fixed Guideway Project
   - Metrolink Station and High Frequency Service Improvements
   - Development of Regional Gateways related to CHST service.

Figure 2.5 – Approved Transit System Projects (2035)

2.3.2 Transportation System Management Alternative

The Transportation System Management (TSM) Alternative addresses the same mobility needs as the build alternatives by maximizing the use and effectiveness of the existing transportation system. This alternative provides a lower capital cost set of mobility improvements, and does not include the construction of the build alternatives identified in this AA study. TSM provides a comparison to measure the resulting mobility improvements from implementing a major transit improvement compared to maximizing the use of the existing transportation system. The TSM alternative includes all of the projects included in the No Build Alternative, plus the transit and arterial system improvement projects identified for implementation by 2035 with Metro and OCTA staff presented in Table 2.5 and Figure 2.5. The TSM Alternative is presented as: a ***Core Service Project*** representing bus service providing a service alignment similar to the build alternatives, which includes the Union Station-Los Cerritos Center service in Los Angeles County, and the Katella Avenue BRT Service in Orange County; and a ***Corridor System*** option which includes the Corridor-wide TSM improvement projects presented in Table 2.5.

Table 2.5 – Transportation System Management (TSM) Alternative Projects (2035)

Project	Description
Los Angeles County	
Bus Service Improvements	
Provide new limited stop bus line serving Corridor travel	• All day weekday and weekend service • Union Station – Los Cerritos Center (transfer point between Metro and OCTA bus systems)
Extend transit signal priority system to support new bus service	31 intersections along Soto Street, Firestone Boulevard, and Lakewood Boulevard
Provide Long Beach Transit service to Green Line	• All day weekday and weekend service • Green Line Lakewood Station – Downtown Long Beach
Other Modal Improvements	
Bicycle/Pedestrian Path along WSAB ROW	Class 1 Bicycle Path (8 miles)
Orange County	
Bus Service Improvements	
Enhance OCTA BRT service with: • Transit signal priority • Queue jumpers • Real-time messaging	• Weekday service on three lines: - Westminster Boulevard – 17th Street - Bristol Street – College Boulevard - Harbor Boulevard
Provide three new OCTA BRT lines	• Weekday service on three lines: - Beach Boulevard BRT - Katella Avenue BRT - Edinger Avenue BRT
Provide express bus service on SR-22 (Long Beach Transit)	• Weekday service • South Coast Metro – Long Beach Transit Mall/Blue Line
Provide express bus service using I-405 HOV Lanes (Long Beach Transit)	• Weekday, peak period only service • South Coast Plaza – Wardlow Blue Line Station via I-405

Figure 2.5 – TSM Alternative Projects (2035)

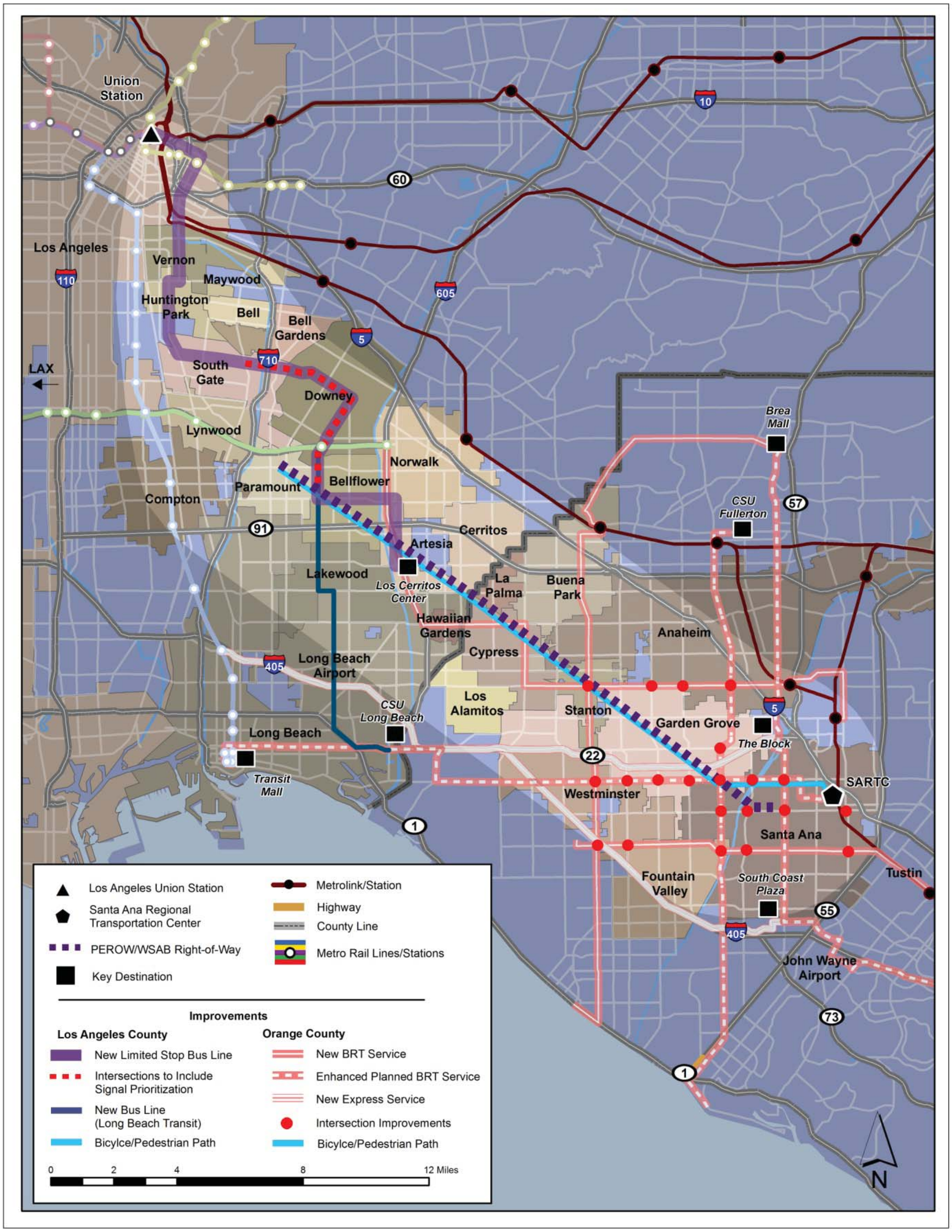


Table 2.5 – Transportation System Management (TSM) Alternative Projects (2035)

Project	Description
Orange County	
Other Modal Improvements	
Bicycle/Pedestrian Path along PEROW	Class 1 Bicycle Path (10.5 miles) from Coyote Creek Bike Path – County Line to Raitt Street
Bicycle Lanes along City Streets	Class 2 Bicycle Lanes (4.5 miles) from Raitt Street – SARTC
Highway Improvements	
Optimize arterial and intersection operations at 21 intersections along six major streets adjacent to the PEROW/WSAB Corridor that form travel corridors connecting to freeway system	Improvements along six corridors: • Katella Avenue to I-5 (four intersections) • Harbor Boulevard to SR-22 (two intersections) • Westminster Blvd. /17th Street to I-5 (two intersections) • Westminster Blvd./17th Street to SR-22 (four intersections) • 1st Street to SR-22 and I-5 (four intersections) • Edinger Avenue to I-405 and I-5 (five intersections)

2.3.3 Bus Rapid Transit Alternative

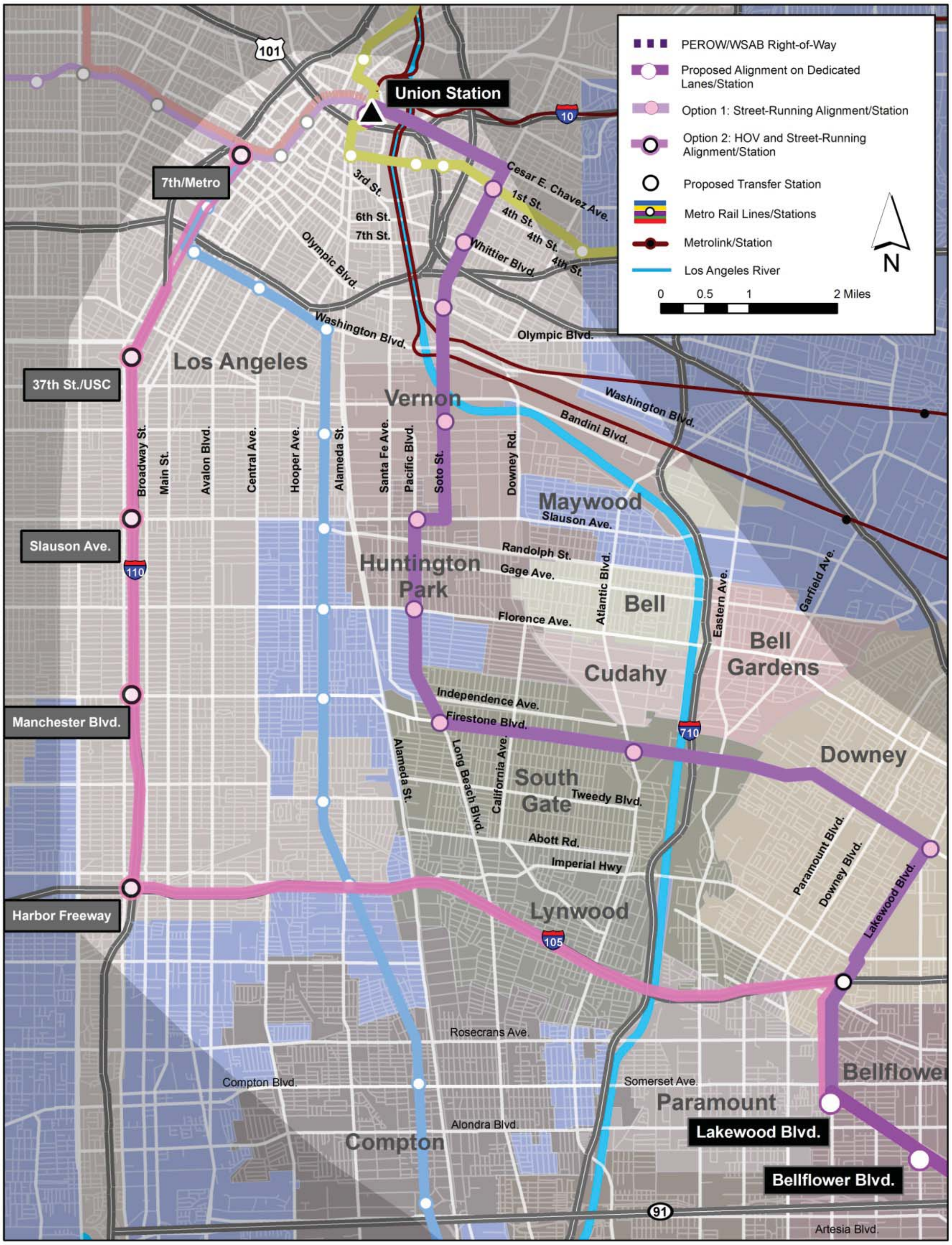
The BRT Alternative is defined as high capacity, high speed bus service running in dedicated lanes where possible similar to the Metro Orange Line operated in the San Fernando Valley portion of Los Angeles County, or with signal priority similar to the Metro Rapid service operating in Los Angeles County. Running in dedicated lanes on a former railroad ROW, the Metro BRT system has an average speed of 22 mph, with top speeds of 35 mph. This system operating on a dedicated right-of-way uses vehicles that are 60-foot articulated buses with a seated capacity of 57 passengers and a total capacity of 74 riders.

Operational Description

Two Corridor BRT operational scenarios were identified and evaluated. While both options have the PEROW/WSAB ROW and the connection south through Santa Ana city streets in common, the proposed connection north from the PEROW/WSAB ROW terminus in Paramount to downtown Los Angeles differs as illustrated in Figure 2.6:

- **HOV Lane-Running Option** – This alternative would operate in HOV lanes along the I-105 and I-110 freeways to the current terminus of the I-110/Harbor Transitway at 23rd Street and continue in street-running operations northbound on Figueroa Street and southbound on Flower Street. Service would terminate at the 7th/Metro Center Station providing a transfer to the Metro Red, Purple, and Blue lines today, and the Gold Line in the future with completion of the Regional Connector and the Exposition Line. In addition, this option would interface with the Metro Green Line Lakewood Boulevard Station. This service would be operated in 45 foot buses similar to the Metro Silver Line.
- **Street-Running Option** – This limited stop service alternative with signal priority improvements would leave the PEROW/WSAB ROW to run north on Lakewood Boulevard to interface with the Metro Green Line Lakewood Boulevard Station, and then continue north in street-running route

Figure 2.6 – BRT Alternative: Northern Alignment Alternatives



along Firestone Boulevard, Long Beach Boulevard, Slauson Avenue, and Soto Street, with a stop at the Metro Gold Line Soto Street Station, and then along Cesar Chavez Avenue to Union Station. This option would provide a transfer to the Metro Red and Gold lines, the Metrolink commuter rail system, and Amtrak intercity rail service. The Street-Running Alternative would be operated in 40 foot buses similar to Metro Rapid service.

At the southern end of the PEROW/WSAB Corridor, both BRT options would leave the ROW to operate on Santa Ana city streets along one of two alternative routes illustrated in Figure 2.7:

- **Harbor Boulevard/1st Street/SARTC** – After leaving the Harbor Boulevard Station located on the PEROW/WSAB Corridor, where riders could transfer to the future Santa Ana Street Car system, this service alignment would travel south on Harbor Boulevard, turn east on 1st Street, and north on a realigned Santiago Street to the SARTC where passengers could transfer to Street Car, Metrolink, and Amtrak services, along with OCTA and international bus services.
- **Westminster Boulevard/17th Street/Main Street** – After leaving the Harbor Boulevard Station located on the PEROW/WSAB Corridor, this service alignment would travel east on Westminster Boulevard/17th Street, south on Main Street to interface with the future street car system, and continue to the SARTC via Santa Ana Boulevard.

Vertical Configuration

Both BRT alternatives were proposed to operate at-grade in all corridor segments. While grade-separation is possible, BRT service is typically implemented at-grade to provide a less costly, more quickly implemented transit system alternative. The Metro Orange Line was built at-grade with the system expansion currently under construction incorporating some grade-separated sections to facilitate interface with the Metrolink system at Chatsworth Station and reduce traffic impacts. Future possible engineering and environmental efforts may identify the need for grade-separated sections to improve system operations and minimize traffic and other impacts.

Service Configurations

The BRT alternatives would operate in three service configurations as illustrated in Figure 2.8:

- ***Dedicated lanes*** located generally in the center of the PEROW/WSAB ROW between Paramount in Los Angeles County and Santa Ana in Orange County;
- ***Street-running operations*** located curbside, as illustrated in Figure 2.8, with signal priority connecting north from the PEROW/WSAB ROW terminus to Union Station, south from the ROW terminus in Santa Ana, and through the civic center and downtown areas to the SARTC; and
- ***Freeway HOV lane operations*** connecting north from the PEROW/WSAB ROW terminus with service operating in the HOV lanes located in the I-105 and I-110 Freeways.

Figure 2.7 – BRT Alternative: Southern Alignment Alternatives

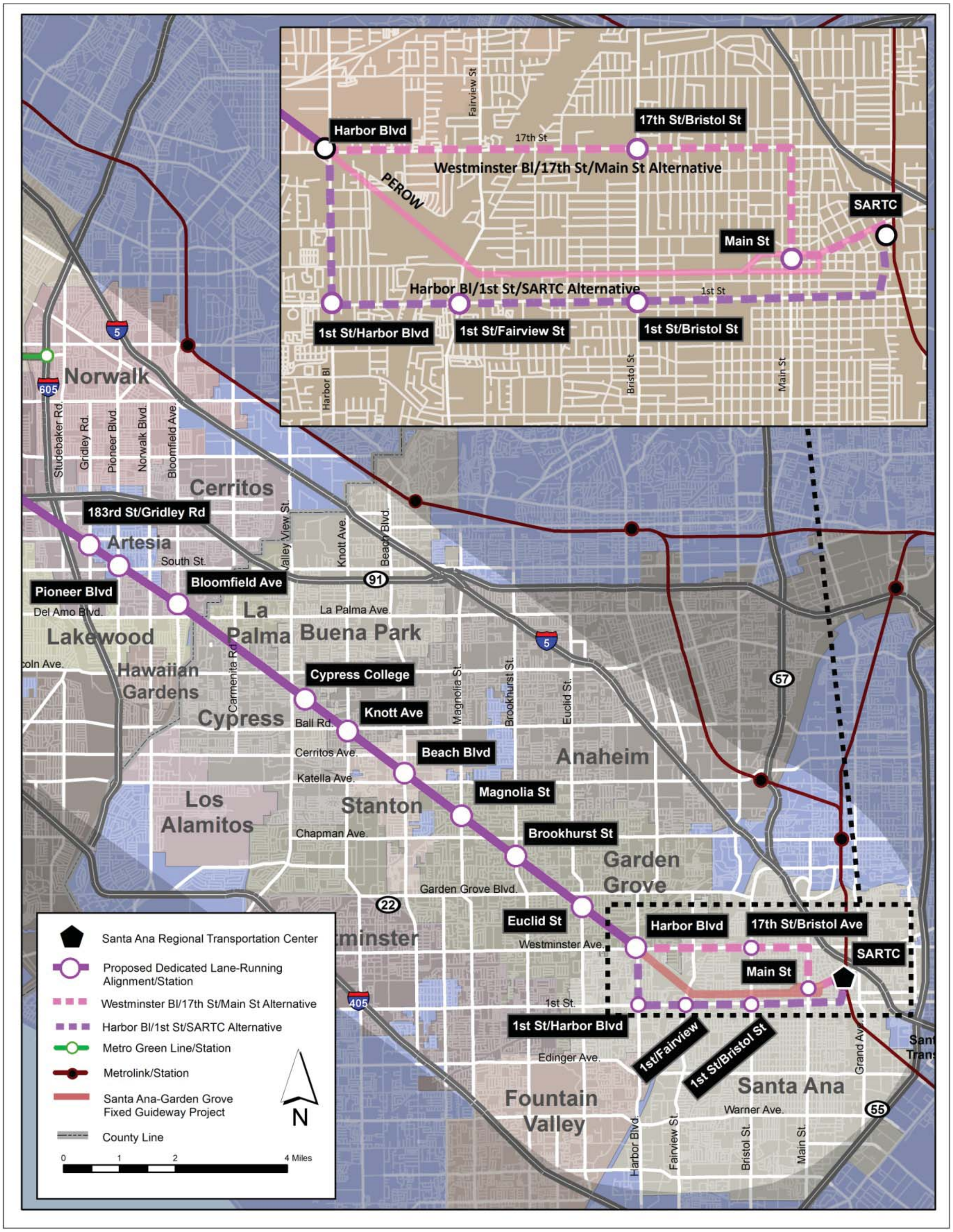
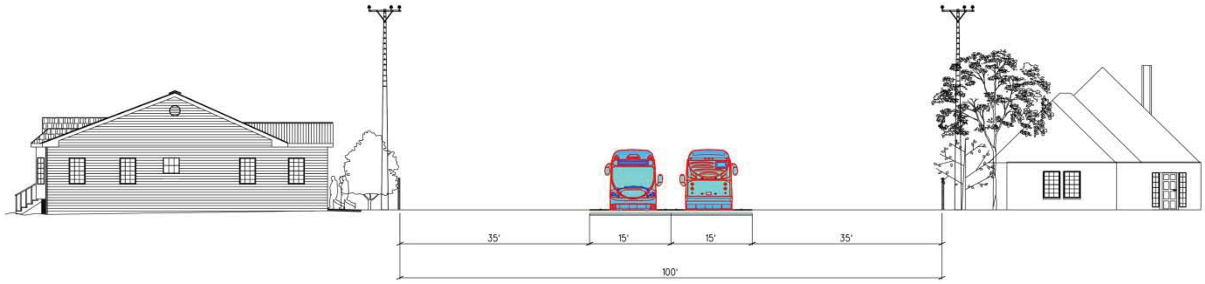
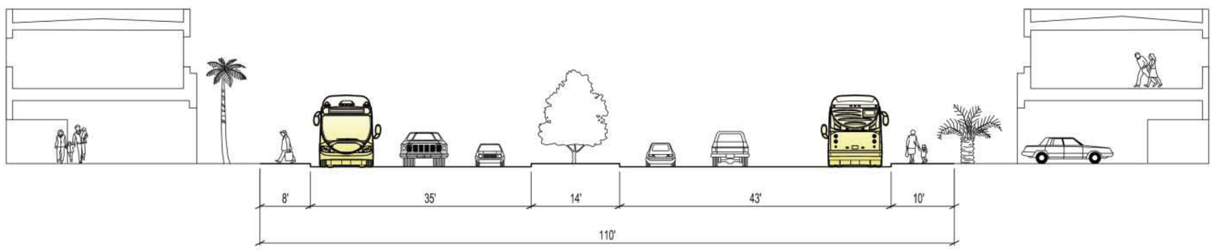


Figure 2.8 – Typical BRT Operational Cross-Sections

PEROW/WSAB Corridor

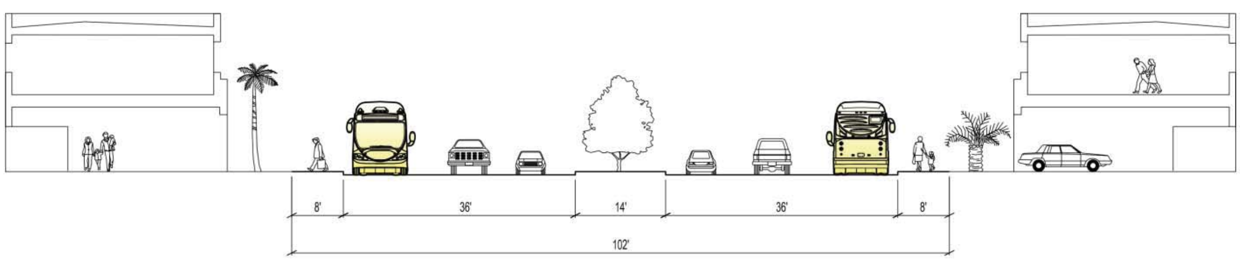


Harbor Boulevard



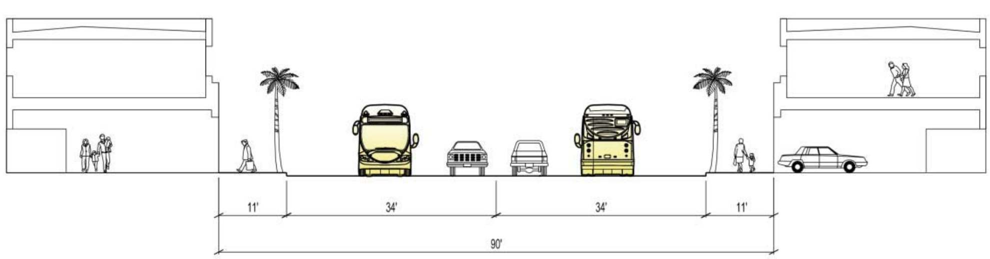
BRT

Westminster Boulevard/17th Street



BRT

Main Street



BRT

Stations

The proposed BRT stations are presented in Table 2.6 and described in the *PEROW/WSAB Corridor AA Station Concepts Report*. Stations were identified through the following efforts: 1) working sessions with the affected study area cities; and 2) initial discussions with Metro and OCTA service planning staff. The proposed stations were located to interface with other Corridor transportation services and serve existing activity centers and future development and economic strategy plans. The BRT HOV Lane-Running Alternative has a total of 22 proposed stations, while the Street-Running Alternative has 27 stations with five more stations in the Northern Connection Area. In this section, the Street-Running Alternative initiates service from Union Station and has six stations along Soto Street and Long Beach Boulevard, and two on Firestone Boulevard before interfacing with the Metro Green Line Lakewood Boulevard Station. The HOV Lane-Running Alternative begins service at the 7^{th}/Metro Center Station and serves the four existing Harbor Transitway stations and Green Line Lakewood Boulevard Station.

Table 2.6 – BRT Alternatives: Proposed Stations

Street-Running Alternative		HOV Lane-Running Alternative	
Northern Connection Area			
City	**Station**	**City**	**Station**
Los Angeles	Union Station	Los Angeles	7^{th}/Metro Center
	Metro Gold Line Soto Station		
	Soto St./Whittier Blvd.		
	Soto St./Olympic Blvd.		
Vernon	Soto St./Vernon Ave.		**Harbor Transitway Stations**
Huntington Park	Pacific Blvd./Slauson Ave.		37^{th} St./USC
	Pacific Blvd./Florence Ave.		Slauson/Harbor Freeway
South Gate	Long Beach/Firestone Blvds.		Manchester
	Firestone/Atlantic Blvds.		Harbor Freeway
Downey	Firestone /Lakewood Blvd.	Downey	
	Green Line Lakewood Station		Green Line Lakewood Station
PEROW/WSAB Corridor (common to both alternatives)			
Bellflower	Lakewood Blvd.	Bellflower	Lakewood Blvd.
	Bellflower Blvd.		Bellflower Blvd.
Cerritos	183^{rd} St. /Gridley Rd.	Cerritos	183^{rd} St. /Gridley Rd.
Artesia	Pioneer Blvd.	Artesia	Pioneer Blvd.
Cerritos	Bloomfield Ave.	Cerritos	Bloomfield Ave.
Cypress	Cypress College	Cypress	Cypress College
Anaheim	Knott Ave.	Anaheim	Knott Ave.
Stanton	Beach Blvd.	Stanton	Beach Blvd.
Garden Grove	Magnolia St.	Garden Grove	Magnolia St.
	Brookhurst St.		Brookhurst St.
	Euclid St.		Euclid St.
Garden Grove/ Santa Ana	Harbor Blvd.	Garden Grove/ Santa Ana	Harbor Blvd.

Table 2.6 – BRT Alternatives: Proposed Stations

Southern Connection Area (common to both alternatives)			
Harbor Boulevard/1st Street/SARTC			
Santa Ana	Harbor Blvd./1st St.	Santa Ana	Harbor Blvd./1st St.
	1st St. /Fairview St.		1st St. /Fairview St.
	1st St. /Bristol St.		1st St. /Bristol St.
	SARTC		SARTC
Westminster/17th Street/Main Street/SARTC			
Santa Ana	17th St./Bristol St.	Santa Ana	17th St./Bristol St.
	Main St./Civic Center Dr.		Main St./Civic Center Dr.
	SARTC		SARTC

Station Parking

Based on initial work sessions with the Corridor cities, existing and proposed BRT station parking opportunities were identified and are presented in Table 2.7. Several cities viewed this alternative as upgraded bus service and did not see the need to provide parking. It should be noted that for the Metro Orange Line, parking is provided at five of the 13 BRT-only stations with the number of spaces ranging from 270 to 1,205 reflecting the station's role and adjacent land uses. Any future planning and design efforts would include more detailed parking demand analysis and work sessions with Corridor cities to identify the optimal location and number of parking spaces.

Table 2.7 – BRT Alternatives: Proposed Station Parking

City	Station	Alternative	Notes
Los Angeles	Union Station	Street	Existing surface and structured parking; no new parking proposed.
	Slauson/Harbor Transitway	HOV	Existing 160 surface spaces.
	Manchester/Harbor Transitway	HOV	Existing 127surface spaces.
	Harbor Freeway	HOV	Existing 253 surface spaces.
Downey	Green Line Lakewood Boulevard	HOV	Existing 545 surface spaces; spill-over parking in adjacent residential neighborhoods.
Cypress	Cypress College	Both	Proposed future station area parking structure for college and station parking.
Stanton	Beach Boulevard	Both	Proposed as part of future station area development plans.
Santa Ana	Harbor Boulevard	Both	Future Street Car Station with surface parking. Additional parking required for this project.
	SARTC	Both	Existing surface and structured parking. Master plan prepared for future Street Car station and parking. Additional parking required for this project.

Notes: Street – BRT Street-Running Alternative; HOV – BRT HOV Lane-Running Alternative; Both – station serves both BRT alternatives.

2.3.4 Guideway Alternatives

Three of the build alternatives would operate on a guideway either a steel rail or a concrete guideway:

- **Street Car Alternative** – This alternative reflects building a community-oriented rail system similar to that being considered by Santa Ana and Garden, and in operation in Portland and other U.S. cities. Street car systems are electrically-powered through an overhead electrical catenary system supported by traction power substations. Currently, the Santa Ana-Garden Grove Street Car system plans on using the Siemens S70 Street Car as the Portland Street Car is not approved for operation by the California Public Utilities Commission (CPUC). The selected vehicle is 79 feet in length and has 60 seats plus standee room. While the Portland Street car vehicles have a typical operating speed of 8.5 to 15 mph in mixed flow conditions, with a maximum speed of 40 mph in a dedicated ROW, the proposed Orange County Street Car vehicle can operate at up to 55 mph in a dedicated ROW.
- **Light Rail Transit (LRT) Alternative** – The LRT Alternative would be similar to the Metro Gold and Blue Lines currently operated by Metro in Los Angeles County. While primarily designed to operate at-grade, LRT service can be built in aerial and underground configurations where necessary, and are electrically-powered through an overhead electrical catenary system supported by traction power substations. Metro's at-grade LRT systems operate in either a street-running configuration, where the trains operate along with vehicular traffic and are controlled by the same traffic controls, or in a dedicated right-of-way where trains can operate at speeds of up to 55 mph. LRT systems Metro LRT vehicles are 90 feet in length, and operated in consists of two to three vehicles with a peak period three-car train seated capacity of 228 passengers and a total capacity of 400 riders.
- **Low Speed Magnetic Levitation (Maglev) Alternative** – This option would be similar to the Linimo System operating in Nagoya, Japan. System and operational needs require low speed maglev service to be run in a grade-separated configuration. Low speed maglev systems are electrically-powered through system of magnets that suspend and guide the vehicles and a linear induction motor for propulsion supported by traction power substations. The Linimo System has a maximum speed of 62 mph, with the current 5.6-mile, nine station system operating at an average speed of 22.4 mph. The vehicles are designed as an integrated three car train approximately 135 feet long with a seated capacity of 104 riders and total capacity of 248.

Operational Description

All three guideway alternatives have the PEROW/WSAB Area and the Northern Connection Area alignment options in common as illustrated in Figure 2.9, while there are variations in the Southern Connection Area that are discussed below. The operational challenges and differences between the alignments are presented in more detail in Section 2.3.5. For the Northern Connection Area, a wide range of alignment alternatives was identified and reviewed with Metro, LADOT, and the affected Corridor cities to identify the following four alignments for conceptual-level engineering and evaluation.

All four alternatives would use the San Pedro Subdivision, now owned by the Ports of Long Beach and Los Angeles, to connect north from the PEROW/WSAB ROW terminus in Paramount to Union Station. Initial conversations with the ports identified an interest in selling the San Pedro Subdivision ROW for continued transportation use by another public entity. Utilization of this railroad ROW would require provision of freight trackage, along with any new transit system, to accommodate service to the remaining customers and provide emergency travel for Alameda Corridor freight activity.

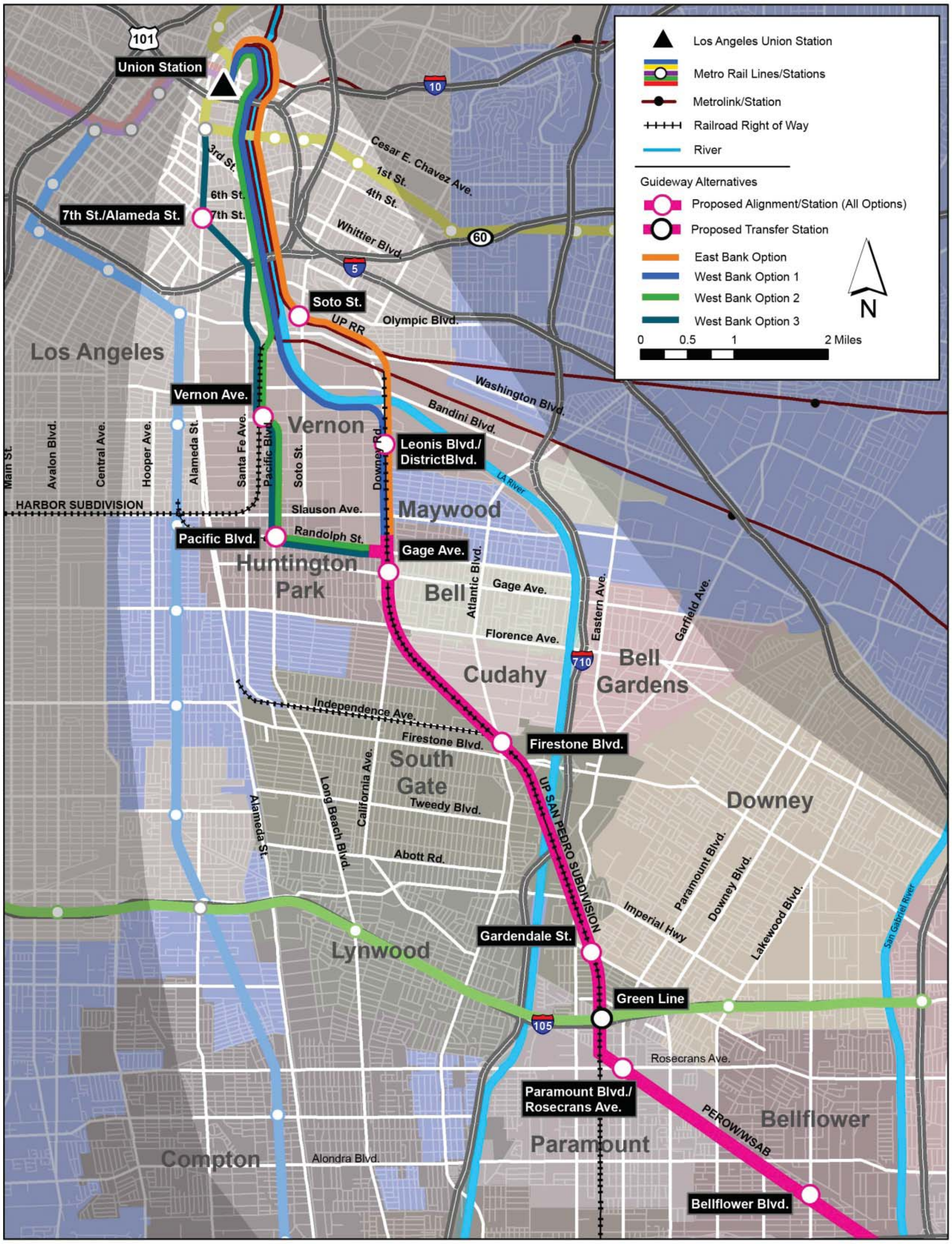
There are two sets of options for the connection north from the PEROW/WSAB ROW to Union Station, either operating along the east or west bank of the Los Angeles River as illustrated in Figure 2.9:

- **East Bank Alternative** – This alignment alternative would operate north along the San Pedro Subdivision to travel over a Burlington Northern-Santa Fe (BNSF) at-grade crossing and a corner of BNSF's Hobart Intermodal Yard to where the ROW intersects with the Union Pacific (UP)-owned ROW used for freight, Metrolink, and Amtrak operations. It would share the UP ROW for a short distance to where the ROW, now owned by Metro and operated by Metrolink, turns north to run along the east bank of the Los Angeles River, and cross the river into Union Station.
- **West Bank Alternative** – This alignment alternative would operate north along the San Pedro Subdivision to either operate along the west bank of the river north along the Metro-owned and Metrolink-operated ROW to reach Union Station, or turn west to operate along the former railroad ROW in the median of Randolph Street and operate north along several street and railroad ROW options to Union Station.

Both alternatives initially had sub-options with minor alignment variations. Based on agency input and engineering constraints, the East Bank Alternative was reduced to one option, while the West Bank Alternative had three viable options identified for further study:

- **West Bank 1** – Under this alignment alternative, the connection to Union Station would operate in its own ROW along the west bank of the Los Angeles River to just beyond the Redondo Junction where it would share the Metro-owned and Metrolink-operated ROW with Metrolink and Amtrak service.
- **West Bank 2** – This alignment alternative would turn west to operate in the median of Randolph Street, formerly a BNSF railroad ROW now owned by UP, through Huntington Park and then turn north to operate in the median of Pacific Boulevard, a former street car ROW until it intersects with the Metro-owned Harbor Subdivision. It would follow the Harbor Subdivision ROW in a bridge over the Redondo Junction, and then operate north along the west bank similar to West Bank option 1 to reach Union Station.
- **West Bank 3** – This alternative follows the same alignment as West Bank 2, but rather than turning to operate along the west bank of the Los Angeles River, it continues north along the Harbor Subdivision, and then under city streets and private property in a combination of aerial and underground configurations to daylight south of Metro Gold Line Eastside Little Tokyo Station where it utilizes the existing at-grade Metro Gold Line tracks to reach Union Station.

Figure 2.9 – Guideway Alternatives: Northern Connection Area Alignment Alternatives



For the Southern Connection Area, two alignment alternatives were identified in working sessions with Santa Ana and OCTA staff. Consideration was given to the engineering and operational fit with future Street Car system plans. At the city's request, the PEROW/WSAB Corridor project would leave the former PE ROW at Harbor Boulevard to operate on Santa Ana city streets along one of the two alternative routes illustrated in Figure 2.10. The Low Speed Maglev Alternative would have a terminal station at the Harbor Boulevard Street Car Station where passengers would transfer to the Street Car system to travel to downtown Santa Ana and the SARTC.

The Street Car and LRT alternatives would operate on one of two alignment options:

- **Harbor Boulevard/1st Street/SARTC** – After leaving the Harbor Boulevard Station located on the former PE ROW, this option travels south on Harbor Boulevard, turns east on 1st Street, and then runs north on a realigned Santiago Street to a terminus at the SARTC where passengers would transfer to Street Car, Metrolink, and Amtrak services, and OCTA and international bus services.
- **Westminster Boulevard/17th Street/Main Street** – After the Harbor Boulevard Station, this alignment would travel east on Westminster Boulevard/17th Street, south on Main Street, where the route would turn south to interface with the future Street Car Main Street Station. Street Car and LRT passengers would transfer to the Santa Ana Street Car system to reach the SARTC.

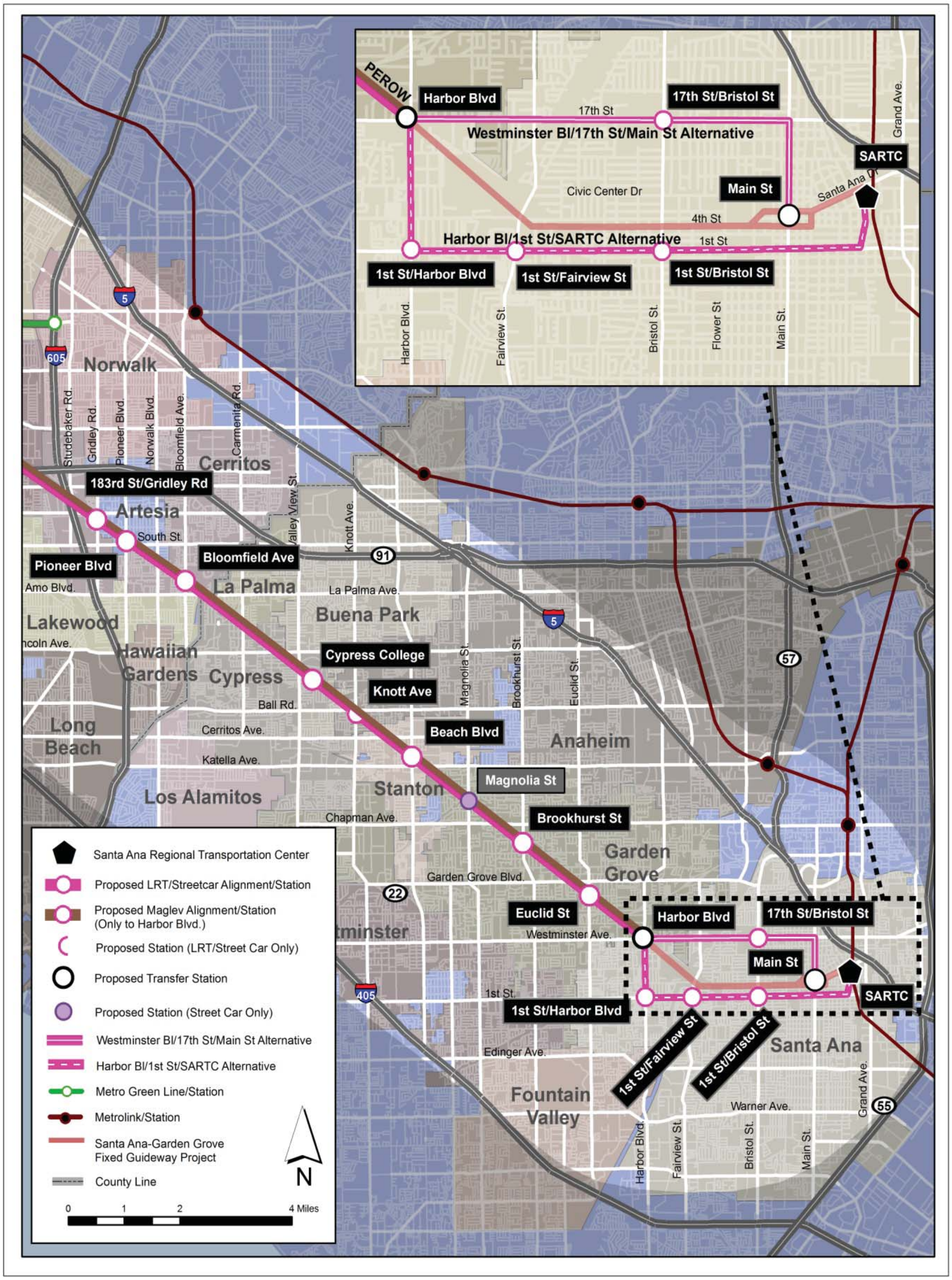
Vertical Configurations

Typical cross-sections for the three guideway alternatives are illustrated in Figures 2.11, 2.12, and 2.13. The Low Speed Maglev Alternative was designed and evaluated as a totally grade-separated system due to operational requirements, while the Street Car and LRT options were evaluated in two vertical configurations, as shown in Figures 2.14, 2.15, and 2.16:

- Combination of at-grade and grade-separated operations based on Corridor fit and physical requirements, engineering best practices, and the Metro *Grade Crossing Policy for Light Rail Transit*; and
- Entirely grade-separated operating in either an aerial or underground configuration.

This was done to bracket benefits, impacts, costs, travel times, and resulting ridership to understand the trade-offs between the two possible vertical configurations. During any subsequent preliminary engineering and environmental review efforts, the decision on whether to grade separate LRT, and possibly Street Car, service in Los Angeles County would be guided by Metro's *Grade Crossing Policy for LRT*, which provides a structured process for making grade-separated versus at-grade operation decisions. During Initial Screening, consideration of building the system entirely in a subway configuration was deleted from further consideration due to two main factors: significant capital cost and the Corridor's high water table which ranges from approximately two to 20 feet below surface, resulting in costly construction impacts, as well as concerns about dealing with contaminated water from years of railroad operations along the ROW. The significant subway construction costs were identified as not being cost-effective given the projected ridership.

Figure 2.10 – Guideway Alternatives: Southern Connection Area Alignment Alternatives



Service Configurations

The guideway alternatives would operate in four service alignments:

- ***Dedicated ROW*** along the PEROW/WSAB ROW between the City of Paramount in Los Angeles County and the City of Santa Ana in Orange County;
- ***Railroad ROW-running operations*** connecting north from the PEROW/WSAB ROW terminus utilizing several active and inactive railroad ROWs along either the eastern or western side of the Los Angeles River, the Metro-owned Harbor Subdivision, or the median of Randolph Street;
- ***Street-running operations*** connecting north along Pacific Boulevard, or south from the Corridor ROW terminus to either interface with the future Street Car Project, or operate along the streets in either at-grade or aerial operations through the Santa Ana civic center and downtown area to the SARTC; and,
- ***Underground operations*** under city streets and public and private property in the Northern Connection Area generally from the Harbor Subdivision north to the existing Metro Gold Line Little Tokyo Station.

Stations

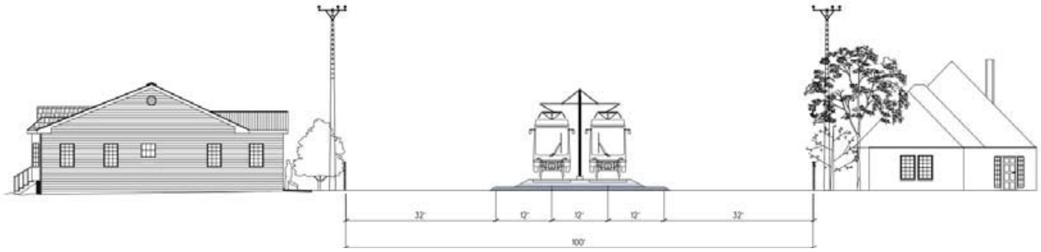
The proposed stations for the guideway alternatives are summarized in Table 2.8, presented in Table 2.9, and described in the *PEROW/WSAB Corridor AA Station Concepts Report*. Stations locations were identified through the following efforts: 1) working sessions with the affected study area cities and agencies; and 2) initial discussions with Metro Planning and Rail Operations staff regarding the northern connection alignment options for the guideway alternatives; and 3) discussions with Santa Ana-Garden Grove Fixed Guideway project staff. The stations were located to interface with other Corridor transportation services and serve existing activity centers and future development and economic strategy plans. Future station area land use planning and operational analysis may refine the Guideway station recommendations.

All of the three guideway alternatives would have similar stations with three exceptions:

- The Street Car Alternative has two more stations in the PEROW/WSAB Area than the other options. Stations were added at city request at Knott Avenue in Anaheim and Magnolia Street in Garden Grove.
- The LRT Alternative has one more station than the Low Speed Maglev Alternative as a station was added at city request at Knott Avenue in Anaheim.
- The Low Speed Maglev Alternative operates from Union Station to the proposed Harbor Boulevard station where passengers would transfer to the future Santa Ana-Garden Grove Street Car system; this alternative has no stations in the City of Santa Ana.

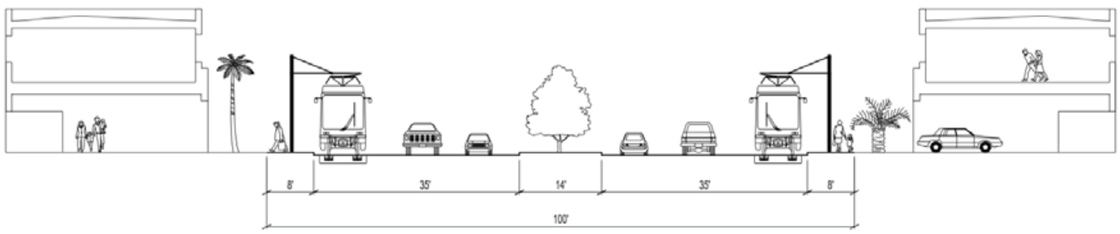
In the Northern Connection Area, the station locations vary based on the four alignment alternatives with all of the options initiating service from Union Station, and having a new Metro Green Line station located to provide a transfer to the Metro Green Line from the proposed operation along the San Pedro

Figure 2.11 – Typical Street Car Operational Cross-Sections
PEROW/WSAB Corridor



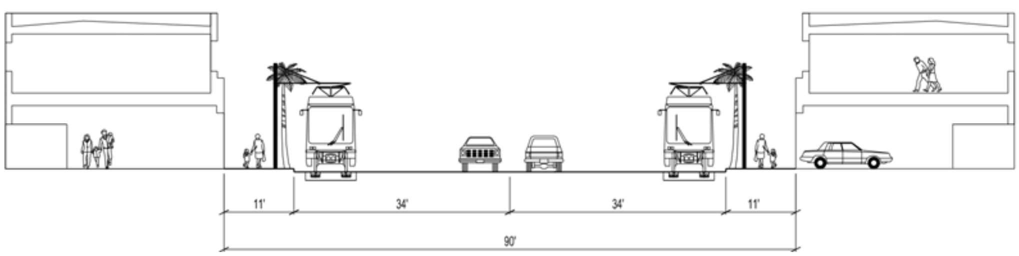
Street Car – At-Grade Center-Running

1st Street



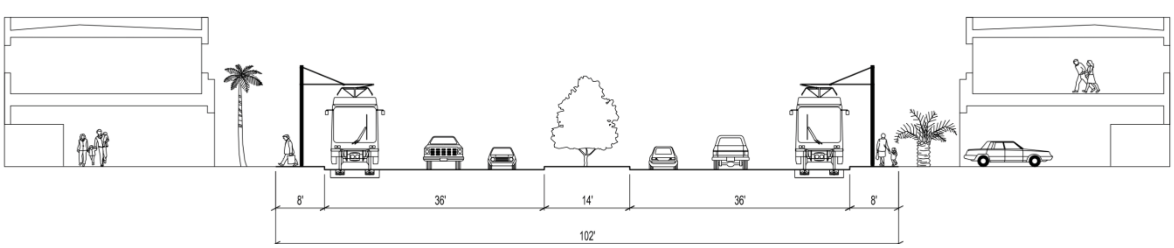
Street Car – At-Grade Curb-Running

Main Street



Street Car – At-Grade Curb-Running

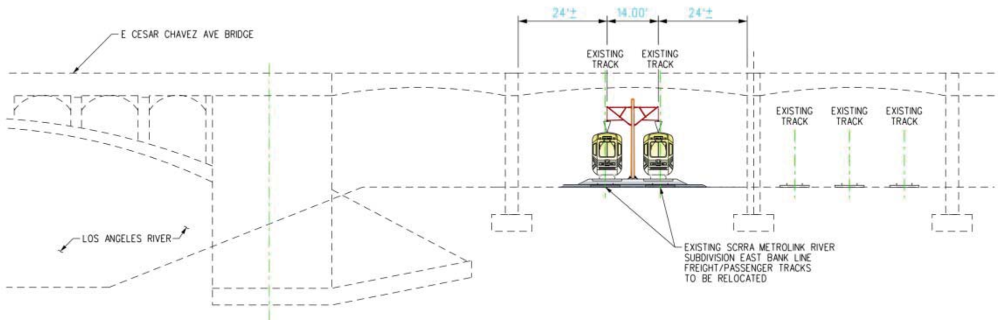
Westminster Avenue/17th Street



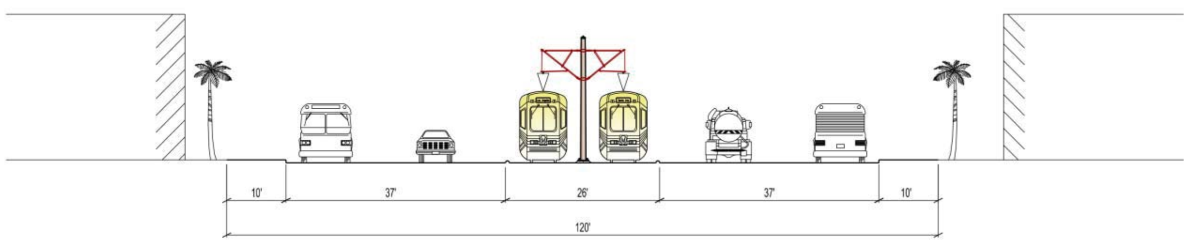
Street Car – At-Grade Curb-Runing

Figure 2.12 – Typical LRT Operational Cross-Sections

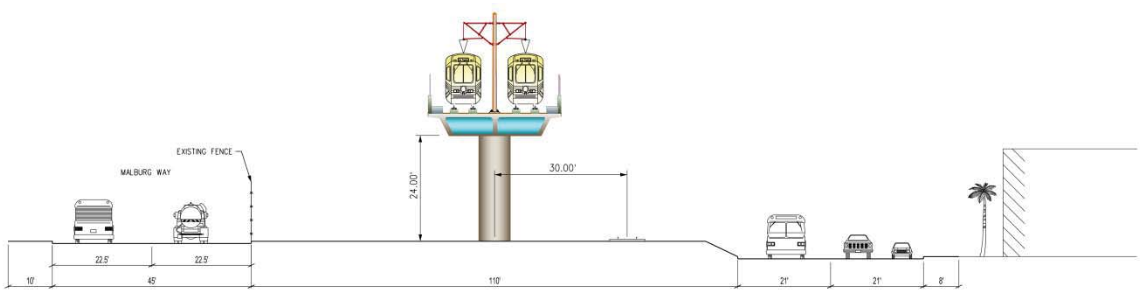
Cesar Chavez Avenue Bridge



Pacific Boulevard



Randolph Street



PEROW/WSAB Corridor

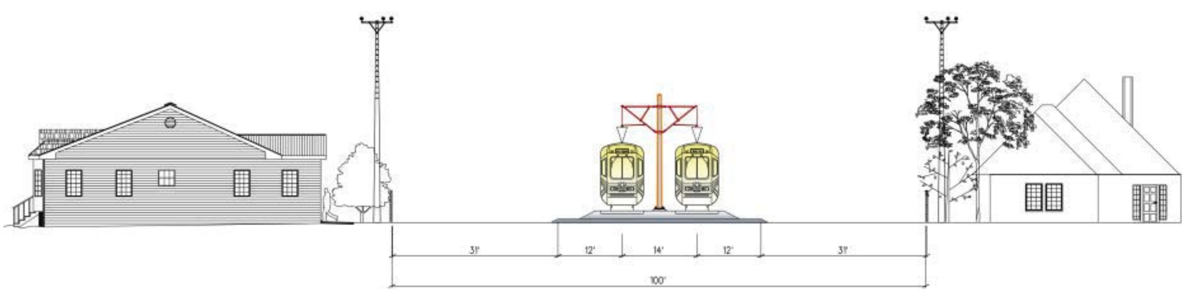
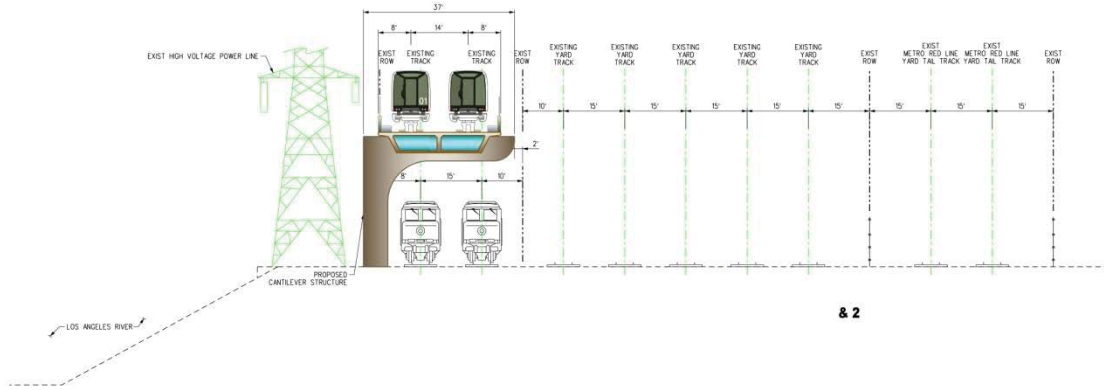
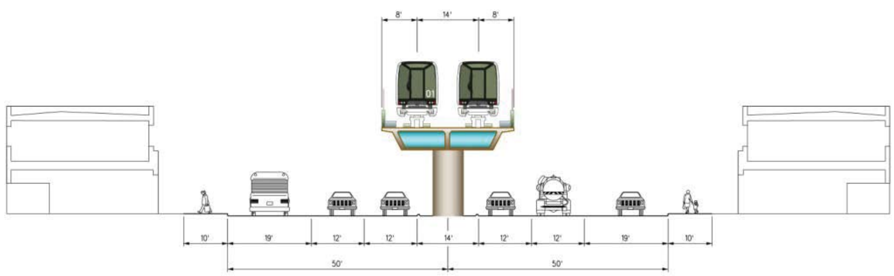


Figure 2.13 – Typical Low Speed Maglev Operational Cross-Sections

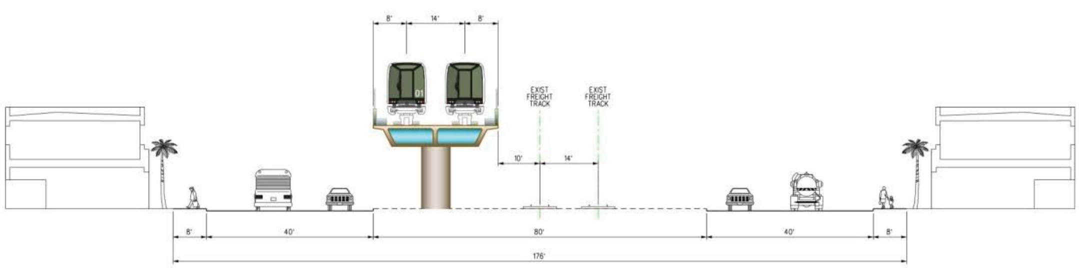
Los Angeles River



Pacific Boulevard



Salt Lake Avenue



PEROW/WSAB Corridor

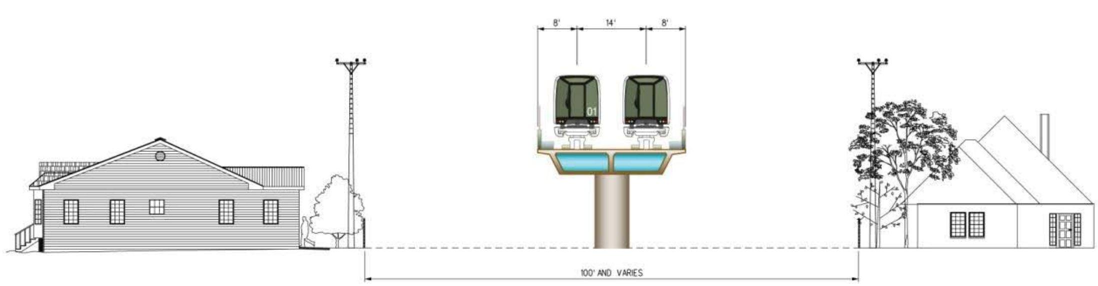


Figure 2.14 – Vertical Configurations – North of the PEROW/WSAB Corridor

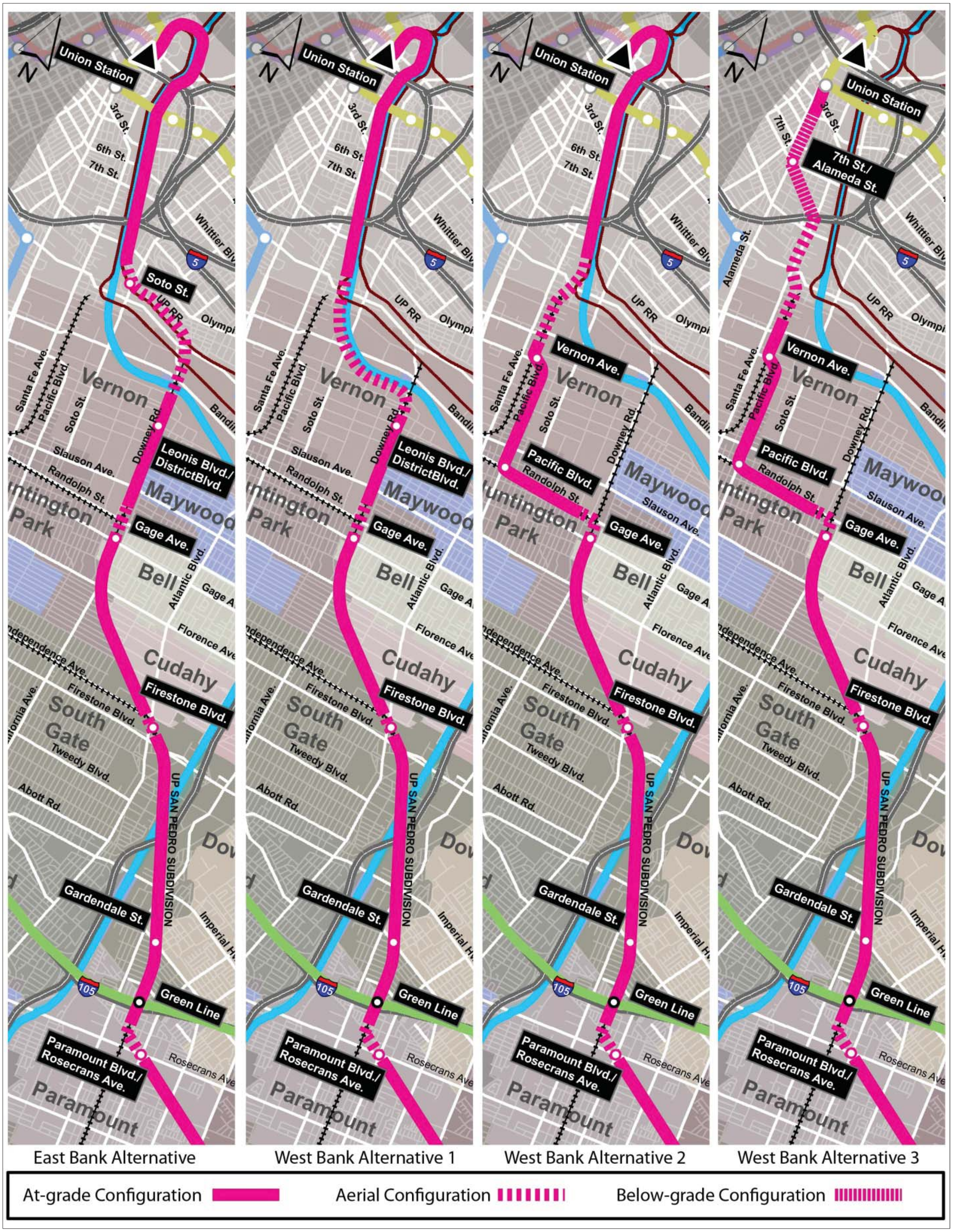
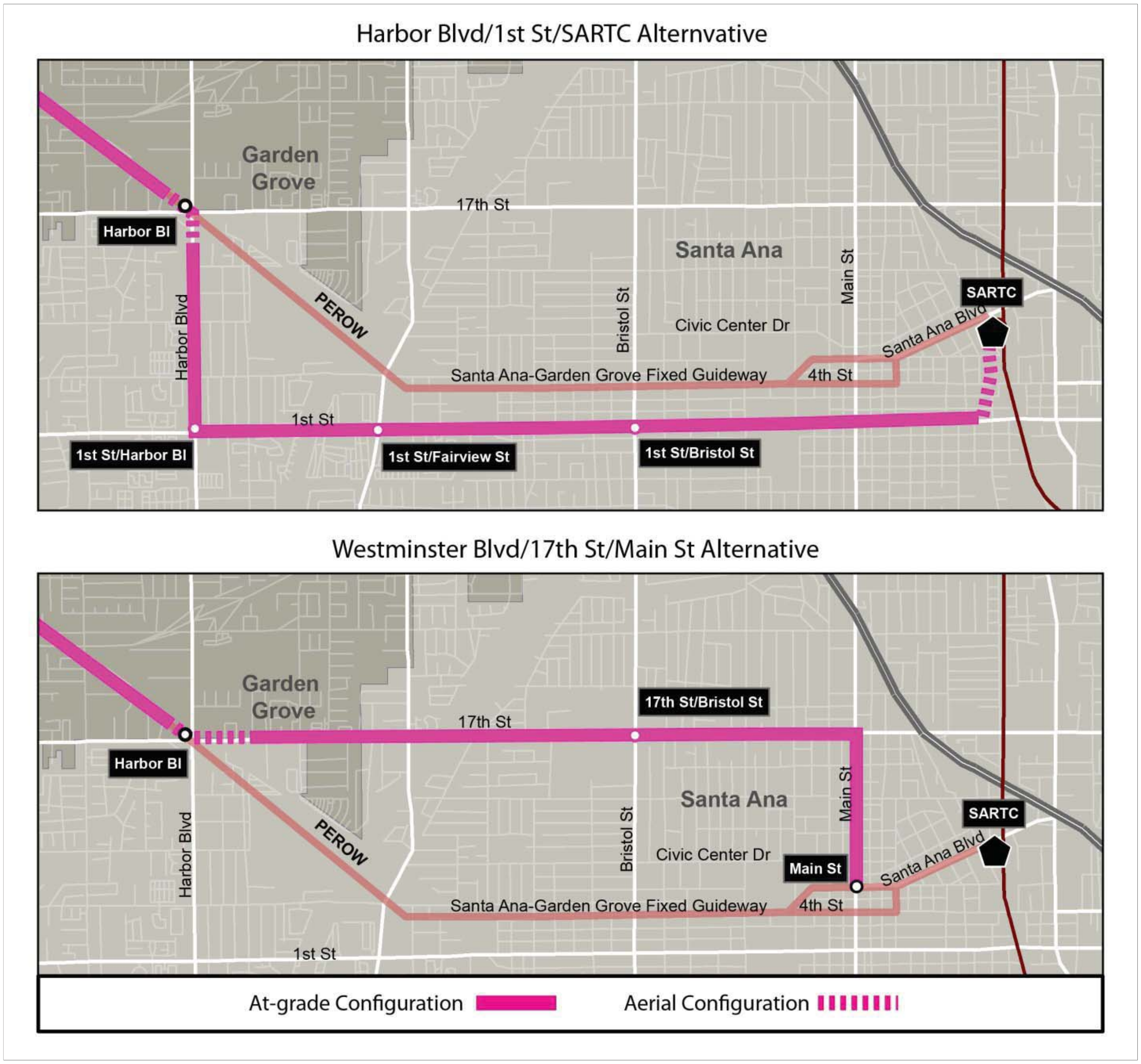


Figure 2.15 – Vertical Configurations on the PEROW/WSAB Corridor

Figure 2.16 – Vertical Configurations South of the PEROW/WSAB Corridor



Subdivision ROW and with three stations in common along the ROW serving Huntington Park, South Gate, and Downey. The East Bank Alternative has two additional stations, with one serving the eastern jobs-rich portion of Vernon and the adjacent residential neighborhoods in Maywood, and a second serving East Los Angeles on Soto Street south of Olympic Boulevard. West Bank Alternative 1, running along the west bank of the Los Angeles River, has one additional station serving the same eastern portion of Vernon. West Bank Alternatives 2 and 3 turn west to operate in the median of Randolph Street through Huntington Park, and then north along Pacific Boulevard, providing a Pacific Boulevard Station serving the northern edge of the vibrant Pacific Boulevard commercial corridor, and a Vernon Avenue Station located one block from Vernon's civic center area. West Bank Alternative 3 is the only option providing an 7th Street/Alameda Street Station serving the evolving Central City East arts community, and also may provide a Little Tokyo station.

Table 2.8 – Guideway Alternatives: Number of Stations

Area/Alignment Alternative	Street Car	Light Rail Transit	Low Speed Maglev
Northern Connection Area			
East Bank	6	6	6
West Bank 1	5	5	5
West Bank 2	6	6	6
West Bank 3	7	7	7
PEROW/WSAB Area	13	12	11
Southern Connection Area	4	4	0
Total			
East Bank	23	22	17
West Bank 1	22	21	16
West Bank 2	23	22	17
West Bank 3	24	23	18

As summarized in Table 2.8, the number of stations for the Street Car Alternative ranges from 22 to 24, for the LRT Alternative from 21 to 23, and for the Low Speed Maglev Alternative from 16 to 18. While having the shortest alignment length, the West Bank 3 Alignment Alternative has the highest number of stations reflecting additional stops in Huntington Park serving Pacific Boulevard and in downtown Los Angeles serving the Central City East area. The West Bank 1 Alignment Alternative has the lowest number of stations due to serving fewer cities; it provides no stations between Leonis/District in eastern Vernon and Union Station, while the East Bank Alignment has an East Los Angeles station and the West Bank 2 Alignment provides an additional Huntington Park station at Pacific Boulevard.

Table 2.9 – Guideway Alternatives: Proposed Stations

City	Station	East Bank Alternative			West Bank Alternative 1			West Bank Alternative 2			West Bank Alternative 3		
		SC	LRT	MLV	SC	LRT	MLV	SC	LRT	MLV	SC	LRT	MLV
Northern Connection Area													
Los Angeles	Union Station	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Soto St.	✓	✓	✓									
	7thSt./Alameda St.										✓	✓	✓
Vernon	Leonis/District Blvds.	✓	✓	✓	✓	✓	✓						
	Vernon Ave.							✓	✓	✓	✓	✓	✓
Huntington Park	Pacific Blvd.							✓	✓	✓	✓	✓	✓
	Gage Ave.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
South Gate	Firestone Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Downey	Gardendale St.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note: SC – Street Car Alternative; LRT – Light Rail Transit Alternative; MLV – Low Speed Maglev Alternative.

Table 2.9 – Guideway Alternatives: Proposed Stations

City	Station	East Bank Alternative			West Bank Alternative 1			West Bank Alternative 2			West Bank Alternative 3		
		SC	LRT	MLV	SC	LRT	MLV	SC	LRT	MLV	SC	LRT	MLV
PEROW/WSAB Corridor													
Paramount	Green Line (new)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Paramount Blvd./ Rosecrans Ave.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bellflower	Bellflower Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cerritos	183rd St./Gridley Rd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Artesia	Pioneer Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cerritos	Bloomfield Ave.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cypress	Cypress College	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Anaheim	Knott Ave.	✓	✓		✓	✓		✓	✓		✓	✓	
Stanton	Beach Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Garden Grove	Magnolia St.	✓			✓			✓			✓		
	Brookhurst St.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Euclid St.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Garden Grove/ Santa Ana	Harbor Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Southern Connection Area													
Santa Ana	**Harbor Boulevard/1st Street/SARTC Alternative**												
	Harbor Blvd./1st St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	1st St./Fairview St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	1st St./Bristol St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	SARTC	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	Westminster Boulevard/17th Street/Main Street Alternative												
	Westminster Blvd./ 17thSt./Bristol St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	Main St./Civic Center Dr.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--

Note: SC – Street Car Alternative; LRT – Light Rail Transit Alternative; MLV – Low Speed Maglev Alternative.

Station Parking

Based on initial work sessions with the Corridor cities, existing and proposed guideway station parking opportunities were identified and are presented in Table 2.10. Any future planning and design efforts would quantify the parking demand resulting from the provision of Corridor guideway service. For example, for the Metro Gold Line, parking is provided at nine of 21 stations with the number of spaces ranging from 43 to 290, with the two terminal stations having 413 (Atlantic) and 1,010 (Sierra Madre Villa) spaces, reflecting the station's role and adjacent land uses. Detailed discussions would be held with Corridor cities to identify the fit of station area parking with surrounding land uses and future development plans.

Table 2.10 – Guideway Alternatives: Proposed Station Parking

City	Station	Alternative	Notes
Los Angeles	Union Station	All	Existing surface and structured parking; no new parking proposed.
South Gate	Firestone Boulevard	All	Part of future station area development plans.[1]
Downey	Green Line Lakewood Blvd. Station	MOS[2]	Existing 545 surface parking spaces; beyond capacity with spill-over parking in adjacent residential areas.
Paramount	Green Line Station (new)	All	Small station site in residential neighborhood; some parking may be provided.
Bellflower	Bellflower Blvd.	All	Part of future station area development plans.[1]
Cerritos	183rd St./Gridley Rd.	All	Part of future station area development plans.[1]
Artesia	Pioneer Blvd.	All	Part of future station area development plans.[1]
Cerritos	Bloomfield Ave.	All	Existing surface parking for Target; future parking structure for station, Target, and retail uses. [1]
Cypress	Cypress College	All	Proposed future station area parking structure for college and station parking.
Stanton	Beach Blvd.	All	Part of future station area development plans.[1]
Garden Grove	Brookhurst St.	All	Part of future station area development plans.[1]
	Euclid St.	All	Future downtown parking structure may include station parking.[1]
Garden Grove/ Santa Ana	Harbor Blvd.	All	Future Street Car station on east side of Harbor Blvd. with surface parking. This project's station and parking to be either co-located or sited on west side of Harbor Boulevard.[1]
Santa Ana	SARTC	SC, LRT	Part of future station area development plans.[1]

Notes: All – all three guideway alternatives; SC – Street Car Alternative; and LRT – Light Rail Transit Alternative.
[1] Initial city interest to include transit system parking in future development plans.
[2] MOS – Minimum Operable Segment station if the project was built in segments.

2.3.5 Alignment Alternative Challenges

While reuse of the former PE ROW offers the unique opportunity to implement transit service along a dedicated 20-mile ROW for approximately 60 percent of the proposed project length, introduction of a new high capacity transit system would have both benefits for and impacts on existing communities and transportation infrastructure. Beyond the dedicated ROW, there are significant challenges to providing transit service connecting north through downtown Los Angeles and south through downtown Santa Ana to serve the Corridor's major residential, employment, and cultural centers. This section presents an overview of the construction, operational, and jurisdictional constraints and challenges related to implementing the alignment alternatives considered in this AA study. It should be noted that the resulting assessment is based on the approximately five percent AA-level of engineering design work.

Northern Connection Area

In this portion of the Corridor Study Area, the BRT and guideway alternatives would have significantly different operating alignments. The BRT alternatives would operate on the Corridor's highway system: the HOV Lane-Running Option would run primarily in the Harbor Transitway and I-105 HOV lanes, while the Street-Running Alternative would operate entirely within city streets. The guideway alternatives would run primarily within the ROW of inactive and active railroad ROWs, some owned by Metro and others by freight railroads, with some city street operations in the cities of Vernon and Los Angeles. BRT operation on railroad ROWs was not considered as the Federal Railroad Administration (FRA), under whose jurisdiction freight operations fall, typically prohibits bus operations with freight operations. Implementation challenges and constraints are discussed below and illustrated in Figure 2.17.

The two BRT alternatives follow different routes to reach downtown Los Angeles and have different interface points with the urban and regional rail system: the HOV Lane-Running Alternative would start and end at the 7th/Metro Center Station providing access to the existing Metro Red, Purple, and Blue lines today, and the Gold Line in the future with completion of the Regional Connector and the Exposition Line; and the Street-Running Alternative would interface with Union Station with connections to the Metro Red and Gold lines, regional Metrolink system, and intercity Amtrak system. The BRT Alternatives would have the following challenges in this portion of the Corridor:

1. ***I-110/Harbor Transitway/HOV Lane Capacity***
   - The BRT HOV-Lane Running Alternative would operate south from the 7th/Metro Center Station along streets in the City of Los Angeles to enter the I-110/Harbor Transitway, and would serve the four existing Transitway stations. It would then run in the I-105 HOV lanes to the Lakewood Boulevard exit to provide a transfer to the Metro Green Line and travel south on Lakewood Boulevard to access the PEROW/WSAB ROW. Based on an initial assessment, there appears to be sufficient station and travel lane capacity to accommodate the proposed peak hour service. BRT travel speeds and times may be constrained on the I-105 in the eastbound direction during the morning peak period and westbound in the evening peak period.
2. ***Interface with Metro Green Line***
   - Both BRT alternatives would provide a transfer to the Metro Green Line at the Lakewood Boulevard Station. The viability of the HOV Lane-Running Alternative serving the three other Green Line stations between the Harbor Transitway and Lakewood Boulevard Station was assessed at a conceptual level. Providing access to these stations was not recommended due to the circuitous and often congested freeway and street system access and egress travel paths, which would have a negative impact on travel times and ridership.
3. ***Operating on City Streets***
   - The BRT Street-Running Alternative would operate south from Union Station on city streets, including Soto Street, Slauson Avenue, Pacific Boulevard, Long Beach Boulevard, Firestone

Boulevard, and Lakewood Boulevard in the cities of Los Angeles, Vernon, Huntington Park, South Gate, Downey, Paramount, and Bellflower. A majority of these streets are heavily congested during both peak periods, and current bus service experiences significantly reduced travel speeds and increased travel times. Bus travel delays occur even with the bus signal priority system on Soto Street within the City of Los Angeles. Adding more bus service to these congested streets would add to the capacity and speed challenges. Even with limited stops and extension of the bus signal priority system, this proposed alternative may not result in improved travel times as demonstrated by the former Metro Rapid 751 Soto Street service.

All of the guideway alternatives would have the segment from the end of the PEROW/WSAB Corridor ROW in Paramount north to Randolph Street in Huntington Park in common, and then would operate on one of four route options connecting north to Union Station. Travel in this common segment would occur along the San Pedro Subdivision now owned by the Ports of Long Beach and Los Angeles.

Initial conversations with the Ports identified an interest in selling this railroad ROW for transportation use by Metro. Purchased from the Union Pacific (UP) as part of a ports-area railroad purchase agreement, UP would have the first right to reacquire the ROW. In addition, this ROW was identified under an Alameda Corridor Transportation Authority (ACTA) agreement as providing emergency freight service route to/from ports area in case of impaired Alameda Corridor operations. Based on an initial review of the ACTA agreement, use of the San Pedro Subdivision would require provision of a freight track along with the new transit system's needs. Any subsequent planning and engineering, efforts would require more detailed legal research and agency discussions, such as with the FRA and the CPUC concerning the joint use of a freight ROW by passenger guideway service. The Street Car and LRT alternatives would share the ROW, either physically or temporally (with time separation), while the Low Speed Maglev Alternative would operate above the ROW. While FRA guidance has been provided locally on shared LRT-freight use of a ROW, no guidance has been provided on shared Street Car-freight operations, and given the lighter vehicular design may not be possible.

North from the San Pedro Subdivision where it crosses Randolph Street in Huntington Park, there are four route options providing service to Union Station:

- ***East Bank Alignment Alternative*** – This alignment would continue north along the San Pedro Subdivision to travel over a Burlington Northern-Santa Fe (BNSF) railroad crossing north of Bandini Boulevard, and run in an aerial configuration across a portion of BNSF's Hobart Intermodal Yard to where the ROW intersects with a UP-owned ROW. This heavily-utilized ROW connects Los Angeles and points east such as Riverside, and serves freight and Metrolink and Amtrak passenger rail service, and may accommodate future California HSR service. The new transit line would share the UP ROW for a short distance to where the ROW, now owned by Metro and operated by Metrolink, turns north to travel along the east bank of the Los Angeles River, and then crosses over the river to enter into Union Station.

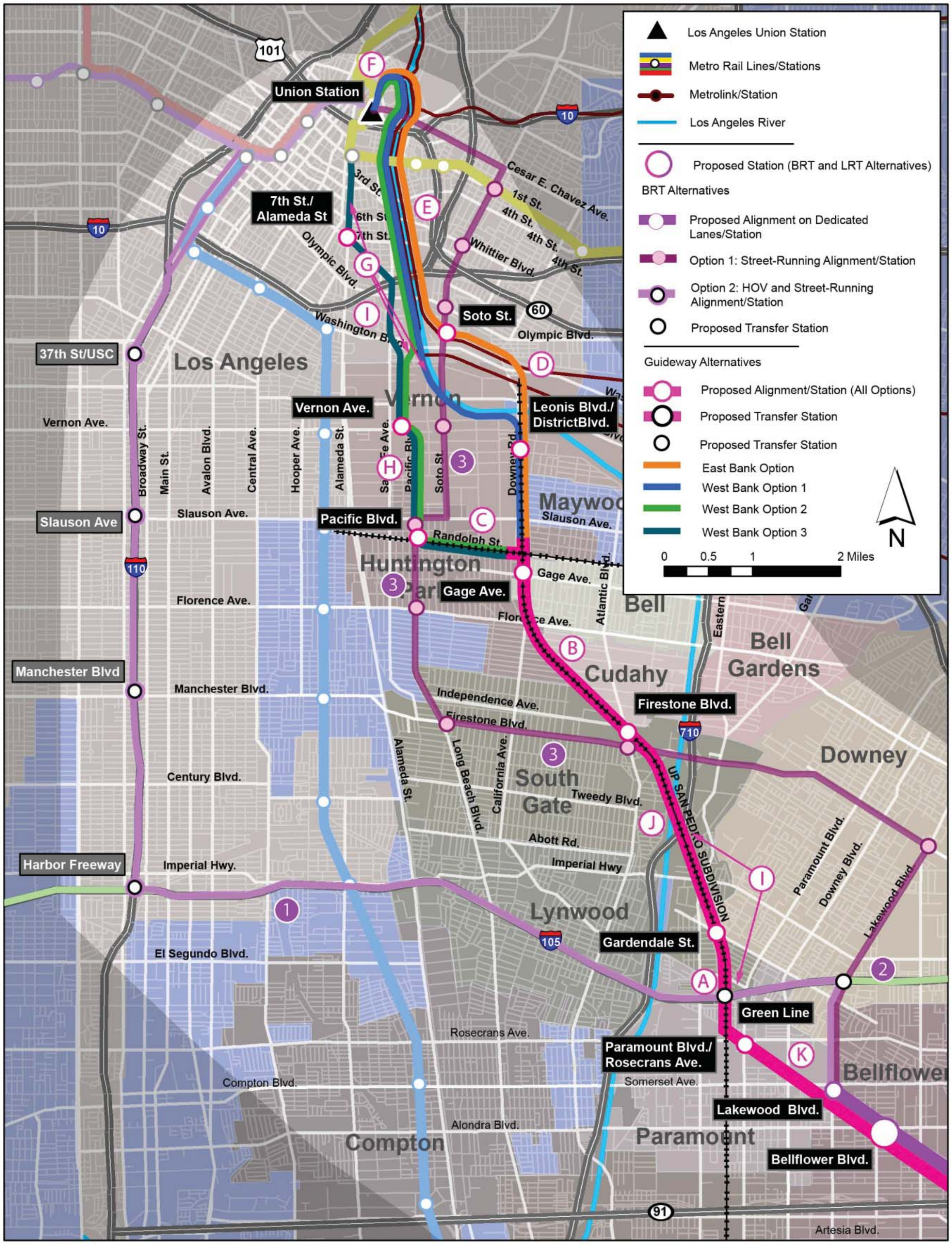
- ***West Alignment Alternative*** – This alignment would turn west to operate in a former railroad ROW located in the median of Randolph Street. The West Bank Alternative has three sub-options:
  - The **West Bank 1** alternative runs along the west bank of the river first in the bank edge area that appears vacant and then would share the Metro-owned ROW to Union Station with Metrolink and Amtrak services.
  - The **West Bank 2** option operates in the median of Randolph Street through Huntington Park, and turns north to operate in the median of Pacific Boulevard to the Metro-owned Harbor Subdivision. It would use this ROW, crossing over the Redondo Junction, and operate north along the Los Angeles River in a route similar to the West Bank 1 Option.
  - The **West Bank 3** alternative follows the same initial route as West Bank 2 north along Pacific Boulevard, but continues north on a combination of the Harbor Subdivision, city streets, and private property in an aerial and underground configuration to daylight south of the Metro Gold Line Little Tokyo Station. Currently, this option is proposed to use the existing Gold Line tracks to reach Union Station.

In addition to the coordination requirements with multiple railroads, passenger service agencies, and state and federal agencies, implementation of the guideway alternatives would have the following challenges:

A. *New Metro Green Line Station*

- *Cost and Green Line service interruptions* – A new station would be required to provide a connection to the Green Line for a new transit system operating on the San Pedro Subdivision. Construction of a new station on a heavily-used urban rail line would be challenging. Previous Metro plans had looked at another Green Line station in the vicinity of the I-710, and this would be a logical location given the opportunity of providing a high-capacity connection to and from downtown Los Angeles and the densely-populated Gateway Cities subregion and Orange County. A conceptual cost has been identified and included in the capital cost estimates. While a contingency factor has been applied, this cost may increase during possible future engineering and environmental work due to conditions and requirements not known during AA design work.
- *Fit with freeway median and operational impacts* – With the Metro Green Line operating in the median of the I-105 Freeway, expansion of the median to accommodate a new station, along with the resulting impacts on freeway operations at this complicated system point where the I-105 Freeway interfaces with the I-710 Freeway, would be challenging. Conceptual-level station plans were developed and discussed in an initial meeting with California Department of Transportation (Caltrans) staff. Caltrans identified the requirement that the final station design must maintain the current number of freeway lanes; the conceptual station plans did fit within the existing ROW with shifting of freeway lanes. Adding a station at this location may disrupt freeway operations during construction, and mitigation plans would need to be developed.

Figure 2.17 – Implementation Challenges and Constraints



- *New station access* – The San Pedro Subdivision passes over the I-105 Freeway and the Green Line in a single-track bridge. It would have to be rebuilt to provide sufficient width to accommodate new guideway service and passenger platforms and circulation elements providing access to the new Green Line station, along with replacement of the freight rail track.

B. *San Pedro Subdivision owned by Ports of Long Beach and Los Angeles*

- *Subdivision availability* – While the Ports have expressed initial interest in selling the ROW for the project, this alignment currently is part of an ACTA agreement to provide emergency freight service and UP has the first right to repurchase the ROW.
- *Freight rail compatibility issues* – While the San Pedro ROW currently provides service to a small number of customers, any use of the ROW must be designed to accommodate freight rail operations and maintenance along with new passenger rail use unless the ACTA agreement is revocable or has a timeframe that will expire.
- *Approvals required* – Any operational change to the San Pedro Subdivision, especially the introduction of passenger rail service, would require close coordination with and the approval of the Ports, UP, FRA and CPUC.

C. Operate on inactive or active railroad lines

- *UP agreement required* – For the West Bank 2 and 3 alternatives, reuse of the inactive railroad ROW located in the median of Randolph Street would require an agreement by UP to vacate as there is insufficient room for both passenger and freight rail service in portions of the ROW.

D. Interface with the BNSF and UP Railroads and the future CHST system for East Bank Alternative

- *BNSF agreement required* – For the East Bank Alternative, the ROW would interface with a BNSF-owned crossing and BNSF's Hobart Intermodal Yard. Approval of the BNSF to cross their facilities would be required.
- *UP agreement required* – The proposed East Bank alignment would operate in and/or above an UP-owned ROW, known as the San Gabriel Line, that accommodates both freight and Metrolink passenger rail service. The trackage in this segment is highly utilized and nearing capacity, and adding new service in this area will be challenging. Sharing the freight ROW would require approval by the FRA and CPUC.
- *Fit with future CHST system* – One of CHST alignments providing connecting service south to Anaheim is proposed along this portion of the UP ROW. Future transit system plans may need to consider the physical fit with the high speed system.

E. Operate on Metro-owned tracks with UP freight and Metrolink passenger rail service

- *Fit with current ROW usage* – The East Bank Alternative would operate on the ROW along the eastern bank of Los Angles River owned by Metro and operated by Metrolink. This heavily-utilized set of tracks provides access for Metrolink passenger rail service into Union Station and freight rail access to UP's Intermodal Yards. Sufficient track capacity appears available, but passenger rail service may not be operationally viable.

F. Access into Union Station

- *Constrained Union Station capacity* – Union Station trackage and passenger platforms are beyond capacity due to the current and future levels of Metro Gold Line, Metrolink, and Amtrak passenger train activity. It also is proposed to serve as a hub for the future CHST system, which would push Union Station beyond its physical capacity and may require provision of a second track level. Train access through Union Station's "throat" is also beyond capacity due to the limited number of tracks and the curving alignment which restricts operating speeds.
- *Replace Los Angeles River Bridge* – The existing railroad bridge crossing the Los Angeles River, while sufficient to handle current Metrolink activity, would require retrofitting or replacement to accommodate increased usage by a project resulting from this AA study. Revisions to or replacement of the bridge would require coordination with a number of agencies and entities, including the U.S. Army Corps of Engineers (USACE) due to the crossing of the Los Angeles River.

G. West Bank Operational Viability and Access Constraints

- *West Bank Alternatives 1 Access* – Based on AA-level engineering and site analysis work, the West Bank 1 alignment would be precluded by an existing system of high tension electrical towers. There is insufficient room along the river's west bank edge to accommodate a new transit system without significant property takes.
- *West Bank Alternatives 2 Access* – As noted above, this alternative would require UP's agreement to vacate the Randolph Street ROW. While not used for freight rail service, it does provide a connection to a track along the Metro Blue Line that is currently used to store empty rail cars. Access into Union Station would be via a potentially expensive crossing of the heavily-utilized Redondo Junction. It then would share a ROW along the west bank of the Los Angeles River used by Metrolink and Amtrak operations, along with the Metro Red Line maintenance and storage facility. This alternative would connect into Union Station through the constrained track throat.
- *West Bank Alternatives 3 Access* – Similar to West Bank Alternative 2, this alternative would require UP's agreement to vacate operations in the median of Randolph Street. Traveling north, both the West Bank 2 and 3 alignment alternatives would travel along Pacific Boulevard, a former Red Car route, where they would connect with and operate along the Metro-owned Harbor Subdivision. The West Bank 3 alternative would run in a combination of aerial and underground operations that would daylight south of the Metro Gold Line Little Tokyo Station where it would use the existing at-grade Gold Line tracks to access Union Station. The proposed configuration would require refining to address daylighting impacts on Alameda Street, interface with the future Regional Connector, and whether the Metro Gold Line tracks have sufficient capacity to accommodate additional traffic.

H. *Assess City Traffic Impacts*

- Whether the proposed transit system operates at-grade or in a grade-separated configuration, introduction of a high-capacity transportation system would impact city street operations. As discussed in Chapter 3.0, at-grade systems may result in impacts requiring mitigation, including loss of traffic capacity and on-street parking and traffic flow impacts. Impacts from above-grade systems may include loss of street capacity, left-turn lanes, and on-street parking due to column placement.

I. *Freeway Crossings*

- In this portion of the Corridor, the proposed guideway alignments would cross under or over three freeways – the US-101, I-10, and I-710 – in addition to the I-105 as previously discussed. The Street Car and LRT alternatives have been designed to operate under the three freeways: for the US-101 and I-10 on streets and/or rail ROWs; and under the I-710 in an existing undercrossing; all have sufficient width and height to accommodate at-grade operations. Both modal alternatives would run in a new bridge over the I-105 as discussed above. Due to the grade-separated operational requirements of the Low Speed Maglev Alternative, all of the alignment options would require structures over this area's freeways. While the other freeway crossings would be approximately 16.5 feet to the bottom of the guideway structure, the I-105 crossing would be significantly higher (approximately 50 feet to the bottom edge) due to the need to not only be above the freeway envelope, but also above the existing freight rail bridge and freight operations.

PEROW/WSAB Area

In this portion of the Corridor, all of the proposed alternatives were designed to operate along the Metro and OCTA owned former PE ROW. While the ROW width of 75 to 195 feet provides more than sufficient space to accommodate the average 28-foot width required for at-grade operations or placement of columns, several cities have strongly requested that the BRT alternative not run on the ROW, but along adjacent city streets. Reuse of this ROW offers a unique opportunity to implement a high-capacity transit project with travel speed and time benefits, but due to the predominant adjacent land use being residential in this section, any project would also result in noise and vibration, visual and privacy, safety, and circulation impacts requiring mitigation as discussed in Chapter 4.0. In the PEROW/WSAB Area, all of the alternatives would have the major challenges discussed below and illustrated in Figures 2.17 and 2.18:

J. *Address Water Crossing Issues*

- In all portions of the Corridor, the proposed alignments would cross and interface with a wide variety of rivers, creeks, and flood channels. In Los Angeles County, the proposed alignments cross the Los Angeles River twice, the San Gabriel River, and the Coyote Creek Flood Control Channel at the county line. In addition, a portion of the ROW is used for a flood channel in the southern portion of Los Angeles County. In Orange County, the proposed ROW crosses the Santa Ana River and a number of flood channels. Existing bridges are primarily single track and would have to be widened or replaced to accommodate a new high-capacity transit system. Based on an initial field and record review of the possible crossings, there appears to be no insurmountable engineering issues; any construction would require input from and approval of the USACE and county flood control agencies.

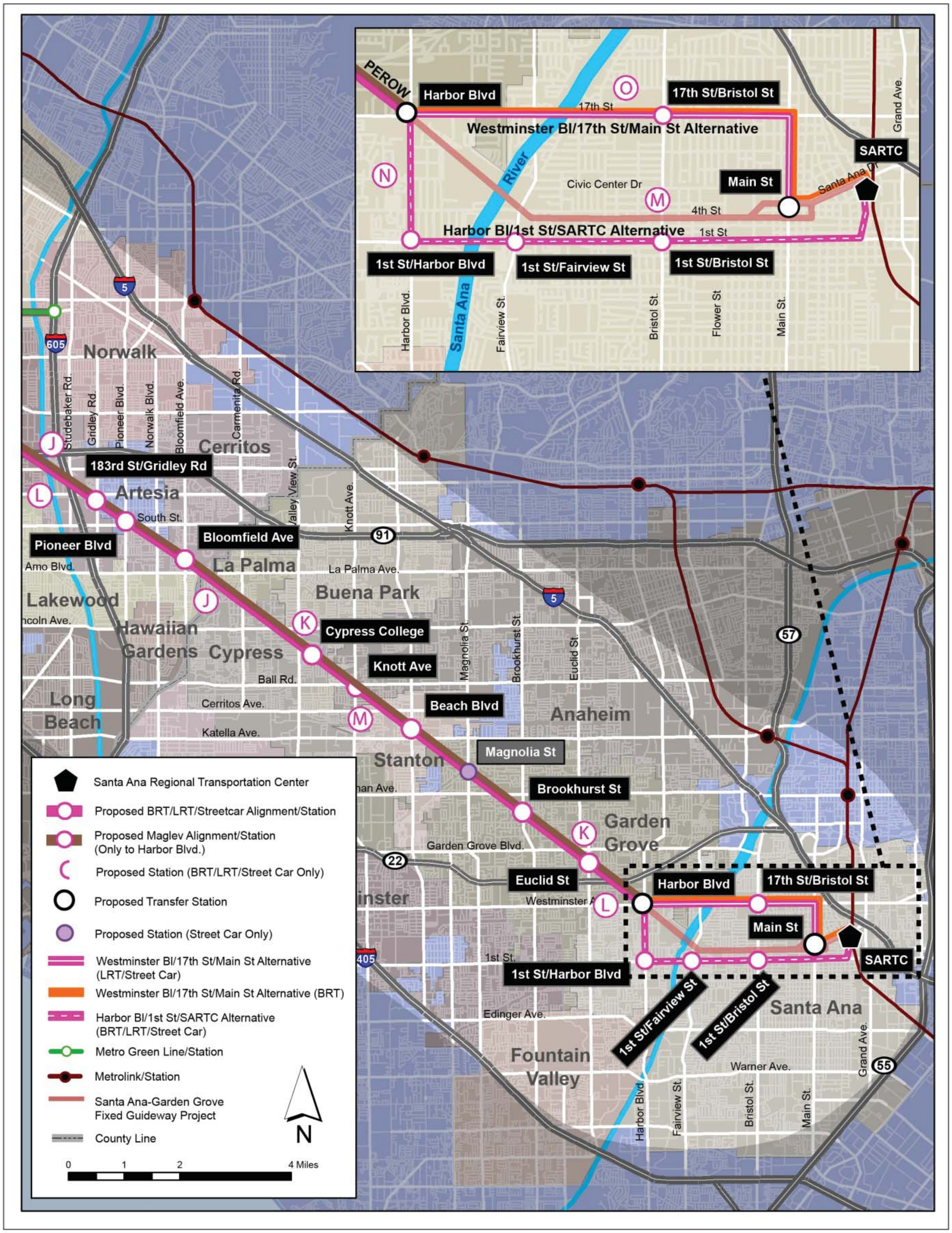
K. *Encroachments on the ROW*

- *Use encroachments* **–** A constraints analysis performed for the PEROW/WSAB ROW identified public and private encroachments onto the former PE ROW. The encroachments in Los Angeles County include several commercial uses or their parking located on the ROW, and in the City of Paramount, Metro has leased land for an oil line that runs along the ROW to provide service to the Paramount Petroleum Facility. In addition, there is a pedestrian bridge over the ROW connecting portions of Paramount High School that are located on opposite sides of the ROW. In Orange County, there have been several major ROW encroachments that have occurred with OCTA's concurrence. A portion was sold to the City of Garden Grove for a commercial development project and related parking, with aerial rights reserved for a future transit project; the City of Buena Park has two small parks located on the ROW; and OCTA uses a portion of the ROW for temporary bus storage purposes. In the City of Santa Ana, residential, commercial and industrial properties have been built on the ROW as it enters the downtown area over the years. Except for the Santa Ana development, none of the encroachments appear to preclude implementation of a future project; they will need to be considered as more detailed design and operational plans are developed.
- *Utility Issues* – As part of the ROW constraints analyses, existing utilities were identified and located. There are a significant number of underground utilities, typically under the streets crossing the ROW, as well as major overhead utility lines crossing or running along the ROW. Minimizing impacts to existing utilities would need to be considered in future engineering plans.

L. *Freeway Crossings*

- In this portion of the Corridor, the proposed system alignments would cross under or over three freeways – the SR-91, I-605 and SR-22. The BRT, Street Car, and LRT alternatives were designed to operate under the freeways: the SR-91 and I-605 freeways have existing undercrossings that provide sufficient width and height to accommodate at-grade operations; and the alignments would circulate under a SR-22 bridge. It should be noted that future plans call for the ROW to be used for vehicular off-ramps from the SR-22 onto the ROW to provide circulation into the City of Santa Ana. In that case, all proposed alternatives would be required to cross above the SR-22. Due to the grade-separated operational requirements of the Low Speed Maglev Alternative, all of this option's alignments would require structures over area freeways. Based on the high number of adjacent residential uses, this alternative's freeway crossings would have significant visual impacts. The Low Speed Maglev Alternative's freeway crossings require a structural transition from a guideway structure 16.5 feet above the ROW to one 16.5 feet above a raised freeway surface. In this area, the resulting structures would be approximately 40 feet to bottom of the structure crossing over the I-605, and 50 feet to cross the SR-22, or a 23.5 to 33.5 foot transition. In all freeway crossing locations, there is insufficient space for the provision of integrated pedestrian and bicycle facilities, and alternative routing would be required.

Figure 2.18 – Implementation Challenges and Constraints



M. *Assess City Traffic Impacts*

- *Street system Impacts* – As stated above, introduction of a high-capacity transportation system improvement would have impacts to city street operations. At-grade systems may result in impacts to traffic capacity and flow, and the removal of on-street parking. Grade-separated systems may result in the loss of street capacity, left-turn lanes, and on-street parking due to column placement.
- *Challenges of diagonal street crossings* – The ROW runs at a diagonal between the cities of Paramount in Los Angeles County and Santa Ana in Orange County with 56 roadway crossings along its 20-mile length – approximately three crossings per mile. Of the total crossings, 46 of the streets are classified as primary or secondary arterials, while the remainder is identified as local or collector streets. The highest number of crossings occurs in the City of Garden Grove (21), followed by the City of Bellflower (six), and then the cities of Paramount, Cerritos, Artesia, and Stanton (five each). An initial assessment of traffic impacts resulting from implementation of a new high-capacity transit system was prepared and an overview of the results is presented in Chapter 3.0. The assessment included a review of the existing geometric layout and number of lanes to identify conceptual impacts. The ROW passes through only two intersections – Paramount Boulevard/Rosecrans Avenue in Paramount and Gridley Road/183rd Street on the border of the cities of Cerritos and Artesia – all of the other crossings occur midway through the impacted roadway segment.

  Aerial operations typically result in minor or no traffic impacts, with only some impacts coming from the system's structural design where it crosses over intersected roads. Due to span constraints, wider street widths may require placement of an intermediate column in the roadway. Outrigger structures are typically used and allow maximum length of 220 feet. While aerial structures minimize traffic impacts, the support elements do have physical and visual impacts on adjacent communities. At-grade transit systems, whether BRT, Street Car, or LRT, would require gates and sound equipment, and possibly signalization, to allow for the safe crossing of transit vehicles. While transit vehicle are in the roadway for a short time (5-10 seconds), the gate crossing bells may have noise impacts on adjacent land uses unless mitigated. During any subsequent preliminary engineering and environmental review efforts, the decision on whether to grade separate future transit service in Los Angeles County would be guided by Metro's grade separation policy.

Southern Connection Area

In this portion of the Corridor, a majority of the alternatives would operate along one of two alignment options connecting south to the SARTC. The exception is the Low Speed Maglev Alternative, which would end at Harbor Boulevard with passengers transferring to the Santa Ana-Garden Grove Fixed Guideway Project to complete their trip. As illustrated in Figure 2.18, the BRT, Street Car, and LRT alternatives would leave the former PE ROW to operate on one of two alternative routes:

- **Harbor Boulevard/1st Street/SARTC Alternative** would leave the Corridor ROW after a future Harbor Boulevard Station to travel south on Harbor Boulevard, east on 1st Street, and then north on a realigned Santiago Street to the SARTC.

- **Westminster Boulevard/17th Street/Main Street Alternative** would serve the future Harbor Boulevard Station and then travel east on Westminster Boulevard/17th Street, and south on Main Street where riders would transfer to future Santa Ana-Garden Grove Street Car system to travel to the SARTC.

In the Southern Connection Area, all of the alternatives are currently proposed to operate in an at-grade configuration with the following implementation challenges and constraints:

N. *Assess City Traffic Impacts*

- Both alignment alternatives would have the impacts on city street operations with similar impacts to those discussed above for at-grade operations. The Westminster Boulevard/17th Street/Main Street Alignment was identified as having a higher level of traffic impacts with 90 percent of the alignment's intersections having geometric impacts compared to 50 percent of the Harbor Boulevard/1st Street/SARTC Alignment's intersections. There would be significant traffic impacts on Main Street through downtown Santa Ana due to a constrained street ROW width – only two through lanes in each direction compared to three through lanes for all of the other streets in the alignment options.

O. *Address Impacts on Sensitive Land Uses and Cultural Resources*

- Implementation of high-capacity transit service along both alignment alternatives would have impacts on adjacent residential neighborhoods and retail development; though land use plans do identify future development opportunities along 1st and Santiago Streets. In addition, there are a large number of historic and cultural resources eligible for and/or listed on the National Register, state, and local historic resource lists in the civic center and downtown areas of Santa Ana. The narrow Main Street segment of the Westminster Boulevard/17th Street/Main Street Alternative is lined with a significant number of historic buildings.

2.3.6 Final Screening Evaluation Criteria

The Final Set of Alternatives were studied and evaluated based on conceptual-level engineering and operating design, station location, capital and operating cost estimates, ridership forecast modeling, and community and environmental impact analysis. The resulting comparative analysis of the alternative-specific technical information, along with public and stakeholder input, will provide the public and decision-makers with the basis to identify the recommended alternative, or phasing of alternatives, which addresses Corridor mobility needs and capacity requirements in the year 2035 and beyond. The recommended evaluation criterion was based on: local goals identified during Project Initiation involvement efforts, applicable criteria of possible implementing and funding agencies, and findings of the Corridor Mobility Problem and Need analysis. The identified criteria are intended to reflect the broad range of benefits and impacts that may be realized by the implementation of a proposed transit project.

The resulting PEROW/WSAB Corridor criteria are grouped in the following five categories and presented with related performance measures in Table 2.11:

1. ***Public and Stakeholder Support*** – the level of community, stakeholder, and jurisdictional support for the project.
2. ***Mobility Improvements*** – the level to which the project improves local and regional mobility and accessibility by minimizing congestion, increasing travel reliability, and improving access to and from key activity centers and destinations.
3. ***Cost-Effectiveness/Financial Feasibility*** – how the project costs are balanced with expected benefits, and how the project funding needs fits within available funding resources.
4. ***Land Use and Economic Development*** – how the project supports local and regional land use and development plans and policies
5. ***Environmental Benefits and Impacts*** – the extent to which the project provides additional travel capacity, while minimizing environmental and community impacts, and balancing distribution of benefits, impacts, and costs by mode, household income, and race/ethnicity.

Table 2.11 – Final Screening Evaluation Criteria

Criteria	Performance Measures
1. Public and Stakeholder Support	• Provide a desirable solution to the community and stakeholders. • Have city/jurisdictional support.
2. Mobility Improvements	• Improve travel speeds and reduce travel times. • Provide connections to the regional rail system. • Increase range of transportation options. • Serve current and future travel growth and patterns. • Serve both community and regional trips. • Make transit a viable alternative as measured by resulting ridership and new riders. • Increase access to and from Corridor activity centers and destinations. • Increase service for transit dependent Corridor residents. • Provide improved cross-county line transit service. • Provide an integrated pedestrian and bicycle system.
3. Cost-Effectiveness/Sustainability	• Balance project costs with expected benefits – resulting construction and operating costs are balanced by strong ridership (cost-effectiveness). • Identify transportation alternatives that are financially sustainable with identified resources.
4. Land Use/Economic Plans	• Provide station spacing that supports local economic development and revitalization plans and job strategies. • Serve areas with transit supportive land use policies.

Table 2.11 – Final Screening Evaluation Criteria

Criteria	Performance Measures
5. Project Feasibility	• Fit with current local transit system operations or plans. • Has state and federally approved vehicles, and is operational in the U.S.
6. Environmental Benefits and Impacts	• Minimize environmental/community impacts • Improve air quality by reducing tailpipe and Greenhouse Gas emissions • Minimize the number of properties to be acquired. • Assess environmental justice impacts

The comparative analysis of the Final Set of Alternatives is presented in the following chapters and summarized in Chapter 7.0, Comparison of Alternatives and Recommendations.

3.0 TRANSPORTATION ANALYSIS

This chapter describes the current transportation system in the PEROW/WSAB Corridor Study Area that would be affected by the proposed project alternatives under consideration. It provides an overview of the existing freeway, arterial, and transit systems, their existing and future conditions, and planned highway and transit projects. This chapter presents the transportation system consequences resulting from the implementation of each of the alternatives under consideration. These effects are presented for the Corridor's highway and transit systems, and are primarily discussed in terms of traffic impacts and ridership forecasts.

3.1 Affected Environment

The existing Corridor transportation system can be characterized as heavily automobile-oriented with 86 percent of work-related trips made by automobile whether in a single-occupant vehicle (SOV) or by carpool. The study area is served by an extensive freeway and arterial system, with transit access provided primarily by bus and circulator service with some rail service. Currently severe congestion is experienced by automobile and bus transit users alike as many Corridor highways operate near or at capacity during both peak periods. Auto travelers are negatively impacted by delays, while transit users experience slowing bus travel on the same congested highway system.

The ability to move quickly and efficiently in the PEROW/WSAB Corridor, both now and in the future, can be expressed in terms of freeway and arterial congestion, along with transportation system accessibility and choice. As discussed in Chapter 1.0 of this document, this densely populated Corridor faces significant mobility challenges in the future with the forecasted growth in population, employment, and travel demand, along with changing employment patterns. By 2035, more than 12.8 million additional daily trips will occur in the Corridor straining the existing transportation network. Without additional transportation system improvements, the Corridor's Mobility Problem can be described in terms of:

- **Freeway and arterial congestion** – Currently, the freeway system serving the Corridor is highly congested resulting in travel time delays for a significant portion of each day. Correspondingly, a large percentage of the study area's major arterial intersections operate at or beyond capacity during both peak travel periods.
- **Transit system constraints** – The study area lacks transit system connections both within the Corridor, and beyond the Corridor to the regional urban and commuter rail system.
- **Limited travel options** – Corridor residents have limited travel options available resulting in a high percentage of work and other trips made by automobile.

The Corridor's congested freeway and arterial street system, together with the limited bus and rail service, offer limited capacity and travel options to accommodate the forecasted increase in travel. Development of an effective multi-modal, high-capacity transportation system is essential to meet the future mobility needs of Corridor residents and businesses.

3.2 Traffic

The ability to move quickly and efficiently in the PEROW/WSAB Corridor can be expressed in terms of freeway and arterial congestion, along with transportation system accessibility and choice. The following discussion presents an overview of current and future conditions, and future highway system plans.

3.2.1 Freeway Network

The PEROW/WSAB Corridor is served by an extensive freeway system that provides a high degree of access to areas throughout Los Angeles and Orange counties and to destinations beyond. When operating effectively, these freeways are capable of moving high volumes of vehicles. As presented in Figure 3.1, the following seven freeways are located in or frame the boundaries of the study area:

- ***I-5/Santa Ana Freeway*** – This freeway runs at a northwest-southeast diagonal parallel to and north of the PEROW/WSAB Corridor, and forms a majority of the eastern study area boundary. The I-5 connects Los Angeles and Orange counties internally and north to the Central Valley and Sacramento, and south to San Diego.
- ***I-405/San Diego Freeway*** – This freeway operates at a northwest-southeast diagonal parallel to and south of the PEROW/WSAB Corridor, and forms a large portion of the southern study area boundary. The I-405 serves Los Angeles and Orange counties, and joins the I-5 to the north in the San Fernando Valley, and to the south in Irvine.
- ***I-710/Long Beach Freeway*** – This north-south freeway runs through the western portion of the study area and connects Long Beach and the ports of Long Beach and Los Angeles north to its current terminus in Alhambra in the San Gabriel Valley.
- ***I-605/San Gabriel Freeway*** – This north-south freeway passes through the heart of the study area, and connects north to the I-210 in the San Gabriel Valley, and south to the I-405 at the boundary between Los Angeles and Orange counties.
- ***I-105/Glenn Anderson or Century Freeway*** – This east-west freeway connects the I-605 in Norwalk west to the I-405 in the Los Angeles International Airport (LAX) area. The Metro Green Line operates in the freeway median west from Norwalk to the LAX area.
- ***SR-22/Garden Grove Freeway*** – This east-west freeway operates through the southern portion of the study area from the SR-1/Pacific Coast Highway in Long Beach east to the SR-55 located in Santa Ana and Tustin.
- ***SR-91/Artesia Freeway*** – This east-west freeway operates through the heart of the study area, and connects Los Angeles, Orange, Riverside, and San Bernardino counties from the I-110/Harbor Freeway in the South Bay Cities east to downtown San Bernardino.

There are three north-south-oriented freeways adjacent to the study area: in Los Angeles County, the I-110/Harbor Freeway to the west connects the South Bay with downtown Los Angeles and the San Gabriel Valley; and in Orange County, the SR-55/Costa Mesa and SR-57/Orange freeways to the east provides connections from the central portion of the county north to the SR-91 and I-10 respectively.

Figure 3.1 – Current Regional Highway System

3.2.1.1 Existing and Future Conditions

The Los Angeles-Santa Ana metropolitan area contains the most congested roadways in the country according to the Texas Transportation Institute's *2009 Urban Mobility Report*. The PEROW/WSAB Corridor freeways are no exception, and often lead the list of the region's most congested facilities. Between now and 2035, these congested conditions are forecast to worsen limiting the ability of the study area's highway system to serve future travel demand. The Metro Travel Demand Model was used to evaluate current and future freeway levels of service in the Corridor. The results are presented as Level of Service (LOS) estimates, where LOS is defined as the roadway's volume compared with its carrying capacity as shown in Table 3.1. Roadways operating at LOS E are nearing or are at capacity, while LOS F indicates a highway operating beyond the identified system capacity resulting in significant delays for travelers.

Table 3.1 – Level of Service Definition

Level of Service (LOS)	Volume/Capacity	Description of Traffic Flow
A	0.000 – 0.600	Free flow
B	0.601 – 0.700	Free flow with periodic slowing
C	0.701 – 0.800	Start of congestion
D	0.801 – 0.900	Traffic volumes approaching capacity
E	0.901 – 1.000	System near or at capacity resulting in unstable flow
F	> 1.000	System beyond capacity with stop and go traffic

Source: *Highway Capacity Model*, 2000.

Based on 2006 and 2035 information from the Metro travel demand model, the study area freeways operating at an LOS of E or F were identified and are presented in Table 3.2, with freeways operating totally at LOS F indicated in bold. The percentage shown represents the length of each freeway in the study area operating near, at, or beyond capacity. In 2006, all of the Corridor freeways experienced LOS E or F along a portion of their alignments during the morning (7:00-9:00 AM) and evening (4:00-6:00 PM) peak periods, except for the I-710. During the morning peak period in 2035, all of the freeways will operate at LOS E or F along 75 percent or more of their study area length, except for the eastbound I-105 and the I-710. Evening congestion will be more severe, with all of the study area freeways, except for the I-710, operating at LOS E or F along 80 percent or more of their Corridor length.

A freeway-specific overview of current and forecast operations shows the following current and future levels of congestion:

- **I-5 Freeway** – In 2006, the I-5 experienced LOS E or F operations along 40 to 50 percent of its length during the morning and evening peak periods. In 2035, segments with congestion will double, with 90 to 100 percent of the I-5 in the study area experiencing LOS E or F operations. In the morning, northbound travelers into downtown Los Angeles will drive in LOS F conditions along 95 to 100 percent of the Corridor freeway route, and again as they return home.

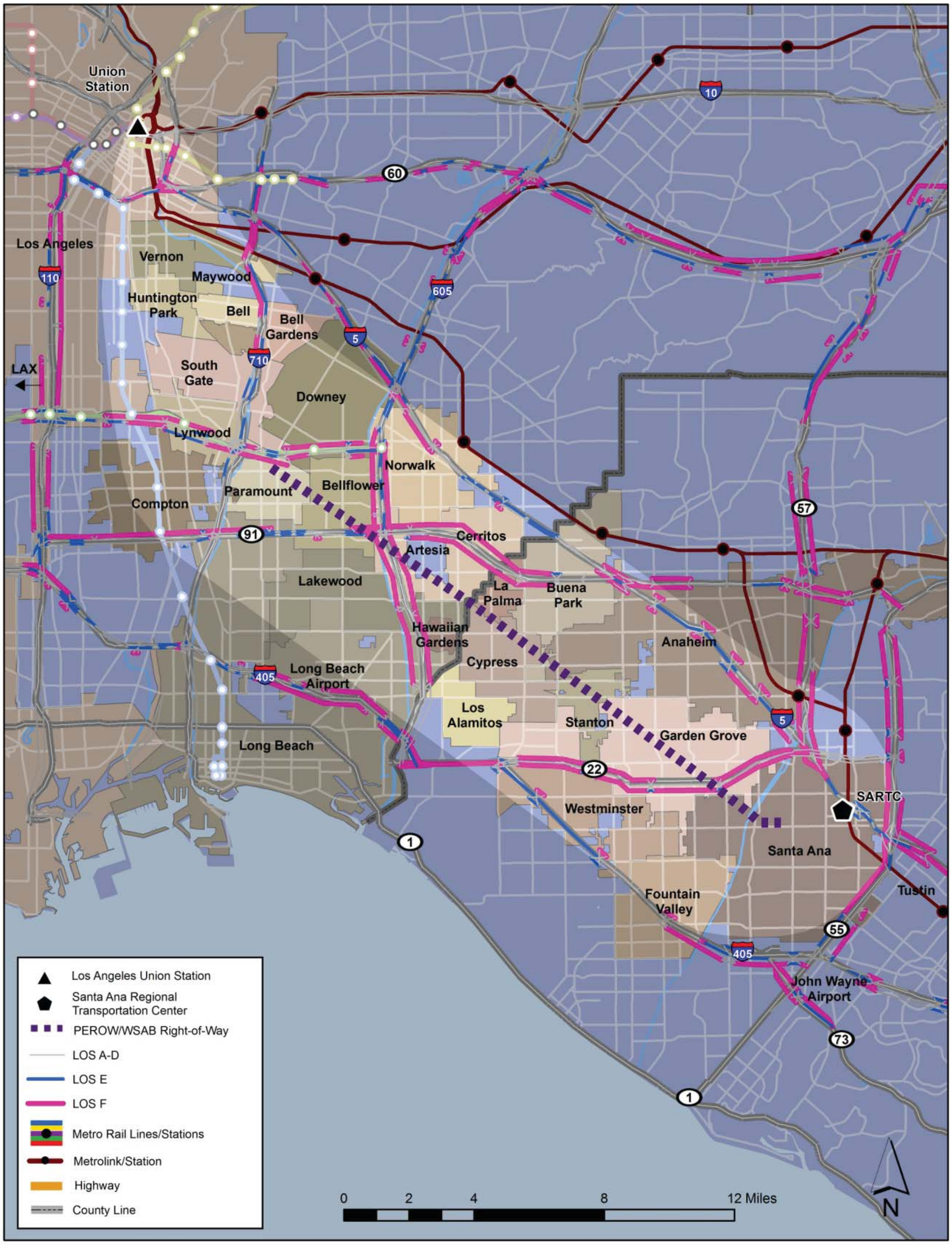
Table 3.2 – Corridor Study Area Freeways Operating at Level of Service E or F

Freeways		AM Peak Period		PM Peak Period	
		2006	2035	2006	2035
I-5	NB	45-50%	**95-100%**	45-50%	95-100%
	SB	40-45%	90-95%	40-45%	**95-100%**
I-405	NB	**90%**	90-95%	**90%**	90-95%
	SB	**90%**	95-100%	**90%**	95-100%
I-710	NB	5%	5-10%	--	5-10%
	SB	--	10-15%	5%	10-15%
I-605	NB	75%	80-85%	80-85%	**80-85%**
	SB	**50-55%**	**80-85%**	80-85%	**80-85%**
I-105	EB	40-45%	65-70%	90-95%	95-100%
	WB	90%	95-100%	50-55%	95-100%
SR-22	EB	**15-20%**	75-80%	15-20%	85-90%
	WB	**15-20%**	75-80%	15-20%	85-90%
SR-91	EB	50-55%	**85-90%**	**90%**	**85-90%**
	WB	90%	**90-95%**	80-85%	**90-95%**

Source: Metro Model, 2006. **Bold** numbers indicates LOS F only.

- **I-405 Freeway** – In 2006, the I-405 experienced LOS F service in both the northbound and southbound directions along 90 percent of its study area length during both peak periods. In 2035, with completion of planned capacity improvements, travel is forecasted to improve with more LOS E conditions in both directions during peak travel periods.
- **I-710 Freeway** – During both peak periods, the I-710 operated at LOS D or better, with the exception of one segment between Firestone Boulevard and Florence Avenue. In 2035, the I-710 is forecasted to experience LOS E or F service along 5 to 15 percent of its Corridor length.
- **I-605 Freeway** – During the 2006 morning peak period, this freeway experienced a combination of LOS E and F operations along 75 percent of its northbound study area length, while 50-55 percent of the Corridor's southbound travel experienced LOS F conditions. Operations will worsen in 2035, with 80 to 85 percent of this freeway's study area length experiencing LOS E or F operations in the northbound direction in the morning, and LOS F operations along 80 to 85 percent of its study area length in the morning southbound direction, and LOS F operations in both directions during evening travel.
- **I-I05 Freeway** – In 2006, travel on the I-105 was primarily constrained in the westbound direction in the morning, and the eastbound direction in the evening. Future congestion will become more severe with forecasted LOS E or F operations along 95 to 100 percent of its Corridor length in both directions in the evening peak, and in the westbound direction in the morning peak.
- **SR-22 Freeway** – In 2006, the SR-22 operated at LOS F along 15 to 20 percent of its study area length in the morning peak, and at LOS E or F conditions along 15 to 20 percent during the evening peak. In 2035, congestion will worsen with 75 to 90 percent of the portion of the SR-22 in the study area operating at LOS E or F during both peak periods.

Figure 3.2 – Corridor Freeway Level of Service (2035)



- **SR-91 Freeway** – In 2006, travelers on the SR-91 experienced a significant level of congestion and delay with LOS E or F operations along 90 percent of its length in the westbound direction during the morning peak. In the evening, the freeway operated at LOS F along 90 percent of the eastbound study area portion, and LOS E or F along 80 to 85 percent of its westbound length. In 2035, this freeway is forecasted to operate at LOS F for 85 to 95 percent of its study area length in both directions during both peak travel periods.

3.2.1.2 Future System Improvements

A wide range of freeway and arterial projects are proposed for implementation in the study area as identified in the Metro and OCTA LRTPs and SCAG's RTIP. In addition to the projects discussed below, three current highway studies and projects in or adjacent to the PEROW/WSAB Corridor may impact future freeway and arterial operations:

- **Interstate 710 South EIR/EIS** – The I-710 South Environmental Impact Report/Environmental Impact Study (EIR/EIS) is evaluating how to better serve this vital travel route, while reducing congestion and related environmental impacts on communities along the freeway. The alternatives under consideration include the addition of four truck lanes and widening to ten general travel lanes from the ports north to the SR-60 in the San Gabriel Valley.
- **Interstate 405 Studies and Plans** – Widening the I-405 between the SR-73 and I-605 has been the subject of several OCTA and California Department of Transportation (Caltrans) studies. OCTA led a Major Investment Study (MIS) to evaluate proposed improvements to increase capacity and improve interchange operations. In 2005, two alternatives were adopted by the OCTA Board: No Build and a Build Alternative comprised of adding two mixed-flow lanes in each direction. Following completion of the MIS, OCTA and Caltrans prepared a Project Study Report in 2008, which recommended that the two alternatives be carried forward into the environmental review phase. A draft EIR/EIS is being prepared that considers four build alternatives: 1) add one general lane; 2) add two general lanes; 3) widen to provide an express facility with two High Occupancy Toll (HOT) lanes and one general lane; and 4) implement TSM/Transportation Demand Management /Mass Transit. The draft document is planned for completion in late 2011, with the final document in mid-2012, and the Record of Decision/Notice of Determination anticipated in late 2012.
- **Interstate 5 Studies and Plans** – Since the passage of Measure M in 1990, Orange County has been widening and improving this freeway from its junction with the I-405 to the Los Angeles County border. There are currently two construction efforts and one planning study underway:
  1. ***Santa Ana Freeway (I-5) Gateway Project*** – This project widened the remaining two miles of the I-5 Freeway in Orange County between the SR-91 and the Los Angeles County line. Completed in the fall of 2010, the project included new travel and HOV lanes, overpasses/underpasses at selected locations, and related improvements.
  2. ***I-5 Widening and HOV Project*** – This project is an extension of the Santa Ana Freeway Gateway Project north into Los Angeles County from the county line to the I-605. Planned

improvements along the 6.7-mile segment include the provision of new mixed-flow and HOV lanes, and construction or reconstruction of overpasses/underpasses and interchanges at selected locations. This project is approximately 50 percent designed, and construction is slated to begin in June 2011 with completion targeted for December 2016.

3. ***I-5 Improvements between the I-605 and I-710 Freeways*** – This project's intent is to evaluate alternatives for widening the I-5 to provide mixed-flow and HOV lanes. Currently, the study effort is in the environmental clearance phase; project design, construction cost estimates, and an implementation schedule have not been identified.

Even with currently planned freeway projects identified in the adopted Metro and OCTA LRTPs and the SCAG RTIP, included in the No Build Alternative described in the previous chapter, the Corridor's freeway system capacity will not keep pace with the growing travel needs, and auto travelers will experience continuing and worsening congestion in the future.

3.2.2 Arterial Network

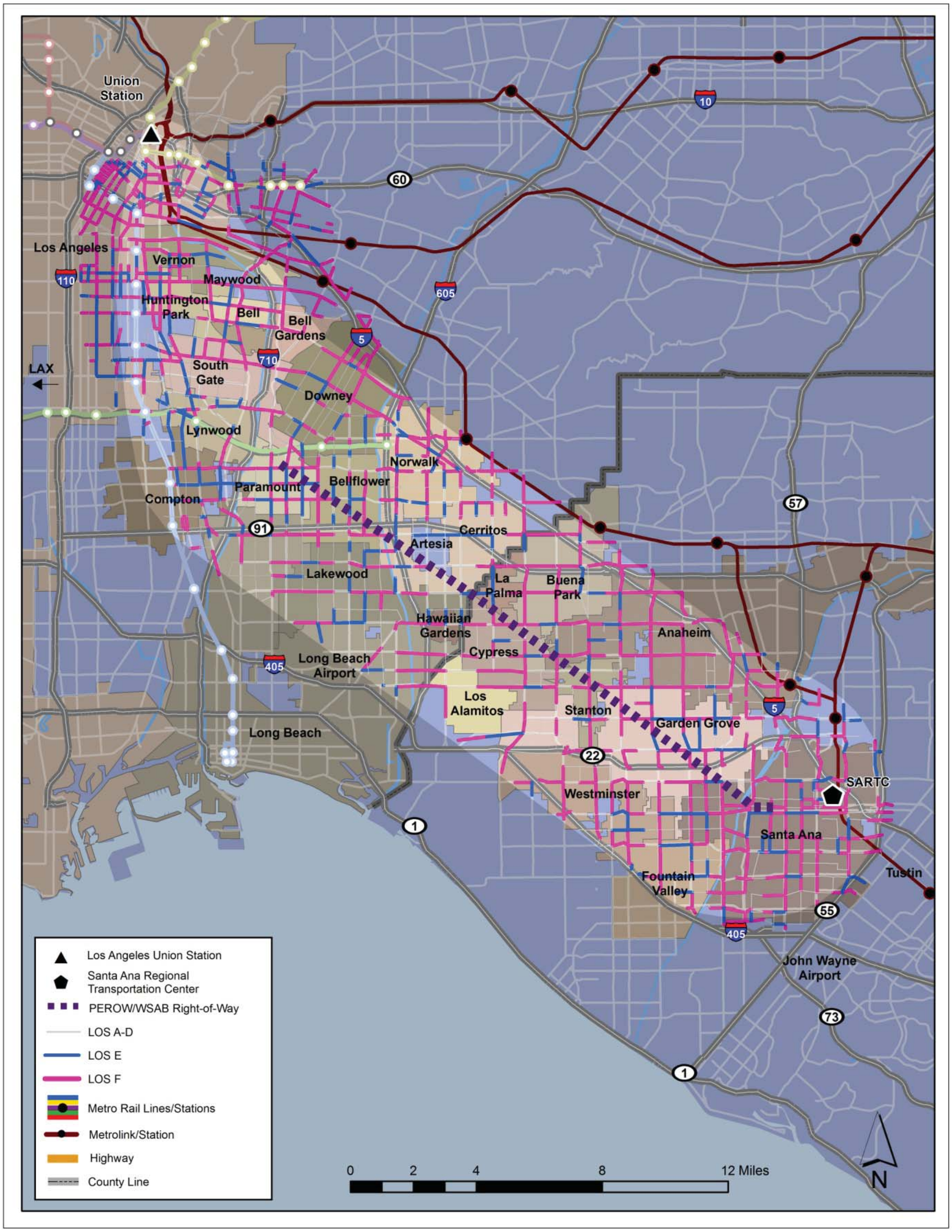
Local streets and roads account for over 80 percent of the total road network in the study area and they carry much of the area's traffic. Arterials often serve as freeway access routes and as alternative parallel routes to congested freeway corridors. The Corridor's arterial street system covers portions of 21 cities, all with their own street standards and plans, but with similar current and future challenges.

3.2.2.1 Existing and Future Conditions

The Metro model was used to assess the existing and projected operating conditions on the study area's arterial street system. In most locations the arterials adjacent to the freeways, and offering access to and from the freeways, are the most congested. The freeways creating a majority of the arterial impacts are the I-5, SR-22, I-710, and I-605. The analysis shows that a number of arterial routes providing access to these freeways are currently operating at LOS E or F, and that the resulting congestion extends from the freeways for several blocks in the morning, and one to two miles in the evening.

In 2035, total miles traveled on the study area's arterial roadway network are expected to increase significantly, severely impacting arterial performance throughout the Corridor. As shown in Figure 3.3, there will be a corresponding increase in the number of arterial segments operating at LOS E or F during both peak periods. During the morning peak period, arterial congestion will remain highest on streets providing access to and from the area's freeways and the congestion will expand in severity. In some cases, arterial congestion from one freeway will start to impact the arterial street congestion resulting from another freeway. For example, congestion on the north-south streets between the SR-22 and I-405 is projected to be almost continuous, and will begin to impact cross streets. During the morning peak period, approximately 25 percent of the area's streets are forecasted to operate at LOS E or F. Evening peak period projections show more than 60 percent of the study area's arterial network operating at LOS E and F.

Figure 3.3 – Corridor Arterial System: Level of Service (2035)



3.2.2.2 Future System Improvements

The current levels of congestion and the forecast increase indicate the need for additional capacity either through highway improvements, or alternative travel options. In mature urban areas such as the Corridor study area, there is little right-of-way available for capacity enhancements, and operational and technological improvements are used to maximize system performance. Typical tools to improve traffic flow, such as signal timing adjustments, signal synchronization, and Intelligent Transportation Systems (ITS), allow traffic engineers to monitor traffic flow and adjust signals in real time to resolve increasing congestion resulting from heavy traffic due to peak period travel, accidents, and/or special events.

County and regional plans include more than $1.5 billion for arterial improvements in Los Angeles County and $2.0 billion in Orange County to be completed by 2035. While these arterial improvement projects are currently in planning, design, and construction, it is anticipated that due to the forecast growth in population, employment, and related daily travel, these projects are not expected to create long-lasting mobility benefits, or address the Corridor's transportation needs on their own. The forecast increase in freeway and arterial system congestion, with most systems operating beyond capacity, demonstrate the increasing need for an alternative travel option.

3.2.3 Highway System Impacts

This section presents a comparative assessment of the impacts the project alternatives may have on the Corridor's highway system operations. Of the proposed alternatives:

- The TSM Alternative would operate entirely at-grade in city streets and freeway HOV lanes.
- The BRT Alternatives would operate primarily in city streets and freeway HOV lanes with dedicated lane operations on the PEROW/WSAB ROW where supported by Corridor cities. BRT street running operations would be located curbside with signal priority for both alternatives.
- The Street Car and LRT alternatives would operate primarily in a dedicated ROW along the PEROW/WSAB ROW, along with: 1) railroad ROW-running operations (shared and not) utilizing several active and inactive railroad ROWs such as the Ports-owned ROW, the Metro-owned Harbor Subdivision, or the median of Randolph Street; and 2) street-running operations in either at-grade or grade-separated operations through the cities of Los Angeles and Vernon, and at-grade operations through the City of Santa Ana.
- The Low Speed Maglev Alternative would run as a totally grade-separated system due to system operational requirements.

As all of the alternatives under consideration are planned to operate on the Corridor's arterial system and railroad ROWs, they would have a negligible impact on freeway system operations. They may have a congestion benefit as a portion of the study area's projected trip growth would travel by the proposed transit system. The only alternative with potential freeway system impacts would be the BRT HOV Lane-Running Alternative where it enters and exits HOV lanes, along with possible capacity impacts to the I-110/Harbor Transitway and I-105 HOV lanes.

Whether the proposed transit system operates at-grade or in a grade-separated configuration, introduction of a high-capacity transportation system would impact city street operations. At the AA-level of analysis, a conceptual level of assessment was performed due to the initial level of system design and the high number of modal and alignment alternatives. During any subsequent preliminary engineering and environmental review efforts, more detailed analysis would be performed.

As discussed below in detail, at-grade operations may result in impacts to traffic capacity and flow, and the removal of on-street parking. The proposed LRT Alternative would be similar to Metro's at-grade service which operates in either: 1) a street-running configuration, where the trains operate along with vehicular traffic and are controlled by the same traffic controls and have the same speed as vehicular traffic; or 2) a dedicated right-of-way where trains can operate at speeds of up to 55 mph. Based on the Los Angeles experience, fast-moving trains may have operational and safety issues related to other vehicular traffic, pedestrians, and bicyclists, particularly along the PEROW/WSAB ROW with the diagonal crossing of roadway segments and two intersections. The decision on whether to grade separate LRT, and possibly Street Car, service in Los Angeles County would be guided by Metro's *Grade Crossing Policy for LRT*, which provides a structured process for making grade-separated versus at-grade operation decisions based on highway system impacts. Grade-separated systems may result in the loss of street capacity, left-turn lanes, and on-street parking due to column placement. All of the options would impact the Corridor's arterial system operations due to increased station area vehicular activity related to drop-off and parking circulation, along with feeder bus and circulator services. Arterial system impacts resulting from implementation of the alternatives are discussed below.

3.2.3.1 Impacts by Alignment Alternative

An overview of the possible impacts resulting from implementation of each of the transit system alignment alternatives on the Corridor's arterial system is presented below. The purpose of the assessment was to identify potential geometric and operational impacts to the local street system, particularly at intersections, with construction and operation of a future transit project. The following discussion provides an overview of the impact assessment methodology used, possible traffic system impacts, and the assumptions that the analysis was based on, along with an identification of Corridor intersections that may be impacted along with proposed mitigation measures.

Possible arterial system impacts to some street cross-sections resulting from implementation of a transit system include:

- Reduction in street capacity due to the conversion of an existing travel lane to a dedicated transit lane either permanently, or for peak period-only transit operations.
- Reduction in capacity for intersecting (cross) traffic due to increased traffic and transit volumes and/or traffic signal priority granted to transit vehicles.
- Conflicts between transit (bus or rail) vehicles and mixed flow vehicular traffic at intersections and mid-block locations.

- Increased delay and congestion due to additional signal phases providing more green time for transit vehicles and/or new signals to accommodate and protect left-turning vehicles.
- Loss of left and right turn movements due to transit facilities resulting in redistribution of traffic on parallel streets, including residential streets.

The potential for Corridor traffic-related impacts was assessed both from an operational and a geometric or intersection layout perspective. For grade-separated locations, the only operational impacts would be related to the potential for column placement to affect median left-turn operations. The analysis identified the following operational Impacts related to at-grade operations:

1. **Current signalized intersections**
   - Minimal effects when trains run concurrently with parallel streets.
   - Shortening or elimination of turn phases with pre-emption may cause queuing impacts.
   - Locations where the guideway alignment would turn would require an all-red signal phase, which would impact intersection operating conditions.
   - Locations where the transit alignment would cross diagonally through an intersection would require an all-red phase, which would impact intersection operating conditions.
2. **Current unsignalized intersections and driveways**
   - With new signalized intersections, minimal effects would occur when transit vehicles run concurrently with parallel streets.
   - None anticipated with closed or right-in/right-out locations.
3. **Mid-block crossings**
   - Queues formed at these locations may spill-back to upstream intersections impacting street operations; traffic queues formed at upstream/downstream intersections may spill-back to impact at-grade transit crossing.
   - Transit vehicles crossing diagonally adjacent to a major intersection may require signalization changes to reduce potential for traffic queues at the at-grade crossing, which would impact intersection operations and may impact queues in other directions.

From a geometric perspective, the assessment identified locations where physical changes may be required for the affected intersections and roadways. At grade-separated locations, the only impact would be potential column placement effecting median left-turn configurations. Potential geometric impacts included:

1. **Current signalized intersections**
   - Reduction in through lanes would likely negatively impact intersection Level of Service (LOS).
   - Shared left-through lanes would need to be converted to left-turn pockets with exclusive signal phases; right-turn pockets would be required for side-aligned configurations.
   - Any reduction in left-turn pockets or elimination of right-turn pockets would likely negatively impact intersection LOS.

- Locations where track alignment must turn could have impacts due to the loss of through lanes or turn pockets.
- Locations where track alignment crosses diagonally through intersection could have impacts due to through lane or turn pocket eliminations.

2. **Current unsignalized intersections and driveways**
    - Signalization of intersections for safety purposes may result in unacceptable conditions.
    - Restriction from full intersection movements to right-in/right-out configurations or full closures could negatively affect circulation and access for the affected streets/driveways, depending upon use of street, availability of supplemental access, and potential for u-turns.
3. **Mid-block crossings**
    - Modifications to turn pocket lengths could result in longer traffic queues blocking through travel lanes.
    - Minor streets and driveways within the crossing area may need to be closed or converted to right-in/right-out configurations, which could negatively affect circulation and access for the affected streets/driveways.

For the evaluation of potential geometric and operational impacts, the analysis was based on the following assumptions:

- All grade-separated locations would have no impacts to intersection/roadway configurations and operations, unless noted.
- Transitions to a grade-separated configuration (tunnel portals or grades to/from aerial segments) could fit within the alignment right-of-way, and would not result in additional geometric changes.
- For the at-grade median alignments, all unsignalized intersections would be signalized, unless proposed for closure.
- Any newly signalized intersection would likely be actuated for the minor streets, thereby reducing the potential for an impacted intersection.
- All signalized intersections would have transit signal priority treatments to facilitate train operations, and would require minimal changes to existing signal timing.
- Side-aligned alignments would require signalization of adjacent unsignalized intersections.
- Train operations assume that no gates are provided at intersections; trains would run concurrently with the parallel streets.

The arterial system assessment was based on the proposed vertical configurations shown in Table 3.3 and illustrated in Figure 3.4 through Figure 3.7, with five different grade-separated configurations and ten at-grade configurations, all of which will result in varied traffic impacts.

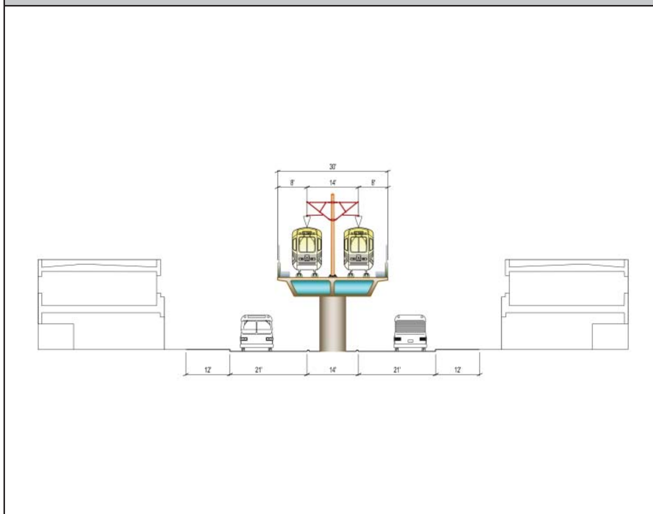
Table 3.3 – Project Vertical Configurations

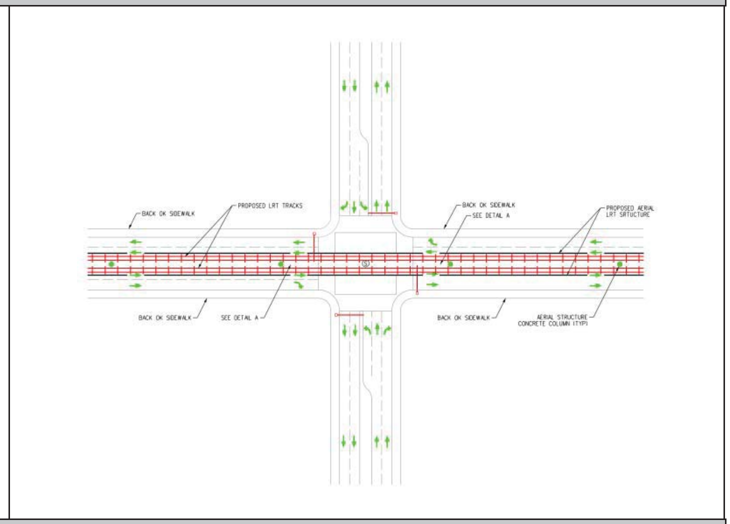
Configuration Type	Description
G1	Grade-separated aerial structure – center running above median
G2	Grade-separated aerial structure – side aligned or crossing street
G3	Grade-separated aerial structure – diagonally across intersection
G4	Grade-separated – undercrossing or bridge structure
G5	Grade-separated – tunnel
A1	At-grade – median running through existing signalized intersection
A2	At-grade – median running through existing unsignalized intersection converted to signalized
A3	At-grade – median running through existing unsignalized intersection – intersection closed or converted to right-in/right-out only
A4	At-grade – side aligned adjacent to signalized intersection
A5	At-grade – side aligned adjacent to unsignalized intersection – intersection converted to signalized
A6	At-grade – diagonally across signalized intersection
A7	At- grade – training turning through signalized intersection
A8	At-grade – mid-block crossing with no adjacent signalized intersections
A9	At-grade – mid-block crossing with adjacent signalized intersection(s)
A10	At-grade – mid-block crossing diagonally at corner of intersection

Figure 3.4 – Intersection Types

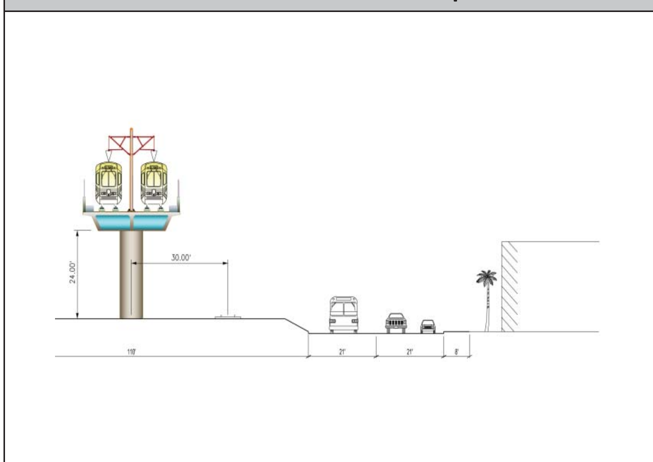
Configuration Type and Description

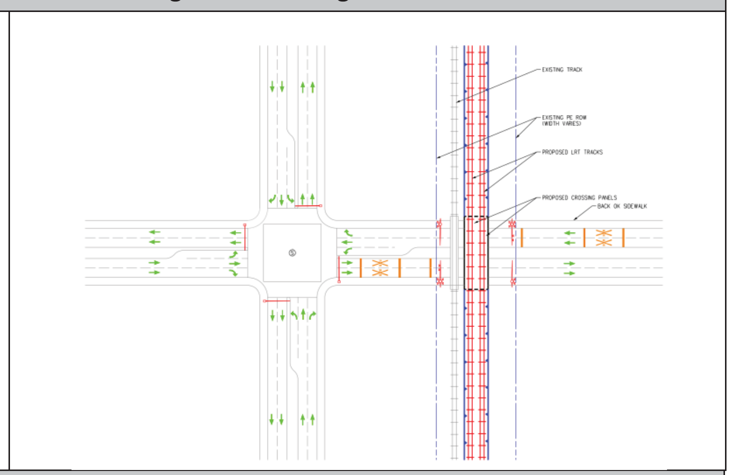
G1: Grade-separated aerial structure – center running above median





G2: Grade-separated aerial structure – side aligned or crossing street





G3: Grade-separated aerial structure – diagonally across intersection

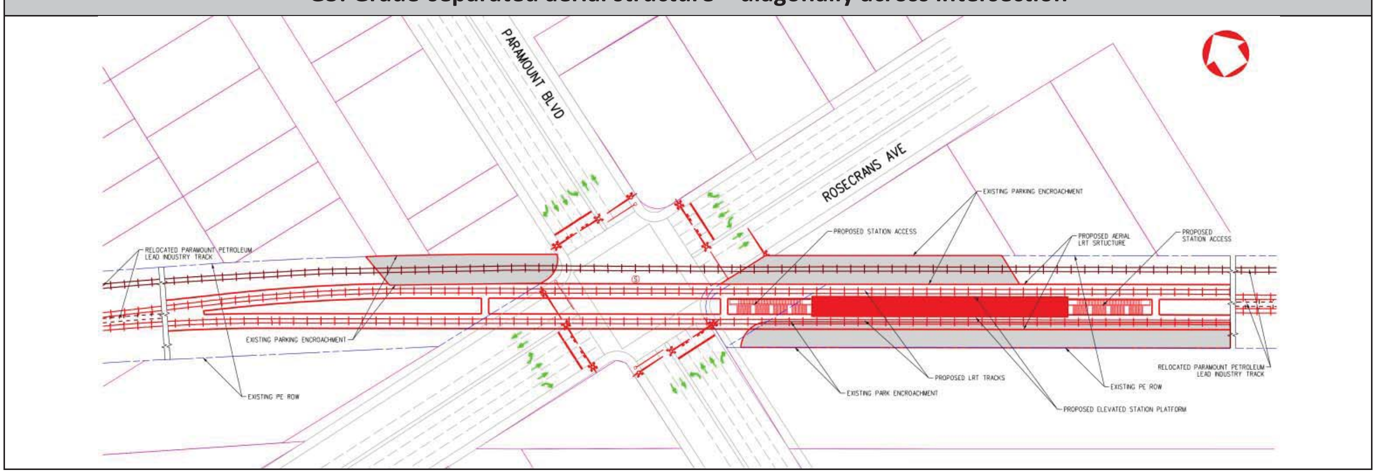
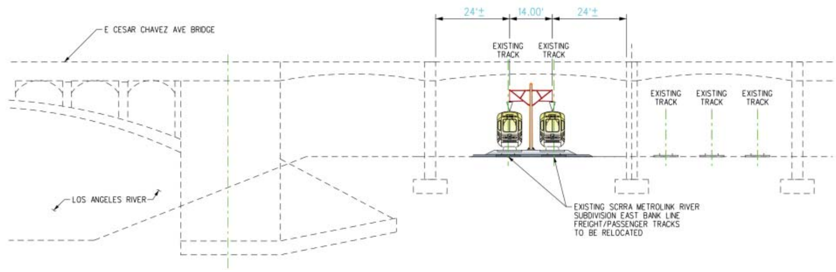


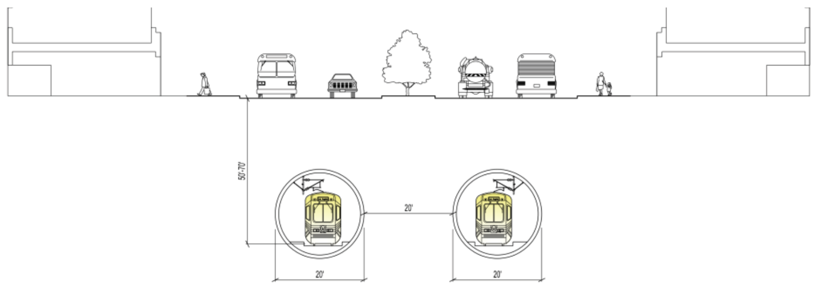
Figure 3.5 – Intersection Types

Configuration Type and Description

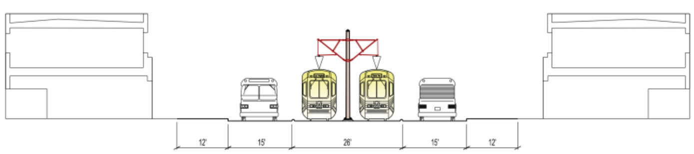
G4: Grade-separated – undercrossing or bridge structure



G5: Grade-separated – tunnel



A1: At-grade – median running through existing signalized intersection
A2: At-grade – median running through existing unsignalized intersection converted to signalized



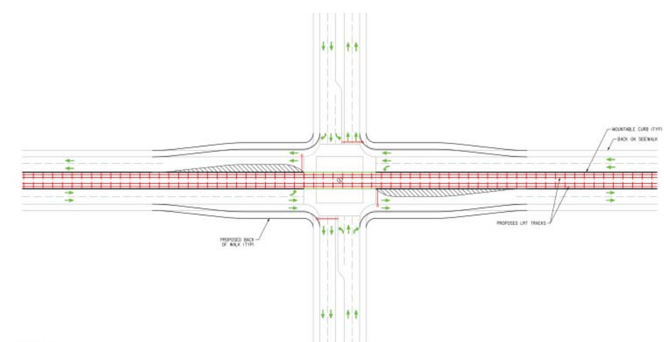
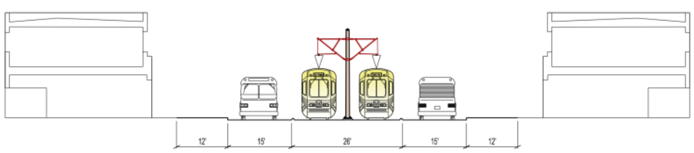
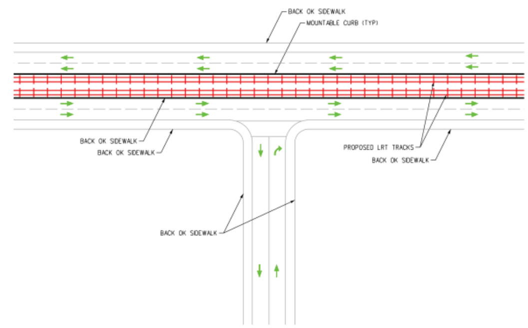


Figure 3.6 – Intersection Types

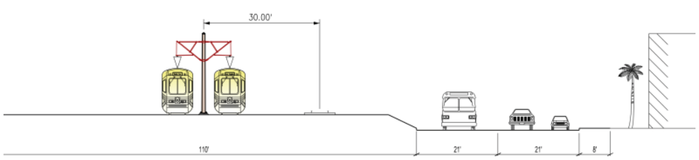
Configuration Type and Description

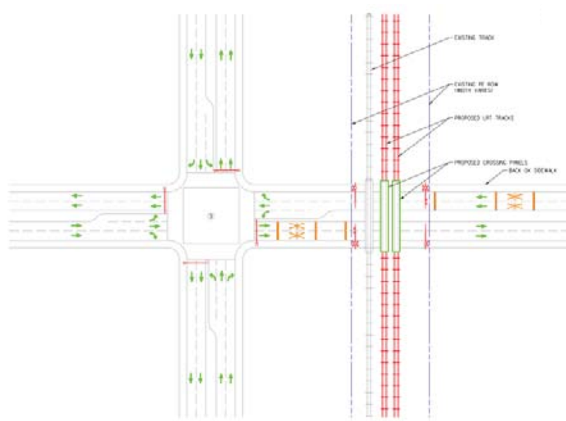
A3: At-grade – median running through existing unsignalized intersection – intersection closed or converted to right-in/right-out only





A4: At-grade – side aligned adjacent to signalized intersection
A5: At-grade – side aligned adjacent to unsignalized intersection – intersection converted to signalized





A6: At-grade – diagonally across signalized intersection

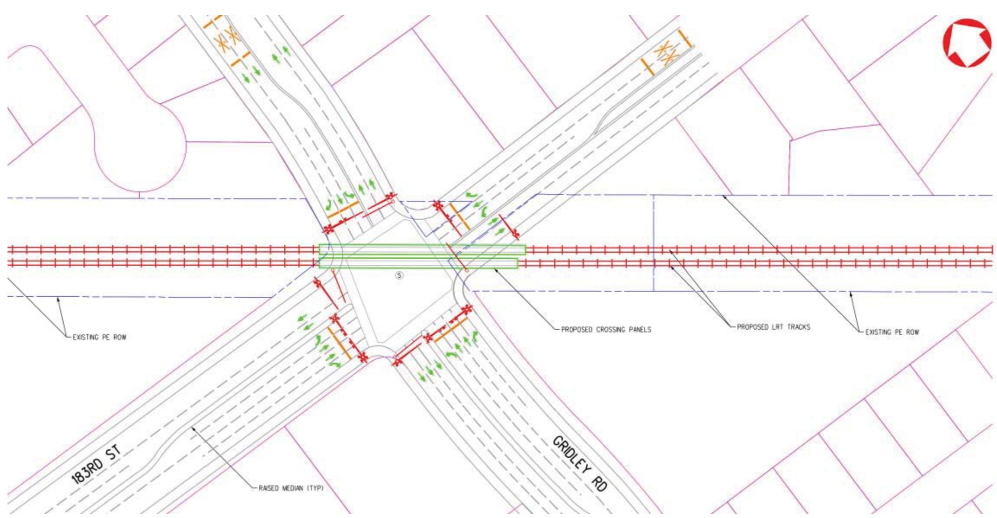
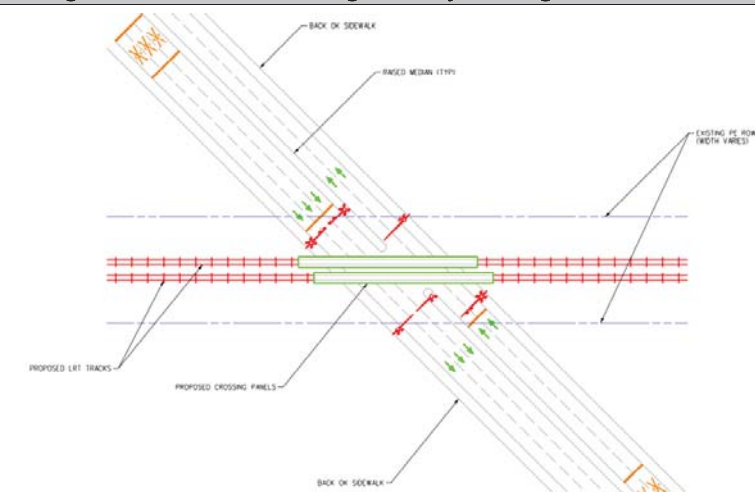


Figure 3.7 – Intersection Types

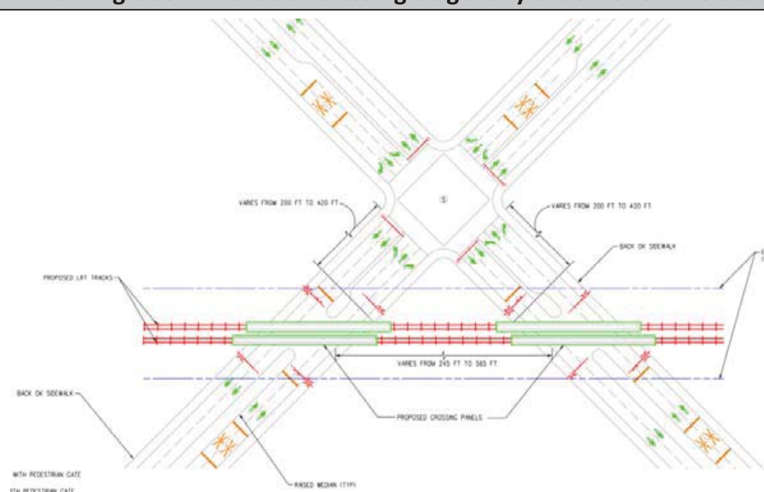
Configuration Type and Description

A7: At-grade – training turning through signalized intersection

A8: At-grade – mid-block crossing with no adjacent signalized intersections
A9: At-grade – mid-block crossing with adjacent signalized intersection(s)



A10: At-grade – mid-block crossing diagonally at corner of intersection



The resulting geometric and operational impacts for the identified intersection configuration types are presented in Table 3.4. The following criteria were used for the general determination of impacts: 1) ***Yes*** – Impacts are likely to occur; 2) ***Potential*** – Impacts may occur depending on the final system design (vertical and horizontal configuration) and operational plans; and 3) ***No*** – No impacts or only minor impacts are anticipated.

Table 3.4 – Intersection Impact Determination Criteria

Intersection Type	Geometric Impact Criteria	Operational Impact Criteria
G1	N/A	N/A
G2	N/A	N/A
G3	N/A	N/A
G4	N/A	N/A
G5	N/A	N/A
A1	• **Yes:** Would require elimination of through travel lanes, left-turn pockets, or right-turn pockets along arterials. • **Potential:** May require elimination of through travel lanes, left-turn pockets, or right-turn pockets along minor streets, or could eliminate affected turning movements. • **No:** No intersection configuration change.	• **Yes:** Train pre-emption would require substantial modification to intersection signalization plan and would affect signal coordination along corridor. • **Potential:** Train pre-emption may result in shortened times for some movements, or minimal effects to corridor coordination. • **No:** Only minor signalization adjustments.
A2	• **Yes:** Would require elimination of through travel lanes, left-turn pockets, or right-turn pockets along arterials, and at intersection with a major cross-street. • **Potential:** Would require elimination of through travel lanes, left-turn pockets, or right-turn pockets along minor streets, or at an intersection with a minor cross-street or driveway. • **No:** Not anticipated to change intersection configuration, with exception of new signal.	• **Yes:** Train pre-emption would require substantial modification to intersection signalization plan and would affect signal coordination along corridor. • **Potential:** Train pre-emption may result in shortened times for some movements, or minimal effects to corridor coordination along corridor would be minimally affected. • **No:** Only minor signalization adjustments.
A3	• **Yes:** Street or driveway provides only access into area, provides direct connection to adjacent major destination, or no nearby u-turn possible. • **Potential:** Alternative access possible but inconvenient, or u-turn provided several streets away. • **No:** Minor access point with adjacent access available, or u-turn provided at next major street.	• **Yes:** Train pre-emption would require substantial modification to intersection signalization plan and would affect signal coordination along corridor. • **Potential:** Train pre-emption may result in shortened times for some movements, or coordination along corridor would be minimally affected. • **No:** Only minor signalization adjustments.

Table 3.4 – Intersection Impact Determination Criteria

Intersection Type	Geometric Impact Criteria	Operational Impact Criteria
A4	• **Yes:** Would require reconfiguration of intersection to provide left-turn and right-turn pockets. • **Potential:** Required turning pockets may fit within existing right-of-way. • **No:** No intersection configuration change.	• **Yes:** Train pre-emption would require substantial modification to intersection signalization plan and would affect signal coordination along corridor. • **Potential:** Train pre-emption may result in shortened movement times, or corridor coordination would be minimally affected. • **No:** Only minor signalization adjustments.
A5	• **Yes:** Would require reconfiguration of intersection to provide left-turn/right-turn pockets and implementation of new signal, or signalization would require geometric changes. • **Potential:** Required pockets may fit within existing right-of-way, or signalization may result in other geometric changes. • **No:** No change to intersection configuration except addition of new signal.	• **Yes:** Train pre-emption would require substantial modification to intersection signalization plan and would affect signal coordination along corridor. • **Potential:** Train pre-emption may result in shortened times for some movements, or coordination along corridor would be minimally affected. • **No:** Only minor signalization adjustments.
A6	• **Yes:** Would require elimination of through travel lanes, left-turn/right-turn pockets. • **Potential:** May require elimination of through travel lanes or left-turn/right-turn pockets. • **No:** No change to intersection configuration.	• **Yes:** Train crossing would require use of lengthy all-red phase for train clearance. • **Potential:** Train crossing would require use of short all-red phase for train clearance, or intersection could accommodate modifications without substantially affecting operations. • **No:** Only minor signalization adjustments.
A7	• **Yes:** Would require elimination of through travel lanes, left-turn/right-turn pockets. • **Potential:** May require elimination of through lanes or left-turn/right-turn pockets. • **No:** No change to intersection configuration.	• **Yes:** Train crossing would require use of lengthy all-red phase for train clearance. • **Potential:** Train crossing would require use of short all-red phase for train clearance, or intersection could accommodate modifications without substantially affecting operations. • **No:** Only minor signalization adjustments.
A8	• **Yes:** Would require modifications to turn pockets or elimination of driveways and/or minor street access. • **Potential:** May require modifications to turn pockets or elimination of driveways and/or minor street access. • **No:** No change to street configuration or close access to driveways or minor streets.	• **Yes:** Queues at gates would block or substantially impair access to upstream minor streets or driveways. • **Potential:** Queues at gates may block or impair access to upstream minor streets or driveways. • **No:** Minimal effects to street operations or nearby intersections.

Table 3.4 – Intersection Impact Determination Criteria

Intersection Type	Geometric Impact Criteria	Operational Impact Criteria
A9	• **Yes:** Would require substantial modifications to turn pockets or eliminate key driveways or minor street access. • **Potential:** May require modifications to turn pockets or eliminate driveways and/or minor street access. • **No:** No change to street configuration or comparable access to driveways or minor streets provided nearby.	• **Yes:** Queues at gates would likely spill back to upstream signalized intersection, or queues at downstream intersection would likely spill back to gate area – primarily when crossing a short distance from intersection or across major street. • **Potential:** Queues at gates may spill back to upstream signalized intersection, or queues at downstream intersection may spill back to gate area – primarily when crossing a further distance from intersection or across a minor street. • **No:** Minimal effects to street operations or nearby intersections.
A10	• **Yes:** Would require substantial modifications to turn pockets or eliminate key driveways or minor street access. • **Potential:** May require modifications to turn pockets or eliminate driveways or minor street access that have possible alternative access. • **No:** No change to street configuration or comparable access to driveways or minor streets provided nearby.	• **Yes:** Queues at gates would spill back to upstream signalized intersection, or queues at downstream intersection would spill back to gate area, or crossing would necessitate extensive changes to signalization plan to reduce queuing potential. • **Potential:** Queues at gates may spill back to upstream signalized intersection, or queues at downstream intersection may spill back to gate area or crossing would necessitate minor changes to signalization plan to reduce queuing potential. • **No:** Minimal effects to street operations or nearby intersections.

Northern Connection Area – Current Conditions and Potential Impacts

From Union Station to the Metro Green Line/I-105 Freeway, the proposed Street Car and LRT alternatives would operate in a combination of at-grade and grade-separated operations, while the Low Speed Maglev option would be entirely grade-separated. All of the guideway options have a common segment along the San Pedro Subdivision from the Metro Green Line north to Randolph Street in Huntington Park. From this point, the East Bank and West Bank 1 alternatives would continue north to operate within existing railroad ROWs or along the edge of the Los Angeles River, while the West Bank 2 and 3 alternatives would turn west to operate in the median of Randolph Street, and then continue north via city streets and Metro-owned rail ROWs.

This study area section is served by a generally north-south and east-west street grid with multiple crossings of freeways, flood channels, and railroad lines. Major streets typically have four to eight through lanes, with turn pockets at the intersections along with mid-block center turn pockets (or dual left-turn lanes) between major intersections. Many streets have multiple driveways and minor streets located between major intersections. In this Corridor segment, possible impacts are identified in the following three categories: 1) mid-block center turn pockets; 2) intersections, and 3) side-aligned intersections where the transit system would operate along the eastern edge of the street ROW, rather than in the center.

More than 60 percent of this segment's intersections are type G4 with the future transit system operating in a grade-separated configuration either as an undercrossing or a bridge structure. Based on the analytical methodology described above, an assessment of the geometric and operational impacts to this segment's intersections along each of the proposed alignments was completed and is summarized in Table 3.5 and with impacted intersections presented in Table 3.6 and Figure 3.8.

Table 3.5 –Northern Connection Area: Summarized Impacted Intersections

Alignment Alternatives	Intersections	Geometric Impacts			Operational Impacts		
		Yes	Potential	Percent	Yes	Potential	Percent
East Bank	42	4	5	21%	1	8	21%
West Bank 1	40	4	5	23%	2	8	25%
West Bank 2	58	6	7	22%	3	7	17%
West Bank 3	79	12	8	25%	4	8	15%

Approximately 15 to 25 percent of the Northern Connection Area intersections would be impacted with the implementation of a transit system. Three intersections were identified as having both geometric and operational impacts:

- Salt Lake Avenue/Florence Avenue (common section) – located in Huntington Park and Bell;
- Pacific Boulevard/Randolph Street (West Bank 2) – located in Huntington Park; and
- Santa Fe Avenue/Hunter Street (West Bank 1) – located in Los Angeles.

Table 3.6 – Northern Connection Area: Impacted Intersections

N/S Street	E/W Street	City	Type	Geometric Impact	Operational Impact
Common Segment					
Salt Lake Ave.	Gage Ave.	Huntington Park	A4	Potential	No
	Bell Ave.	Bell/Huntington Park	A5	Potential	No
	Florence Ave.	Huntington Park/Bell	A4	Yes	Yes
Otis Ave.	Salt Lake Ave.	Huntington Park/Cudahy	A5	Yes	Potential
	Santa Ana St.	Huntington Park/ Cudahy/South Gate	A8	Potential	No
	Ardine St.	South Gate/Cudahy	A5	Yes	No
Atlantic Ave.	Firestone Blvd.	South Gate	A8	Potential	Yes
Rutchi/Garfield	Imperial Hwy.		A4	No	Potential
Garfield Ave.	ROW		A9	No	Potential
	Main St.		A8	No	Potential
East Bank and West Bank 1 Alignments					
Downey Rd.	Fruitland Ave.	Vernon	A4	Yes	Potential
	Slauson Ave.	Vernon/Maywood/ Huntington Park	A4	Potential	Potential
West Bank 2 Alignment					
Pacific Blvd.	Slauson Ave.	Huntington Park	A1	Yes	No
	Belgrave Ave.		A1	Yes	No
	Randolph St.		A7	Yes	Yes
Arbutus Ave.	Randolph St.		A2	Potential	No
Randolph St.	ROW		A2	Potential	Potential
	State St.	Vernon/Huntington Park	A4	Potential	No
West Bank 3 Alignment					
Alameda St.	1st St.	Los Angeles	A4	No	Potential
Santa Fe Ave.	Hunter St.		A2	Yes	Yes
	Porter St.		G1	Potential	No
Pacific Blvd.	Leonis Blvd.	Vernon	A1	Yes	No
	Fruitland Ave.		A1	Yes	No
	55th St.	Huntington Park	A1	Yes	No
	Slauson Ave.		A1	Yes	No

Figure 3.8 – Northern Connection Area 1: Impacted Intersections

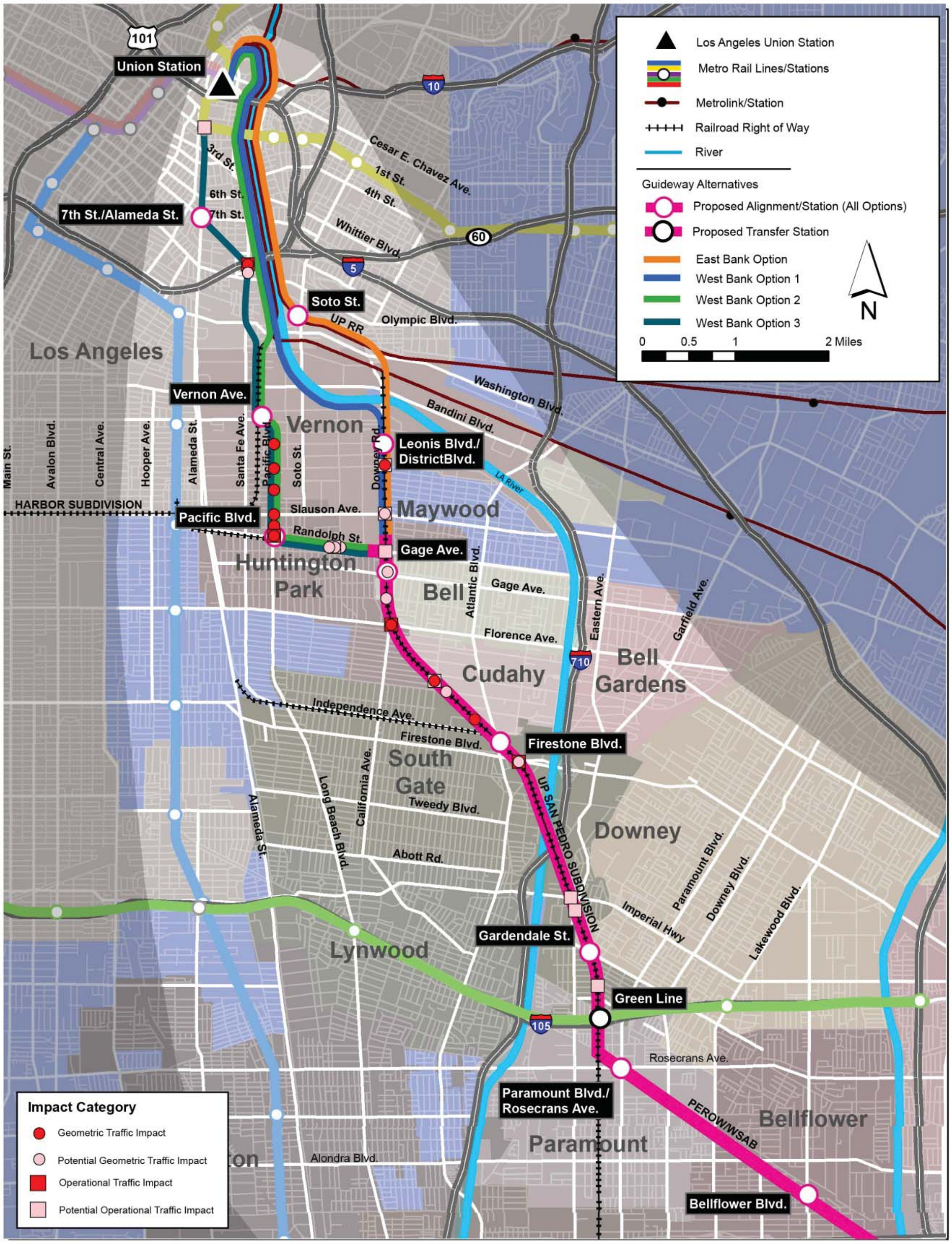


Table 3.7 presents the proposed geometric and operational street system changes that could be implemented to mitigate the intersection impacts resulting from implementation of a transit system in this segment of the Corridor.

Table 3.7 – Northern Connection Area: Proposed Street System Changes

Geometric Changes	Operational Changes
At-Grade Alignments	
Mid-block locations • Establish an at-grade crossing zone. • Provide signalization or full/partial closure of mid-block driveways and minor streets. Intersection locations • Establish at-grade crossing through intersection. • Restripe approaches to minimize conflicts with shared lanes. • Close minor cross-streets. Side-aligned locations • Restripe approaches to provide exclusive left-turn and right-turn pockets. • Signalize adjacent unsignalized intersections.	Mid-block locations • Provide independent at-grade crossing phase. • Implement modifications to upstream and downstream signals, if present. Intersection locations • Provide at-grade crossing phases tied into intersection signalization (pre-emption). • Provide all-red phase for train operations. Side-aligned locations • Provide at-grade crossing phases tied into intersection signalization (pre-emption).
Grade-Separated Alignments	
Aerial structures • Provide modifications to left-turn pockets and median dual left-turn lanes for columns. Undercrossings or bridge structures • None anticipated. Tunnels • None anticipated.	Aerial structures • None anticipated. Undercrossings or bridge structures • None anticipated. Tunnels • None anticipated.

PEROW/WSAB Area – Current Conditions and Potential Impacts

Along the former PE Railway ROW, the proposed Street Car and LRT alternatives would operate in a combination of at-grade and grade-separated operations, while the Low Speed Maglev option would be entirely grade-separated and operate to a terminus at the future Santa Ana Street Car Harbor Boulevard Station.

In this section of the Corridor, the study area is served by a generally north-south and east-west street grid with multiple crossings of river and flood channel crossings, two freeways (SR-91 and I-605) in the Los Angeles County portion, and one freeway (SR-22) in Orange County. Major streets typically have four to eight through lanes with turn pockets at the intersections along with mid-block center turn pockets (or dual left-turn lanes) between major intersections. The challenge of this Corridor section is the diagonal crossing of the proposed transit system ROW of many major streets especially in the

Orange County portion. In this segment, possible impacts were identified in the following three categories: 1) mid-block center turn pockets; 2) intersections, and 3) corner locations. More than 60 percent of the PEROW/WSAB Area intersections are type A8 and A10 reflecting the large number of proposed at-grade mid-block crossings in this Corridor section. Based on the analytical methodology described above, an assessment of the geometric and operational impacts to this segment's intersections along each of the proposed alignments was completed and is summarized in Table 3.8 and presented in Table 3.9 and Figure 3.9.

Table 3.8 – PEROW/WSAB Area: Summarized Impacted Intersections

Alignment	Number of Intersections	Geometric Impacts			Operational Impacts		
		Yes	Potential	Percent	Yes	Potential	Percent
WSAB/PEROW	63	9	24	52%	12	19	49%

An initial assessment identified that 40 of the 63 intersections in the PEROW/WSAB Area may be impacted with implementation of a transit system. Approximately 50 percent of the intersections may have geometric and/or operational impacts that would require mitigation. Three intersections were identified as having both geometric and operational impacts:

- Gridley Road /183rd Street – located in Cerritos and Artesia;
- Gilbert Street/WSAB/PEROW – located in Garden Grove; and
- Nelson Street/Garden Grove Boulevard – located in Garden Grove.

Table 3.9 – PEROW/WSAB Area: Intersection Impacts

N/S Street	E/W Street	City	Type	Geometric Impact	Operational Impact
WSAB/PEROW Corridor					
ROW	Artesia Blvd.	Cerritos	A9	Potential	Potential
Gridley Rd.	183rd St.	Cerritos/Artesia	A6	Yes	Yes
	186th St.	Artesia	A3	Potential	No
	187th St.		A3	Potential	No
Pioneer Blvd.	ROW		A9	No	Potential
	South St.	Artesia/Cerritos	A9	Potential	Potential
Norwalk Blvd.	ROW		A10	Potential	Yes
	195th St.		A10	Potential	Yes
Bloomfield Ave.	ROW	Cerritos	A8	Potential	No
Coyote Creek	Crescent Ave.	La Palma/Cypress	A10	Potential	Yes
Moody St.	ROW		A10	Potential	Yes
Walker St.	ROW	Cypress	A10	Potential	Potential
	Lincoln Ave.		A10	No	Potential

Figure 3.9 – PEROW/WSAB Area: Impacted Intersections

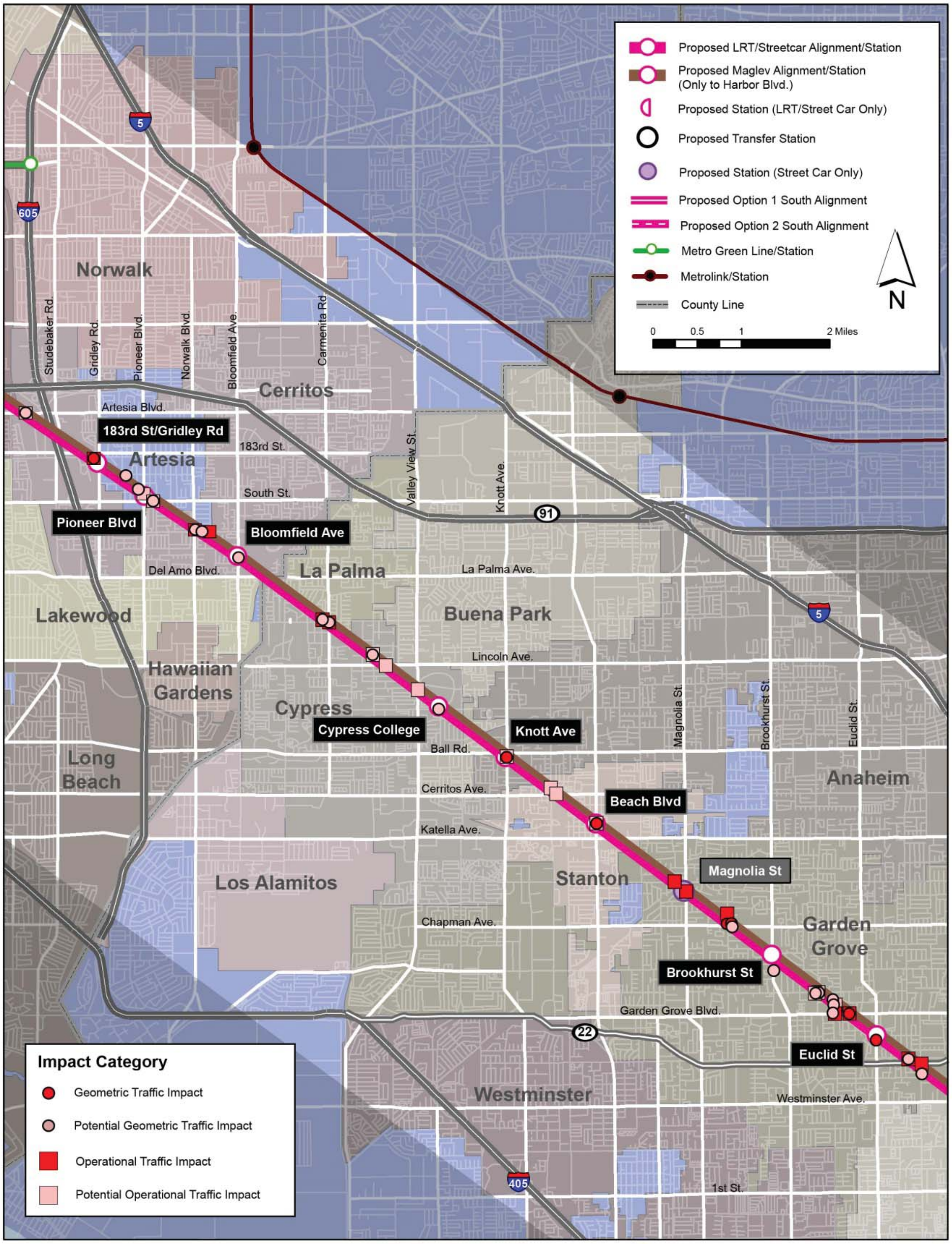


Table 3.9 – PEROW/WSAB Area: Intersection Impacts

N/S Street	E/W Street	City	Type	Geometric Impact	Operational Impact
WSAB/PEROW					
Valley View St.	ROW	Cypress	A8	No	Potential
	Orange Ave.		A8	Potential	No
ROW	Ball Rd.	Anaheim	A10	Potential	Potential
Knott Ave.	ROW	Anaheim	A10	Yes	Potential
Western Ave.	ROW	Stanton	A10	No	Potential
	Cerritos Ave.		A10	No	Potential
Beach Blvd.	ROW		A8	Yes	Potential
Dale St.	Orangewood Av.	Garden Grove	A10	No	Yes
Magnolia Ave.	ROW		A10	No	Yes
Gilbert St.	ROW		A9	Yes	Yes
Garden Grove development	Former ROW		A3	Yes	No
	Chapman Ave.	Garden Grove	A8	Potential	No
Brookhurst Ave.	Lampson Ave.	Garden Grove	A8	Potential	No
Nutwood St.	ROW		A10	Potential	Potential
	Stanford Ave.		A10	Potential	Potential
Nelson St.	ROW		A10	Potential	No
	Acacia Pkwy.		A10	Potential	Potential
	Garden Grove		A10	Potential	Yes
Grove/Taft St.	ROW		A10	Yes	Yes
Euclid St.	ROW		A8	Yes	No
	Trask Ave.		A10	Potential	Yes
Newhope St.	ROW		A10	Potential	Yes

Table 3.10 presents the proposed geometric and operational street system changes that could be implemented to mitigate the intersection impacts resulting from implementation of a transit system in this segment of the Corridor. During any subsequent engineering and environmental efforts, the decision on whether to totally grade-separate the Street Car or LRT alternative in Los Angeles County, which would reduce arterial system impacts, would be studied further and may be guided by Metro's *Grade Crossing Policy for LRT*.

Table 3.10 – PEROW/WSAB Area: Proposed Street System Changes

Geometric Changes	Operational Changes
At-Grade Alignments	
Mid-block locations • Establish at-grade crossing zone. • Provide signalization or full/partial closure of mid-block driveways and minor streets.	Mid-block locations • Establish Independent at-grade crossing phase. • Provide modifications to upstream and downstream signals, if present.

Table 3.10 – PEROW/WSAB Area: Proposed Street System Changes

Geometric Changes	Operational Changes
At-Grade Alignments	
Corner locations • Establish at-grade crossing zone. • Shorten left-turn pockets at adjacent intersections. • Provide full or partial closure of mid-block driveways and minor streets.	Corner locations • Establish at-grade crossing phases tied into intersection signalization (pre-emption). • Provide modifications to signal plans to reduce potential for gate queues.
Intersection locations • Establish at-grade crossing diagonally through intersection. • Restripe approaches to minimize conflicts with shared lanes.	Intersection locations • Establish at-grade crossing phases tied into intersection signalization (pre-emption). • Provide all-red phase for train operations.
Grade-Separated Alignments	
Aerial structures • Provide modifications to left-turn pockets and median dual left-turn lanes for columns.	Aerial structures • None anticipated.
Undercrossings or bridge structures • None anticipated.	Undercrossings or bridge structures • None anticipated.

Southern Connection Area – Current Conditions and Potential Impacts

In this segment, Low Speed Maglev Alternative service would end at the future Harbor Boulevard Station with passengers transferring to the Santa Ana Street Car system to reach Santa Ana and the SARTC. The proposed Street Car and LRT alternatives have been analyzed as operating along two alignment alternatives, with the following configurations, through Santa Ana:

1. **Westminster Boulevard/17th Street/Main Street**
   - Westminster Boulevard /W. 17th Street
     - Three through lanes in each direction;
     - Single left-turn pockets at full intersections, with occasional double left-turn pockets;
     - Single right-turn pockets at some locations; and
     - Combination of fixed median and continuous left-turn lane between intersections, with some dedicated mid-block left-turns at driveways.
   - N. Main Street
     - Two through lanes in each direction;
     - Single left-turn pockets at full intersections;
     - Continuous left-turn lane between intersections; and
     - On-street parallel parking (in general) on both sides of street.
2. **Harbor Boulevard/1st Street/SARTC**
   - N. Harbor Boulevard
     - Three through lanes in each direction;

  - Single left-turn pockets at full intersections, with occasional double left-turn pockets; and
  - Combination of fixed median and continuous left-turn lane between intersections, with some dedicated mid-block left-turns at driveways.
- W. 1st Street
  - Three through lanes in each direction, with a section at the Santa Ana River crossing reduced to two through lanes in each direction;
  - Single left-turn pockets at full intersections; and
  - Combination of fixed median and continuous left-turn lane between intersections, with some dedicated mid-block left-turns at driveways.
- Santiago Street
  - New realigned street north past the SARTC.

The Street Car and LRT alternatives were analyzed as operating within the existing street ROW and primarily in at-grade operations with a minor aerial segment for the Harbor Boulevard/1st Street/SARTC Alignment. Future engineering and environmental efforts may evaluate taking of property to maintain the existing street ROW and lane configuration, and/or building the system in a grade-separated structure.

In the City of Santa Ana, the study area is served by a generally north-south and east-west street grid. Major streets typically have four to eight through lanes with turn pockets at the intersections along with mid-block center turn pockets (or dual left-turn lanes) between major intersections. Possible impacts were identified in the following three categories: 1) mid-block center turn pockets; 2) intersections, and 3) corner locations for smaller, unsignalized streets. More than 70 percent of the Westminster Boulevard/17th Street/Main Street Alignment and 85 percent of the intersections along the Harbor Boulevard/1st Street/SARTC Alignment are either type A1 or A3 reflecting the large number of proposed at-grade, median-running operations in this section of the Corridor.

Based on the analytical methodology described above, an assessment of the geometric and operational impacts to this segment's intersections along both of the proposed alignments was completed and is summarized in Table 3.11 and presented in Table 3.12 and Figure 3.10.

Table 3.11 – Southern Connection Area: Impacted Intersections

Alignment Alternatives	Intersections	Geometric Impacts			Operational Impacts		
		Yes	Potential	Percent	Yes	Potential	Percent
Westminster Boulevard/ 17th Street/Main Street	35	17	14	89%	1	0	3%
Harbor Boulevard/1st Street/SARTC	48	19	6	52%	1	0	2%

An initial assessment identified the following impacts for the two alignment alternatives with implementation of a transit system:

- **Westminster Boulevard/17th Street/Main Street Alignment** – Approximately 90 percent of this alternative's intersections may have geometric impacts, and three percent may have operational impacts that would require mitigation.
- **Harbor Boulevard/1st Street/SARTC Alignment** – More than 50 percent of this alternative's intersections may have geometric impacts, and two percent may have operational impacts that would require mitigation.

Two intersections were identified as having both geometric and operational impacts: 17th Street/Main Street; and Harbor Boulevard /1st Street.

Table 3.12 – Southern Connection Area: Intersection Impacts

N/S Street	E/W Street	City	Type	Geometric Impact	Operational Impact
Westminster Boulevard/17th Street/Main Street					
Westminster Boulevard	Harper/Susan	Garden Grove/ Santa Ana	A3	Potential	No
	Clinton St.		A1	Yes	No
	Roxey Dr.	Garden Grove	A1	Potential	No
	Buena St.		A3	Potential	No
	MarLes/Sydney St.	Garden Grove/ Santa Ana	A3	Yes	No
	Fairview St.	Santa Ana	A1	Yes	No
17th Street	Private drive		A3	Potential	No
	King St.		A3	Potential	No
	English St.		A1	Yes	No
	Alona St.		A1	Yes	No
	College Ave.		A1	Yes	No
	Bristol Mkpl.		A1	Yes	No
	Bristol St.		A1	Yes	No
	Towner St.		A3	Potential	No
	Freeman St.		A3	Potential	No
	Fire station		A2	Potential	No
	Flower St.		A1	Yes	No
	Ross St.		A1	Yes	No
	Broadway		A1	Yes	No
	Main St.		A7	Yes	Yes
Main Street	16th St.		A3	Potential	No
	15th St.		A3	Potential	No
	14th St.		A3	Potential	No
	Washington Av		A1	Yes	No
	12th St.		A3	Potential	No

Figure 3.10 – Southern Connection Area: Impacted Intersections

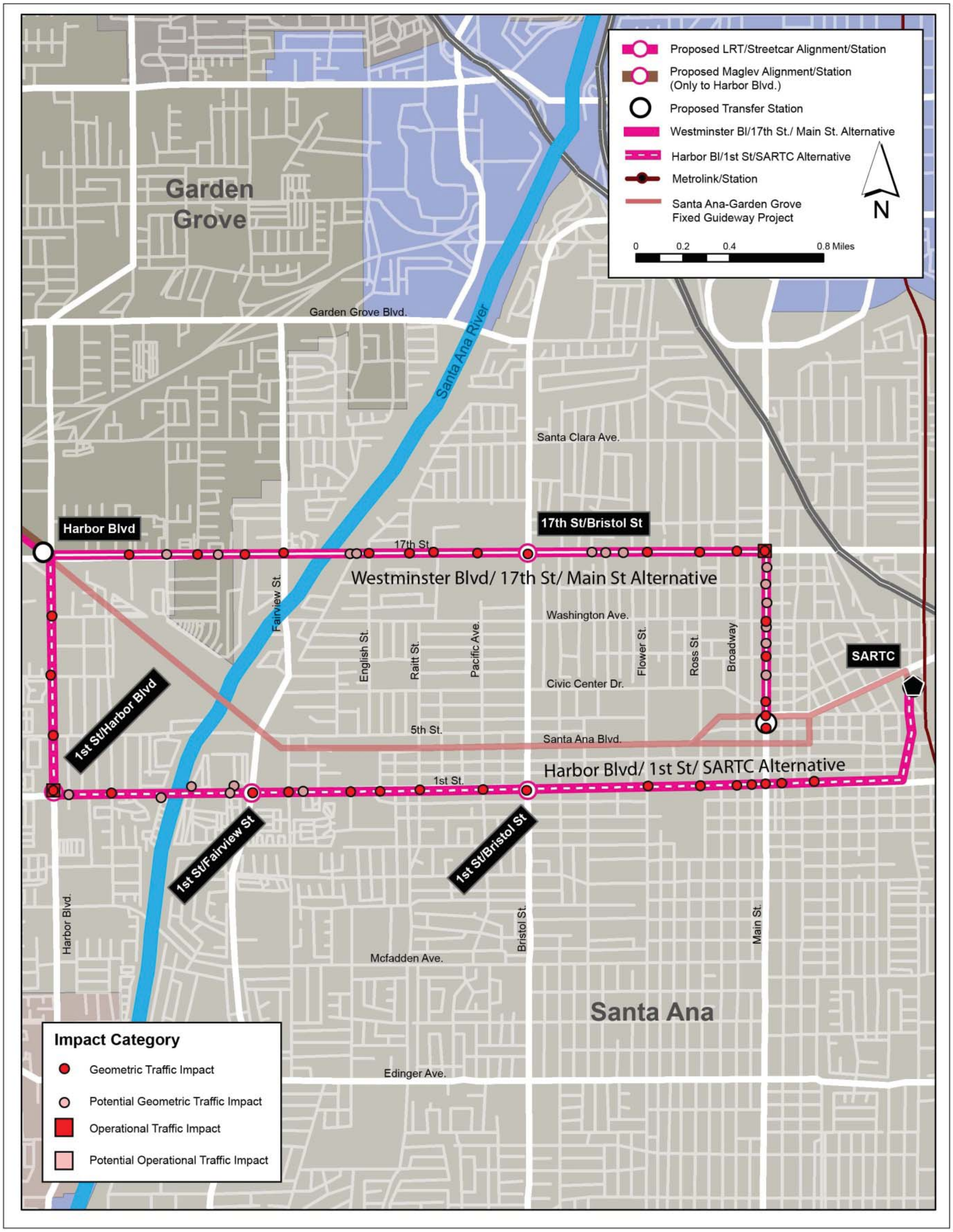


Table 3.12 – Southern Connection Area: Intersection Impacts

N/S Street	E/W Street	City	Type	Geometric Impact	Operational Impact
Westminster Boulevard/17th Street/Main Street					
Main Street	11th St.		A3	Potential	No
	10th St.		A1	Yes	No
	9th St.		A3	Potential	No
	8th St.		A2	No	No
	Civic Center Dr		G1	Yes	No
	Santa Ana Blvd		G1	Yes	No
	5th St.		G1	Yes	No
Harbor Boulevard/1st Street/SARTC					
Harbor Blvd.	Washington Av	Santa Ana	A3	Yes	No
	Hazard Ave.		A1	Yes	No
	5th St.		A1	Yes	No
	1st St.		A7	Yes	Yes
	Figueroa St.		A3	Potential	No
1st Street	Jackson St.		A1	Yes	No
	Quiet Village St		A3	Potential	No
	Private Road		A3	Potential	No
	Monaco Dr.		A3	Potential	No
	Banana Blvd.		A3	Potential	No
	Fairview St.		A1	Yes	No
	Sullivan St.		A1	Yes	No
	Driveway		A3	Potential	No
	Center St.		A1	Yes	No
	Townsend		A1	Yes	No
	Raitt St.		A1	Yes	No
	Pacific Ave.		A1	Yes	No
	Bristol St.		A1	Yes	No
	Flower St.		A1	Yes	No
	Ross St.		A1	Yes	No
	Broadway		A1	Yes	No
1st Street	Sycamore St.		A1	Yes	No
	Main St.		A1	Yes	No
	Cypress Ave.		A1	Yes	No
	Commercial St.		A1	Yes	No

Table 3.13 presents the proposed geometric and operational street system changes that could be implemented to mitigate the intersection impacts resulting from implementation of a primarily at-grade system operating within the existing street ROW in this segment of the Corridor. Future planning efforts may evaluate taking of property to maintain the existing street ROW, and/or building the system in a grade-separated configuration.

Table 3.13 – Southern Connection Area: Proposed Street System Changes

Geometric Changes	Operational Changes
At-Grade Alignments	
Signalized intersections • Provide two through lanes with single left-turn pocket. • Eliminate right-turn pockets.	Signalized intersections • Independent at-grade crossing phase. • Potential modifications to upstream and downstream signal, if present.
Unsignalized intersections • Eliminate left-turns to major streets. • Convert to right-in/right-out only.	Unsignalized intersections • None anticipated.
Grade-Separated Alignments	
Aerial structures • Potential modifications to left-turn pockets and median dual left-turn lanes for columns. Undercrossings or bridge structures • None anticipated.	Aerial structures • None anticipated. Undercrossings or bridge structures • None anticipated.

3.3 Transit

Currently, bus transit service is the predominant transit service available to Corridor residents with minor rail transit service also provided. The regional Metrolink commuter rail system is accessible only at the northernmost and southernmost ends of the study area as illustrated in Figure 3.11. While the Metro Green Line is located in the Los Angeles County portion of the study area, its east-west operations do not adequately serve the Corridor's primarily north-south travel patterns, or its destinations and activity centers. With the forecast growth in population, employment, and resulting daily travel, along with the high level of low income and transit-dependent households, improving Corridor accessibility and mobility will become of increasing importance.

3.3.1 Existing Transit Service

Within the study area, bus transit service is provided by Metro, OCTA, and various Los Angeles County municipal operators including, Long Beach Transit, Norwalk Transit, and Montebello Transit. City-based circulator service is provided by Bellflower Bus, Bell Gardens Transit, Cerritos Transit, Downey LINK, Lynwood Trolley, and Paramount Easy Rider. Corridor Metro bus service in Los Angeles County is illustrated in Figure 3.12, and OCTA service in Orange County is presented in Figure 3.13.

Rail service is provided by Metro on two lines that operate through portions of the Corridor Study Area:

- ***Metro Green Line*** – This LRT line operates predominantly east-west in the median of the I-105 Freeway through the northern portion of the study area. This line runs between Redondo Beach and Norwalk, and provides connections to downtown Los Angeles and Long Beach by way of the Metro Blue Line. Study area Metro Green Line stations are located at the Norwalk Transit Center, Lakewood Boulevard in Downey, and Long Beach Boulevard in Lynwood.

- ***Metro Blue Line*** – Forming the western study area boundary, this LRT line provides north-south rail service between downtown Long Beach and 7th Street/Metro Center in downtown Los Angeles. The study area contains nine Metro Blue Line stations: two located in Compton, and seven in Los Angeles. One of the stations – Imperial/Wilmington – provides a transfer to and from the Metro Green Line.

Regional Metrolink and Amtrak rail service operates along an alignment to the north of the WSAB/PEROW Corridor boundaries. Metrolink provides commuter access throughout a five-county service area, and Amtrak operates intercity service from San Luis Obispo to San Diego, as well as long-distance connections. Both systems are accessible to Corridor Study Area residents only from Union Station at the northern terminus of the study area, and the SARTC at the southern terminus.

3.3.2 Future Transit System Improvements

Within the PEROW/WSAB Corridor, no transit infrastructure improvements are planned beyond several bus service increases and a new rail system connection, which will improve mobility, but only in limited portions of the study area, and will not address the Corridor's growing travel needs. As presented in Section 2.0, approved Corridor transit projects identified from the adopted county and regional plans include the following to be implemented by 2035: an LRT system connection in downtown Los Angeles; three BRT lines in Orange County; and more frequent Long Beach Transit bus service connecting Long Beach and Orange County. In addition, a Street Car system is being planned to serve Santa Ana and Garden Grove, and master plans are being developed for Union Station and the SARTC.

All of the transit alternatives would provide benefits for Corridor travel by providing a new modal option with additional capacity to serve forecasted 2035 travel demand. The following discussion presents information on: vehicle assumptions; the operating assumptions and plans, including service span and frequency; run times; and resulting ridership projections for all of the alternatives.

3.3.2.1 Operating Assumptions and Plans

The following provides a summary of the general operating assumptions and plans for each of the PEROW/WSAB Corridor alternatives. Detailed information is provided in *Appendix E: Operating and Cost Estimate and Financial Analysis Technical Memorandum*.

Vehicle Assumptions

The vehicles for the BRT Alternatives were assumed to be as follows:

- **HOV Lane-Running** Option – 45 foot NABI vehicles similar to those used for Metro Silver Line service, with the decision on whether to use the 60 foot articulated Metro Orange Line vehicles deferred to the future as ridership expands; and
- **Street-Running Option** – 40 foot NABI vehicles similar to those used for Metro Rapid service.

Figure 3.11 – Existing Rail Transit Service

Figure 3.12 – Existing Los Angeles County Transit Service

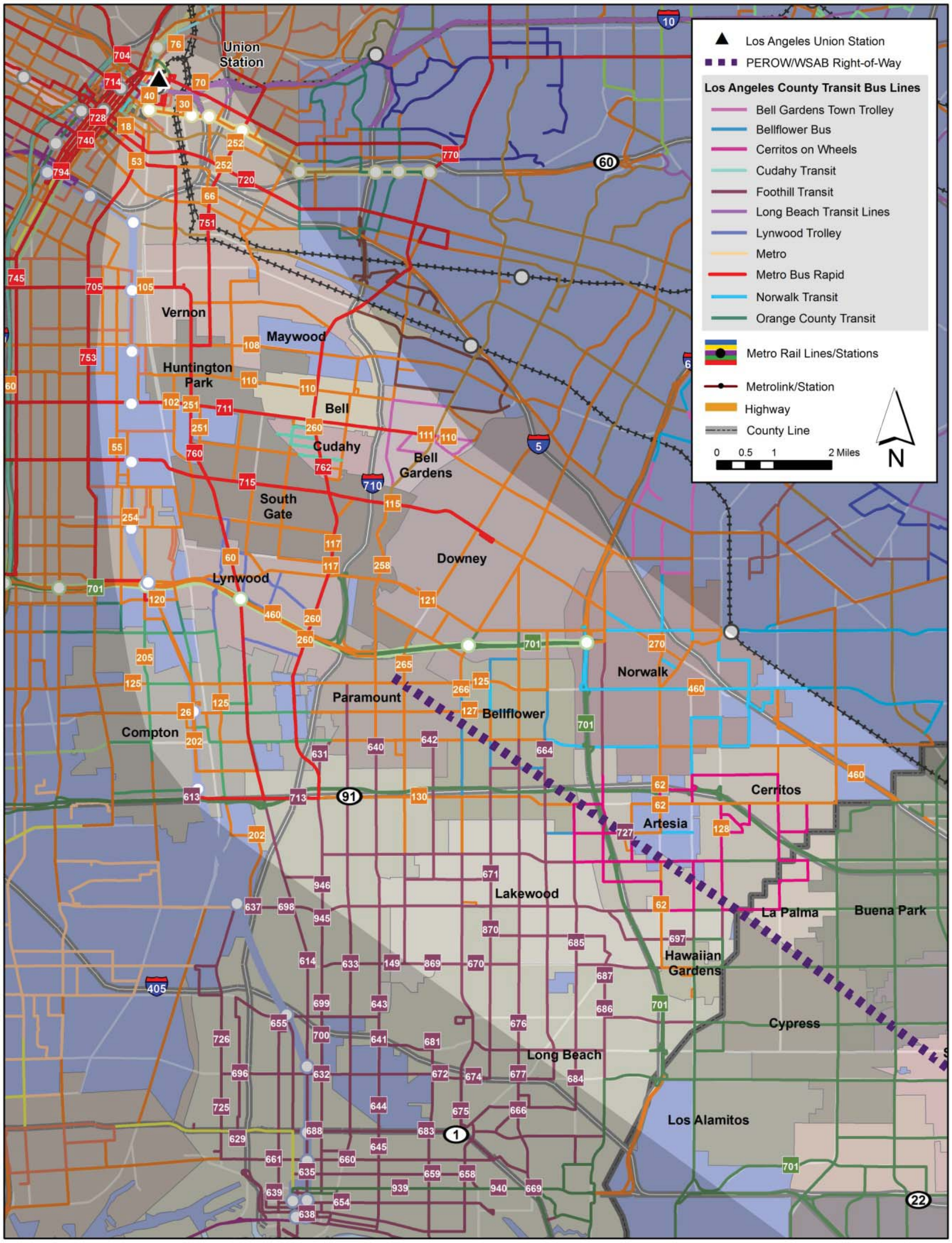
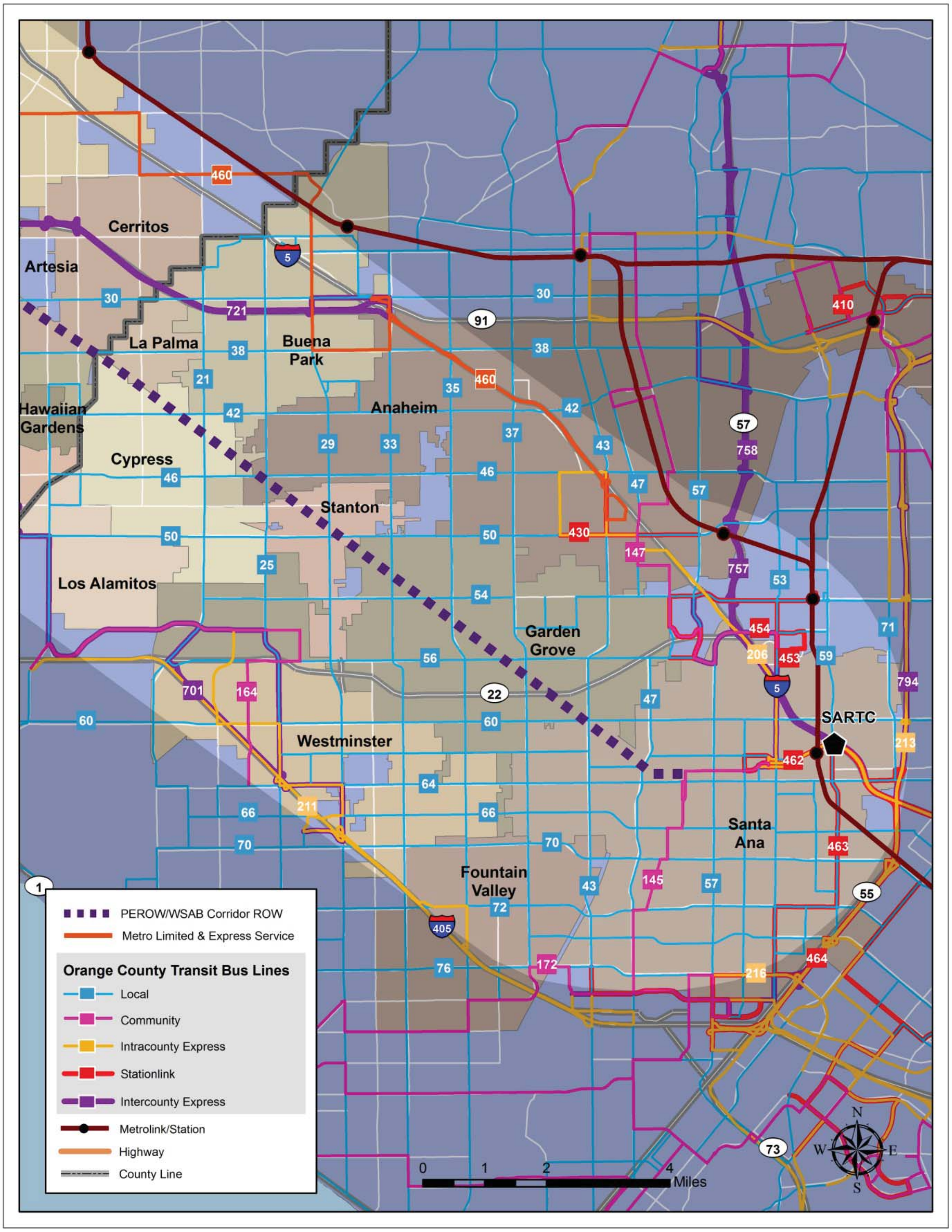


Figure 3.13 – Existing Orange County Transit Service



The Guideway Alternatives vehicle assumptions are as follows:

- **Street Car** – Reflecting the anticipated Santa Ana Street Car system, analysis was based on the Siemens S70 Street Car low-floor vehicle, 79'-1" in length with a double-articulated design, and proposed to be operated singly;
- **LRT Option** – Vehicles similar to those used by Metro for their current LRT service, which are Breda 90' 2550 LRV vehicles and typically operated by Metro in a three-car consist in length; and
- **Low Speed Maglev Option** – Vehicles used by the Linimo system in Nagoya, Japan, which are Nippon Sharyo HSST-100L vehicles built as an integrated, three-car consist 134'-7" in length.

Service Span and Frequency

Existing bus services in the PEROW/WSAB Corridor are primarily operated by Metro and OCTA, while existing urban rail service is operated by Metro. For the AA-level of analysis, Metro was assumed to be the operating agency for the BRT Alternatives based on their experience in operating both proposed service types, as well as for the guideway alternatives. During subsequent planning efforts, the operator decisions may be revised to reflect evolving operator capabilities. The service frequency for the BRT alternatives was identified based on: the HOV Lane-Running Option on the Metro Orange Line, and the Street-Running Alternatives on the Metro Silver Line as shown in Table 3.14.

Table 3.14 – Service Frequency (BRT Alternative)

Day of Week	Frequency	Hours
BRT Street-Running Alternative		
Weekday	10 minutes	6:00 – 9:00 AM 3:00 – 6:00 PM
	20 minutes	4:30 – 6:30 AM 9:00 AM – 3:00 PM 6:00 – 11:00 PM
Weekend	20 minutes	5:30 AM – 11:00 PM
BRT HOV Lane-Running Alternative		
Weekday	5 minutes	6:00 – 9:00 AM 3:00 – 7:00 PM
	10 minutes	9:00 AM – 3:00 PM
	15 minutes	4:30 – 6:00 AM 7:00 – 9:00 PM
	20 minutes	9:00 – 11:00 PM
Weekend	10 minutes	5:30 AM – 7:00 PM
	20 minutes	7:00 – 11:00 PM

Table 3.14 – Service Frequency (Guideway Alternatives)

Day of Week	Frequency	Hours
All Guideway Alternatives		
Weekday	5 minutes	6:30 – 8:30 AM 4:00 – 7:00 PM
	10 minutes	8:30 AM – 4:00 PM 7:00 – 8:00 PM
	15 minutes	4:00 – 6:30 AM 8:00 PM – 1:30 AM
Weekend	12 minutes	9:00 AM – 6:30 PM
	15 minutes	7:00 – 9:00 AM 6:30 – 7:30 PM
	20 minutes	4:00 – 7:00 AM 7:30 PM – 1:00 AM

Run Time Estimates

A first step in developing ridership projections was identifying run times for each of the alternatives. Travel times for the alternatives were calculated using a spreadsheet simulation model based on the performance characteristics of Metro's current fleet of BRT and LRT vehicles, and manufacturer information for the Street Car and Low Speed Maglev options. Inputs to the run time model included:

- **Speed restrictions for operations** – Speeds used reflected existing Metro operational information and manufacturer information based on operation in three configurations: mixed-flow at-grade guided by the traffic signal system; exclusive right-of-way at-grade; and aerial alignment;
- **Horizontal curves** – Utilized alignment curve radii identified by conceptual engineering plans;
- **Distances between stations** – Calculated from the Conceptual Engineering plans;
- **Dwell and layover times** – reflected Metro operations policy of: BRT dwell time of 20 seconds and layover time of 60 seconds at end of line; and LRT dwell time of 20 seconds and layover time of 60 seconds at the line terminus; and
- **Vehicle performance characteristics** – utilized acceleration and deceleration rates and maximum operating speeds from current fleet vehicles and manufacturer's information for those not currently in operation.

Using the alternative definition documented in Chapter 2.0 and the operating inputs identified above, the alternative number of stations, length, end-to-end run times, and the resulting average speed was identified and is summarized in Table 3.15. Modal- and alignment-specific results are discussed below.

The travel times for the BRT options shown represent the total travel time between Union Station and the SARTC for the Street-Running Alternative, and between 7th/Metro Center Station and the SARTC for the HOV Lane-Running Alternative. Due to similar alignments, operating speeds, and number of stations

Table 3.15 – Alternative Definition and Resulting Operational Information

Alternative	Number of Stations[1]	Distance[2] (Miles)	Run Time	Average Speed (mph)
BRT				
HOV Lane-Running	22	39.0	1:18:30	32.6
Street-Running	27	38.2	1:21:11	30.3
Street Car				
East Bank 1	23	35.2	1:09:55	30.7
West Bank 1	22	35.2	1:08:20	31.6
West Bank 2	23	35.6	1:10:36	30.7
West Bank 3	24	34.5	1:07:15	31.1
LRT				
East Bank 1	22	35.2	1:02:09	35.3
West Bank 1	21	35.2	1:00:55	35.8
West Bank 2	22	35.6	1:03:45	34.4
West Bank 3	23	34.5	1:00:12	35.5
Low Speed Maglev				
East Bank 1	17	29.7	43:06	40.2
West Bank 1	16	29.6	42:39	41.0
West Bank 2	17	29.9	44:18	40.0
West Bank 3	18	29.2	43:00	40.2

[1] Represents the Harbor Boulevard/1st Street/SARTC Alternative in the Southern Connection Area.
[2] Low Speed Maglev Alternative ends at Harbor Boulevard; does not continue through Santa Ana.

the run times for the PEROW/WSAB and Southern Connection areas are similar for both alternatives, with a faster average speed on the dedicated lanes along the PEROW/WSAB ROW than operating in Santa Ana city streets primarily due to more frequent signalized intersections.

In the Northern Connection Area, the HOV Lane-Running Alternative operates at a faster average speed of 35 mph than the Street-Running Option (30 mph). The BRT HOV Lane-Running Alternative has a slightly longer alignment distance (0.8 miles), but has fewer station stops (six) than the Street-Running Option with 11 proposed station stops. The average speed for the Street-Running Alternative may be overstated as current Soto Street Metro Rapid operations operate at an average of 14 mph due to congestion. There is a minimal difference between the overall average speeds of the BRT alternatives, though the HOV Alternative may provide riders with a faster and smoother ride with less stop-and-go operations.

Table 3.16 – BRT Alternatives: Run Times

Alternative	Run Time	Distance (Miles)	Average Speed (mph)
HOV Lane-Running			
Northern Connection Area	31:25	18.2	34.8
PEROW/WSAB Area	32:36	15.7	32.8
Southern Area	14:29	5.1	21.2
Total (Minutes)	**78:30**	**39.0**	**32.6**
Total in (Hours)	**1:18:30**		
Street-Running			
Northern Connection Area	34:06	17.4	29.6
PEROW/WSAB Area	32:36	15.7	32.8
Southern Area	14:29	5.1	21.2
Total (Minutes)	**81:11**	**38.2**	**30.3**
Total (Hours)	**1:21:11**		

Using the alternative definitions and operating inputs identified above, end-to-end run times were identified for the Guideway alternatives and are presented in Table 3.17. The travel times for the Street Car and LRT options represent the total travel time between Union Station and the SARTC, while the Low Speed Maglev Alternative run time is calculated from Union Station to a future Santa Ana Street Car Harbor Boulevard Station.

Among the guideway alternatives, the Low Speed Maglev options would provide a faster average operating speed (40.3 mph) and travel time between Union Station and the Harbor Boulevard Station than the other two guideway alternatives primarily due to entirely grade-separated system. The LRT alternatives have a higher average speed of 35.3 mph compared to 31.0 mph for the Street Car Alternatives resulting in a shorter run time of approximately seven minutes for the three West Bank alignment options and approximately eight minutes for the East Bank alignment, due to higher maximum operating speed and fewer stations.

Among the alignment alternatives, the West Bank 3 option would be the fastest for all of the guideway alternatives, followed by the West Bank 1 alternative. For the Low Speed Maglev Alternative, the West Bank 1 and 3 alignment options are the fastest.

Table 3.17 – Guideway Alternatives: Run Times

Alternative	Street Car			LRT			Low Speed Maglev		
	Run Time	Distance (Miles)	Avg. Speed (mph)	Run Time	Distance (Miles)	Avg. Speed (mph)	Run Time	Distance (Miles)	Avg. Speed (mph)
East Bank 1									
Northern	23:55	12.5	32.1	21:45	12.5	35.3	17:56	12.0	40.1
PEROW/WSAB	32:47	17.6	32.2	27:53	17.6	37.5	25:10	17.7	41.0
Southern	13:13	5.1	17.7	12:31	5.1	24.5			
Total (Minutes)	**69:55**	**35.2**	**30.7**	**62:09**	**35.2**	**35.3**	**43:06**	**29.7**	**40.2**
Total (Hours)	**1:09:55**			**1:02:09**			**43:06**		
West Bank 1									
Northern	22:20	12.5	34.4	20:31	12.5	36.6	17:29	11.9	41.0
PEROW/WSAB	32:47	17.6	32.2	27:53	17.6	37.5	25:10	17.7	41.0
Southern	13:13	5.1	17.7	12:31	5.1	24.5			
Total (Minutes)	**68:20**	**35.2**	**31.6**	**60:55**	**35.2**	**35.8**	**42:39**	**29.6**	**41.0**
Total (Hours)	**1:08:20**			**1:00:55**			**42:39**		
West Bank 2									
Northern	24:36	12.9	32.1	23:21	12.9	33.1	19:08	12.2	38.4
PEROW/WSAB	32:47	17.6	32.2	27:53	17.6	37.5	25:10	17.7	41.0
Southern	13:13	5.1	17.7	12:31	5.1	24.5			
Total (Minutes)	**70:36**	**35.6**	**30.7**	**63:45**	**35.6**	**34.4**	**44:18**	**29.9**	**40.0**
Total (Hours)	**1:10:36**			**1:03:45**			**44:18**		
West Bank 3									
Northern	21:15	11. 8	33.2	19:48	11. 8	35.8	17:50	11.5	38.9
PEROW/WSAB	32:47	17.6	32.2	27:53	17.6	37.5	25:10	17.7	41.0
Southern	13:13	5.1	17.7	12:31	5.1	24.5			
Total (Minutes)	**67:15**	**34.5**	**31.1**	**60:12**	**34.5**	**35.5**	**43:00**	**29.2**	**40.2**
Total (Hours)	**1:07:15**			**1:00:12**			**43:00**		

Travel times could be further reduced for the Street Car and LRT alternatives by operating them in an entirely grade-separated system similar to the Low Speed Maglev Option. Based on an AA-level of system design, the end-to-end travel time from Union Station to the SARTC for the LRT West Bank 3 Alternative would be shortened by just over three minutes as shown below in Table 3.18. The minor increase represents several constraints and assumptions. At this level of analysis, the run time for both PEROW/WSAB Area alignment alternatives is the same as the current LRT alignment has a major curve (PEROW/WSAB ROW to the San Pedro Subdivision) that requires a speed reduction whether in at-grade or grade-separated operations. This connection could be modified to run faster, but would require major residential property acquisition to do so. In addition, the run time for the combination alternative was based on an assumption of new signals in roadway segments (96 percent of ROW crossings occur in roadway segments rather than intersections) adjacent to stations and signal priority at all other crossings. Also, the West Bank 3 combination alignment alternative was already designed with a 27 percent grade-separated configuration. Analyzing the trade-offs related to grade separation would be refined during any subsequent engineering work based on the Metro *Grade Crossing Policy* which provides a process for making grade separation decisions based on more detailed highway system analysis and transit system design.

Table 3.18 – LRT West Bank 3 Alternative: All Grade-Separated System Travel Times

Operational Alternative	**Northern Connection Area** (Minutes:Seconds)	**PEROW/WSAB Area** (Minutes:Seconds)	**Southern Connection Area** (Minutes:Seconds)	**Total Trip**[1] (Minutes:Seconds)
Combination: at-grade and grade-separated	19:48	27:53	12:31	60:12
All grade-separated	18:30	27:53	10:47	57:10

[1] Represents time to complete one-way trip from Union Station to SARTC.

Currently, the guideway alternatives have an average station spacing of approximately of two miles between stations as shown in Figures 3.14 and 3.15. If peak period express or skip-stop service with a five-mile station spacing were implemented, an end-to-end travel time savings of eight minutes could result as shown in Table 3.19. The proposed major stations considered in this analysis were Union Station, Pacific Boulevard, Firestone Boulevard, the Metro Green Line, 183rd Street/Gridley Road, Beach Boulevard, Harbor Boulevard, and SARTC. Further evaluation of express service and the stations to be included may be studied through possible future study efforts, though it is not current Metro policy.

Table 3.19 – LRT West Bank 3: Skip Stop System Travel Times

Operational Sections	**All Proposed Station Stops** (Minutes:Seconds)	**Possible Skip Stop Stations** (Minutes:Seconds)
Northern Connection Area	19:48	17:28
PEROW/WSAB Area	27:53	24:04
Southern Connection Area	12:31	10:34
Total	**60:12**	**52:06**

Given the approximately 34-mile length of the proposed project and its location within two counties, the decision may be made to construct the project in several segments over time reflecting issues such as county priorities and funding availability. The Corridor has been divided into four Minimum Operable Segments (MOSs), which refers to a proposed phase of project implementation. Each MOS can be built independently, it connects logical termini, and its usefulness as a transportation investment does not depend upon implementation of subsequent phases. Construction of the Los Angeles County portion of the project was seen as occurring in two MOSs: 1) between Union Station and the Metro Green Line; and 2) the Metro Green Line and the county line. The Orange County portion also may be built in two MOSs: 1) the county line to Harbor Boulevard to interface with the future Santa Ana-Garden Grove Street Car Harbor Boulevard Station; and 2) from the Harbor Boulevard Station to the SARTC.

The resulting run times for the two MOS segments in Los Angeles County, using the LRT West Bank 3 alignment as a test case, is presented in Table 3.20. Two run times are presented for the Metro Green Line to the County Line segment:

1. **MOS 1A** – The first assumed construction of a stand-alone, initial operational segment along the PEROW/WSAB Corridor connecting north in the median of Lakewood Boulevard to provide a transfer to the existing Metro Green Line Lakewood Boulevard Station. It should be noted that the Lakewood Boulevard connection would be a "tear down" section if the decision were made to continue the transit system north to connect with Union Station. This MOS segment is 6.9 miles in length and has five stations, including the existing Metro Green Line Lakewood Boulevard Station and the Bellflower Boulevard, 183rd Street/Gridley Road, Pioneer Boulevard, and Bloomfield Avenue stations.
2. **MOS 1B** – The second run time was based on construction of a new Metro Green Line station interfacing with the proposed operational alignment north on the San Pedro Subdivision. This MOS segment is 7.3 or 7.5 miles in length and has six stations, including a new Metro Green Line Station and the Paramount Boulevard/Rosecrans Avenue, Bellflower Boulevard, 183rd Street/Gridley Road, Pioneer Boulevard, and Bloomfield Avenue stations.

Table 3.20 – Travel Times for Minimum Operable Segments in Los Angeles County

Alternative	MOS 1A Metro Green Line[1] (existing station) to County Line		MOS 1B Metro Green Line[2] (new station) to County Line		MOS 2 Union Station to Metro Green Line[2] (new station)		Total Union Station to County Line[2] (Using MOS 1B)	
	Minutes: Seconds	Miles	Minutes: Seconds	Miles	Minutes: Seconds	Miles	Minutes: Seconds	Miles
Street Car	12:39	6.9	14:05	7.5	21:15	11.8	35:20	19.3
LRT	10:53	6.9	12:20	7.5	18:30	11.8	30:50	19.3
Low Speed Maglev	10:53	6.9	11:14	7.3	17:50	11.5	29:05	18.8

1 Based on connecting to the existing Metro Green Line Lakewood Boulevard Station.
2 Based on new Metro Green Line Station to be accessed from the San Pedro Subdivision.

Figure 3.14 – Corridor Guideway Station Spacing

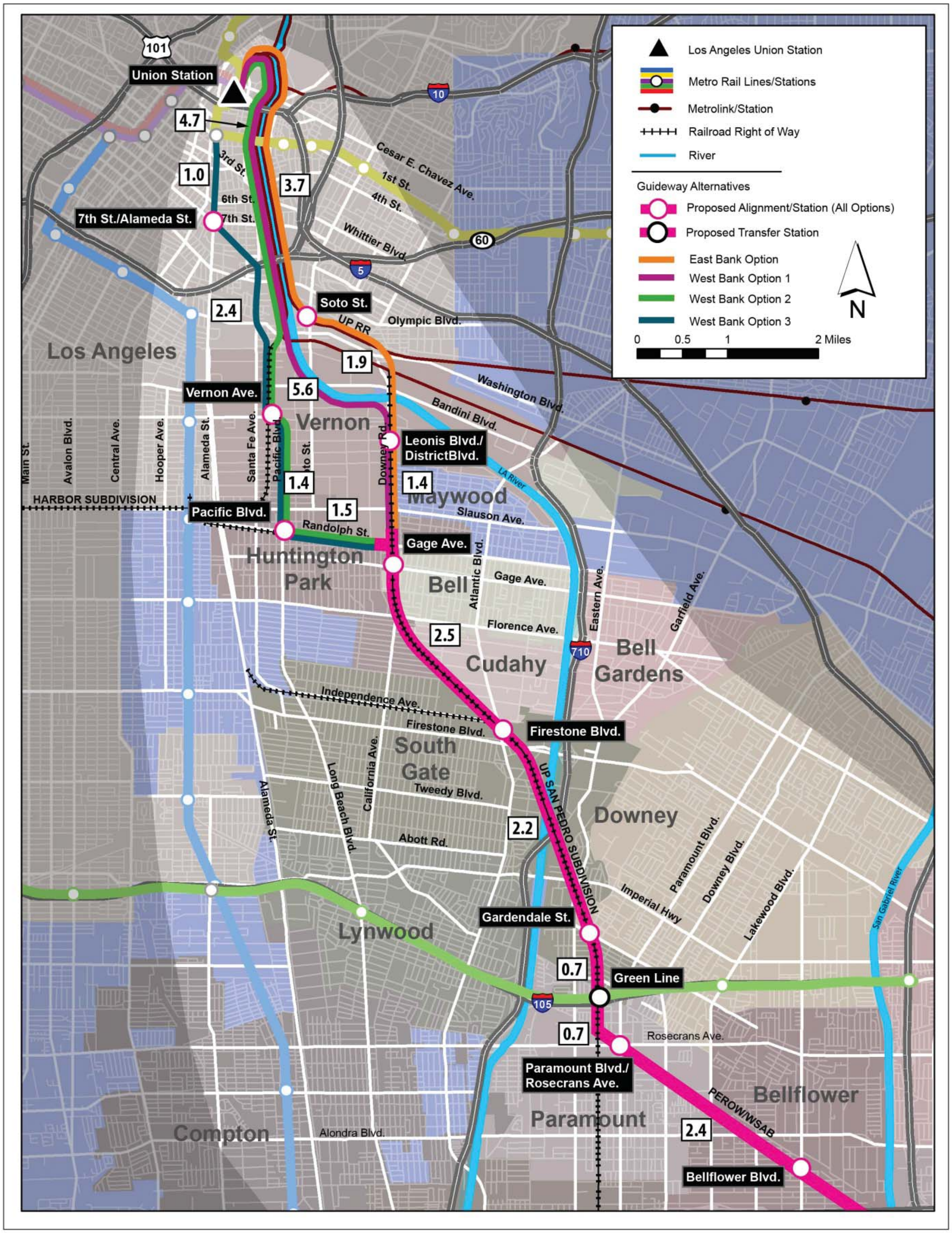
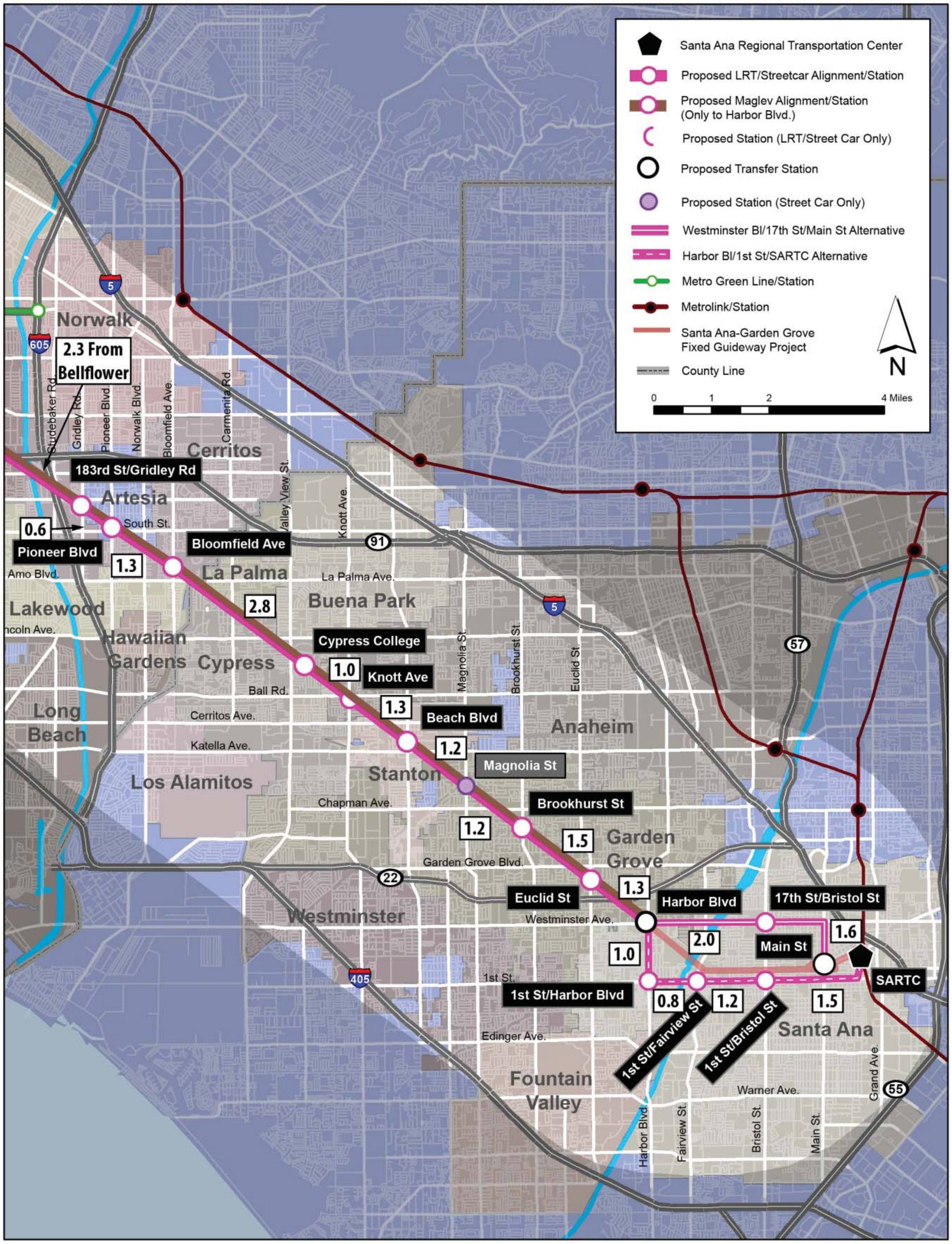


Figure 3.15 – Corridor Guideway Station Spacing


Santa Ana Regional Transportation Center
Proposed LRT/Streetcar Alignment/Station
Proposed Maglev Alignment/Station (Only to Harbor Blvd.)
Proposed Station (LRT/Street Car Only)
Proposed Transfer Station
Proposed Station (Street Car Only)
Westminster Bl/17th St/Main St Alternative
Harbor Bl/1st St/SARTC Alternative
Metro Green Line/Station
Metrolink/Station
Santa Ana-Garden Grove Fixed Guideway Project
County Line
0 1 2 4 Miles
N
2.3 From Bellflower
183rd St/Gridley Rd
0.6
Pioneer Blvd
1.3
Bloomfield Ave
2.8
Cypress College
1.0
Knott Ave
1.3
Beach Blvd
1.2
Magnolia St
1.2
Brookhurst St
1.5
Euclid St
1.3
Harbor Blvd
17th St/Bristol St
1.6
2.0
Main St
1.0
SARTC
1st St/Harbor Blvd
0.8
1.2
1.5
1st St/Fairview St
1st St/Bristol St
Norwalk
Cerritos
Artesia
La Palma
Buena Park
Lakewood
Hawaiian Gardens
Cypress
Long Beach
Los Alamitos
Stanton
Anaheim
Garden Grove
Westminster
Fountain Valley
Santa Ana

3.3.2.2 Ridership Projections

Ridership projections were prepared using a Corridor-specific model developed from the FTA-reviewed Metro travel demand model that was expanded to include both Los Angeles and Orange counties, and was validated for existing conditions. Projections for the year 2035 were identified for the TSM and four build alternatives, along with the No Build to provide a basis for comparison. Due to the significant number of modal and alignment alternatives, the decision was made to perform detailed coding and analysis of a set of base alternatives, along with a series of sensitivity tests to explore other alignment options and system decisions. Also, the West Bank 1 and 2 alignments were so similar in length, number of stations, and physical setting, that only the West Bank 2 was analyzed. The full model runs are indicated by a tone in Table 3.21 below that presents the forecast ridership and user benefits. A detailed discussion of the ridership analytical process and results is presented in *Appendix B: PEROW/WSAB Corridor AA Travel Demand Modeling Report.*

Table 3.21 – Forecast Ridership (2035)

Alternative	Total Daily Project Boardings	Daily New Transit Riders	Daily User Benefits Per Project Boarding (Minutes)	Daily User Benefits (Hours)
No Build	49,760	--	--	--
TSM				
‣ Core Service Project[1]	39,000	16,000[2]	N/A	N/A
‣ Corridor System	85,575	35,815	22.2	21,720
BRT Alternatives				
‣ Street-Running	57,340	18,120	13.2	12,605
‣ HOV Lane-Running	67,210	26,640	15.7	17,580
Street Car Alternatives				
‣ East Bank 1	77,545	28,900	18.9	23,240
‣ West Bank 2	75,750	27,550	18.5	24,365
‣ West Bank 3	79,600	28,945	18.6	24,635
LRT Alternatives				
‣ East Bank 1	84,895	32,730	18.9	26,780
‣ West Bank 2	82,930	31,200	18.5	25,540
‣ West Bank 3	87,150	32,870	18.6	27,075
Low Speed Maglev				
‣ East Bank 1	74,020	28,430	19.2	22,635
‣ West Bank 2	72,310	26,985	18.8	23,735
‣ West Bank 3	75,990	28,430	18.9	23,995

Notes: Colored tone identifies a coded model run; numbers with no tone were derived from sensitivity runs.
[1] Ridership for two bus service projects that represent the same travel corridor as the build alternatives.
[2] New ridership estimate based on same percentage increase as total daily boardings.

The modeling results show a strong increase in daily transit boardings in the PEROW/WSAB Corridor with implementation of any of the proposed transit system alternatives, clearly demonstrating the travel demand and need for more transit in the study area. At one end of the transit investment spectrum, the TSM Core Service Project option, which represents the two bus service lines (approximately 34 miles in length) that would serve the same travel corridor as the build alternatives: Union Station-Los Cerritos in Los Angeles County and the Katella Avenue BRT in Orange County. This option would attract and serve 39,000 daily Corridor boardings and approximately 16,000 new riders by the year 2035. A higher level of ridership would be served by the TSM Corridor System option, which includes a 206-mile system of new and enhanced bus services and arterial and intersection operational improvements. This alternative would attract and serve 85,575 daily Corridor boardings primarily in Orange County; only one new Metro bus line and one new Long Beach Transit line is proposed in Los Angeles County compared to improved service on three lines and provision of five new lines in Orange County. At the other end of the ridership spectrum, the approximately 35-mile long LRT alternatives would have the highest projected daily boardings among the guideway options with 82,900 to 87,150 daily boardings, and attracting up to 32,900 new transit riders.

The BRT Alternatives were forecasted to serve an additional 57,000 daily Corridor boardings for the Street-Running Alternative, and 67,000 daily boardings for the HOV Lane-Running Alternative. These two options would attract the lowest number of daily boardings and new riders among the proposed alternatives, other than TSM Core Service Project. The BRT HOV Lane-Running Alternative was projected to attract a higher level of ridership than the Street -Running Alternative primarily due to a faster average speed and providing direct service into downtown Los Angeles. For both BRT options, it should be noted that the projected ridership would significantly exceed the hourly and daily capacity typically provided by a BRT system. For example, the Metro Orange Line served 26,900 daily boardings in September 2011.

Construction of the Street Car alternatives was forecasted to serve from 77,545 to 79,600 daily Corridor boardings, and attract an average of 28,400 daily new transit riders. The Street Car user benefits were identified as equal to the LRT options on a per boarding level, but were approximately 10 percent lower when compared on a daily total user benefits level primarily due to slower operating speeds and longer end-to-end travel times. It should be noted that the forecasted ridership information was based on operating three-car trains using the same street car vehicle proposed for use by the Santa Ana Street Car system. Research identified that the vehicle cannot be coupled together into two or three car trains, but must be operated singly. The capacity provided by a system of single Street Car vehicles would not accommodate the Corridor's forecasted ridership demand.

Daily boardings among the LRT alternatives were forecasted to be between 82,900 and 87,150 daily boardings, and would attract an average of 32,270 daily new riders. The West Bank 3 Alternative was projected to attract and serve the highest level of daily boardings (87,150) and new riders (32,900) due to having the fastest travel speeds and shortest end-to-end travel times. With a slightly longer run time of approximately two minutes and serving different communities, the East Bank Alternative was second with 84,900 daily boardings and 32,700 new transit riders. Looking at forecasted daily user benefits per project boarding, the LRT alternatives are similar to the Street Car and Low Speed Maglev options, but have the highest user benefits on a daily total user benefit basis among the alternatives.

A model run was performed to evaluate the ridership impact of operating the LRT Alternative from one identified in the run time analysis spreadsheets to a speed more comparable to actual Metro Rail operations experience. The Metro Blue Line section between the Washington and Willow stations was identified as having an operational configuration similar to that proposed for the PEROW/WSAB Corridor project. This segment operates northbound at 29.7 mph and southbound at 32.9 mph; the northbound speed was used in a run time analysis for the LRT West Bank 3 Alternative that resulted in an average speed of 29.9 mph due to the grade-separation in the northern portion of the alignment. The results presented in Table 3.22 show an increase in end-to-end run time (Union Station to SARTC) of more than five minutes. The eight percent reduction in average speed was forecasted to result in a corresponding eight percent decrease in daily corridor boardings (6,700 fewer riders) and a ten percent decrease in new riders (3,400 less).

Table 3.22 – Comparison of Forecast Ridership based on Metro Blue Line Operating Speed (2035)

Speed Alternative	Average Speed (mph)	Run Time[2] (Mins:Secs)	Total Daily Corridor Boardings	Daily New Transit Riders	Daily User Benefits Per Project Boarding (Minutes)	Daily Total User Benefits (Hours)
Run Time Analysis	35.5	1:00:12	87,150	32,870	18.6	27,075
Metro Blue Line[1]	29.9	1:05:49	80,460	29,435	18.5	24,810

[1] Based on run time analysis using FY2011 Metro Blue Line northbound average speed of 29.7 mph.
[2] End-to-end run time from Union Station to SARTC for LRT West Bank 3 Alternative.

The Low Speed Maglev alternatives were forecasted to serve from 72,300 to 76,000 daily boardings and attract an average of 27,950 daily new transit riders. The West Bank 3 Alternative was projected to attract and serve the highest level of daily boardings (76,000) primarily due to having the shortest alignment. With a longer alignment and run time (1.3 minutes) and the lowest average speed, the West Bank 2 Option would attract the lowest ridership among the Low Speed Maglev alternatives with 72,300 daily boardings. The East Bank Alternative has the highest user benefit per project boarding of all of the guideway alternatives, but on a daily total user benefit basis, all of the Low Speed Maglev alternatives are comparable to the Street Car options and lower than the LRT alternatives.

The Corridor benefits go beyond the project ridership identified as resulting from implementation of a transit project. Table 3.23 presents an overview of the resulting study area transit daily boardings in 2035 demonstrating that a transit project (the West Bank 3 alignment is used) would encourage a higher level of transit ridership throughout the Corridor. When identifying annual boardings (defined by Metro as multiplying the daily boardings by 325 days), the resulting numbers are significant – from 18.6 million annual project boardings for the BRT Street-Running Alternative to 28.3 for the LRT West Bank 3 Alternative.

Table 3.23 – Annual Corridor Daily Boardings (2035)

Boardings	TSM Core Service	BRT Street	BRT HOV Lane	Street Car	LRT	Low Speed Maglev
Daily Boardings	39,000	57,340	67,210	79,600	87,150	75,990
Annual Boardings (Millions)	12.7	18.6	21.8	25.9	28.3	24.7

An overview of the peak versus off-peak boarding access among the alternatives is presented in Table 3.24. Peak period access for the BRT alternatives would be different than the guideway alternatives, with the Street-Running alternative providing more all day service as shown by having the lowest percentage (63 percent) of peak boardings among the options, and the more commuter-oriented HOV Lane-Running Alternative having the highest percentage of peak period travel (75 percent). All of the guideway alternatives have a similar access breakdown with approximately 70 percent peak and 30 percent off-peak boardings.

Table 3.24 – Peak and Off-Peak Boarding Access (2035)

Alternative	BRT Street-Running	BRT HOV Lane-Running	Street Car	LRT	Low Speed Maglev
Peak Boardings	63%	75%	71%	72%	72%
Off-Peak Boardings	37%	25%	29%	28%	28%

When evaluating the mode of access to the system for each of the alternatives, the two BRT options vary slightly with the Street-Running Alternative having a higher percentage (82 percent) of walk, bus, and rail access than the HOV Lane-Running Option (71 percent), while the HOV Option has a higher drive access (29 percent). Table 3.25 presents an overview of the mode of access among the guideway alternatives using the West Bank 3 alignment. The access categories include walking to the station, transferring from a bus or community circulator, parking at the station (park-and-ride or PNR), being dropped off (kiss-and-ride or KNR), and transferring from a rail line (Metro, Metrolink, Amtrak, or the future Santa Ana Street Car system). While a majority of the access for the Street Car and LRT alternatives is similar, there is one difference: reflecting its more community-based service type, the Street Car alternatives would attract more walk access. For the Low Speed Maglev options, the analysis showed a low level of access by bus, and higher levels of drive and rail access than the other two guideway alternatives.

Table 3.25 – Guideway Alternatives: Mode of Access (2035)

Alternative	Walk	Bus	PNR	KNR	Rail
Street Car	35%	30%	11%	2%	22%
LRT	32%	31%	11%	3%	23%
Low Speed Maglev	32%	12%	18%	4%	34%

Based on the ridership projections, an overview of the busiest stations is presented in Table 3.26 for Los Angeles and Orange counties separately. The "asterisk" indicates that one station was identified as significantly more active than the other proposed stations. For example, Union Station typically attracted three times more boardings than the second busiest stations, and in many cases, would have four to five times the activity of the other stations. In Los Angeles County, the busiest stations would be in the cities of Los Angeles, South Gate, Cerritos, Huntington Park, and Bellfower. In Orange County, the SARTC, Harbor Boulevard, Cypress College, Beach Boulevard in Stanton, Knott Avenue in Anaheim, and Brookhurst Street in Garden Grove would be the most active. In Santa Ana, the BRT alternatives attract a high level of ridership at the 1st Street/Bristol Street Station serving the Civic Center Area. For the Guideway Alternatives, Santa Ana travelers would use the future Street Car system to reach their local destinations from the more regional service provided by the PEROW/WSAB Corridor system.

Table 3.26 – Forecasted Most Active Stations by Alternative and County (2035)

Alternative	Los Angeles County	Orange County
BRT Street-Running	* Metro Green Line 1. Union Station 2. Firestone/Long Beach Blvds. 3. Firestone/Lakewood Blvds. 4. 183rd St./Gridley Rd. 5. Bellflower Blvd.	* SARTC 1. Harbor Blvd. 2. Cypress College 3. 1st/Bristol Sts. 4. Knott Ave. 5. Beach Blvd.
BRT HOV Lane-Running	* 7th/Metro Center Station 1. Metro Green Line 2. Harbor Fwy./Century Blvd. 3. Harbor Fwy./Manchester Blvd. 4. Bloomfield Ave. 5. Bellflower Blvd.	* SARTC 1. Harbor Blvd. 2. 1st/Bristol Sts. 3. Cypress College 4. Knott Ave. 5. Beach Blvd.
Guideway Alternatives	* Union Station 1. Metro Green Line 2. Firestone/Atlantic Blvds. 3. 183rd St./Gridley Rd. 4. Pacific Blvd. or Gage Ave. 5. Bellflower Blvd.	* SARTC 1. Harbor Blvd. 2. Cypress College 3. Beach Blvd. 4. Brookhurst St. 5. Knott Ave.

Sensitivity Run Results

The following sensitivity runs were prepared to assess the effects of the following possible future system decisions:

- Fully grade separating the LRT Alternative;
- Fare-related ridership impacts for the Low Speed Maglev Alternative if a "private operator" fare was charged rather than a public agency fare; and
- MOS options in Los Angeles County.

The first sensitivity test evaluated the ridership impact of entirely grade separating the LRT Alternative using the West Bank Option 3 alignment as the test case. The base ridership projections previously presented in Table 3.21 for the LRT options were based on the construction of an alignment that was a combination of grade-separated and at-grade operations. For the West Bank 3 alignment, 27 percent of the Northern Connection Area was grade-separated, as were eight percent of the PEROW/WSAB and Southern Connection areas. Future system decisions may be made to entirely grade-separate the LRT alignment to improve system performance and reduce traffic impacts. The results of the sensitivity run, shown in Table 3.27, show a slight increase in daily boardings (three percent), new transit riders (four percent), user benefits (four percent), and user benefits per project boarding (two percent). The slight growth in ridership is due to a minor increase in operating speed and decrease in run time. Further travel time savings could be achieved with express or skip stop service as discussed above.

Table 3.27 – Sensitivity Test: Entirely Grade-Separated LRT Alternative (2035)

Statistic	Combination Alignment	Fully Grade-Separated Alignment
Daily Project Boardings	87,150	89,560
Daily New Riders	32,870	34,320
Daily User Benefits (Hours)	27,075	28,150
User Benefits Per Project Boarding (Minutes)	18.6	18.9

A second sensitivity test evaluated ridership impacts for the Low Speed Maglev Alternative based on whether this option was operated by a private operator rather than a public agency such as Metro or OCTA. This alternative differs from the other Low Speed Maglev alternatives only in the amount charged for passengers to use the system. The West Bank 3 alignment option was used as it had the highest forecasted ridership of the Low Speed Maglev alternatives and would represent the best case scenario.
The identified difference reflects the fare required to generate the operating revenue required to support a public-private partnership with different financing tools and return needs than an entirely publicly-funded project. A revised fare assuming private operations was calculated through financial analysis effort and then used in the Corridor model in place of the Metro rail system fare. The resulting

private operations fare was identified as $8.75, and the significant impact on project ridership is presented in Table 3.28. The analysis showed that the public fare-based ridership of 75,990 daily boardings was forecasted to be reduced by 89 percent to 8,255 boardings. The results show that in this Corridor, with a large number of low-income households, riders would find less expensive travel alternatives to avoid paying the higher fare.

Table 3.28 – Low Speed Maglev Alternative: Private Fare (2035)

Statistic	Public Fare-Based Ridership	Private Fare-Based Ridership
Daily Project Boardings	75,990	8,255
Daily New Riders	28,430	3,090
Daily User Benefits (Hours)	23,995	2,610
User Benefits Per Project Boarding (Minutes)	18.9	18.9

A final set of sensitivity tests evaluated the resulting ridership if the Corridor project were built in Los Angeles County with the following MOS segments using the LRT West Bank 3 Alternative:

- **MOS 1** – With a use agreement for the San Pedro Subdivision and construction of a new Metro Green Line station, implementation of the system section connecting north to Union Station;
- **MOS 2** – Implementation of the segment from the new Metro Green Line station along the WSAB Corridor ROW to the future Bloomfield Avenue Station located in Cerritos just west of the county line; and
- **Both** – If both MOSs were constructed from Union Station to the proposed Bloomfield Station in Cerritos and went into operation at the same time.

Table 3.29 – Ridership Projections for Minimum Operable Segments in Los Angeles County

Statistics	MOS 1 Union Station to Metro Green Line[1]	MOS 2 Metro Green Line[1] to County Line	Both Union Station to County Line
Daily Project Boardings	19,620	11,060	38,790
Daily Corridor Boardings	103,820	111,070	125,540
Daily New Riders	1,850	3,350	9,790
Daily User Benefits (Hours)	2,330	3,360	9,940
Daily User Benefits (Minutes)	7.1	18.2	15.4

[1] Based on new Metro Green Line Station to be accessed from the San Pedro Subdivision.

The ridership results presented in Table 3.29 show a strong level of ridership in the Union Station to Metro Green Line portion of the Corridor. This section currently has a high level of transit ridership (15 percent) and the low number of new riders indicates that the project would be primarily serving existing riders better with faster, more direct service. Building and operating MOS 2 alone would attract a lower level of total riders than MOS 1, but it would attract three times more new riders than MOS 1 resulting in a higher level of user benefits. The synergy resulting from completion and operation of both segments is demonstrated by a resulting higher level of ridership than if the ridership of the two segments were added together. Building both segments would result in three times more new riders than MOS 2 alone, and almost nine times more than only MOS 1. The total forecasted ridership for the Los Angeles County only portion of the Corridor system is strong, but not as significant as if a Corridor transit project were to provide service connecting the two counties and their jobs and destinations.

3.4 Other Modes

This section provides an initial assessment of possible impacts on study area pedestrian and bicyclists with implementation of each of the transit system alternatives under consideration as all of the trips made on the proposed alternatives will have a strong pedestrian component and may enhance Corridor bicycle usage.

3.4.1 Existing Pedestrian and Bicycle System

The PEROW/WSAB Corridor has an extensive street system lined with sidewalks and with many streets served with bus and circulator service generating current pedestrian activity. In addition, several cities have active mixed use pedestrian areas attracting residents and visitors, such as downtown Los Angeles, Pacific Boulevard in Huntington Park, Little India on Pioneer Boulevard in Artesia, and downtown Santa Ana. Cities typically provide sidewalk and related amenities, and implement pedestrian-related guidelines for commercial and residential areas, and in some cases, for transit station areas.

Within the Corridor, Metro, OCTA, and SCAG have adopted policies and projects that support bicycling as a transportation mode that improves air quality and congestion, and helps create healthy communities. Regional, county, and local policy and planning documents seek to increase the number of bicyclists who ride for commuting and other daily purposes. Bicyclists are encouraged on OCTA's bus system and Metro's bus and rail systems. Adopted Corridor bicycle facilities falling in the following classifications are presented in Figure 3.16:

- **Class I Bike Paths** – Off-road, two-way paths most often located along flood control channels, riverbanks, active or inactive rail ROWs, and utility ROWs.
- **Class II On-Street Bike Lanes** – Striped, one-way lanes on streets with posted signage.
- **Class III Bike Routes** – Bicycles operate in space shared with vehicles; typically designated by signage only.

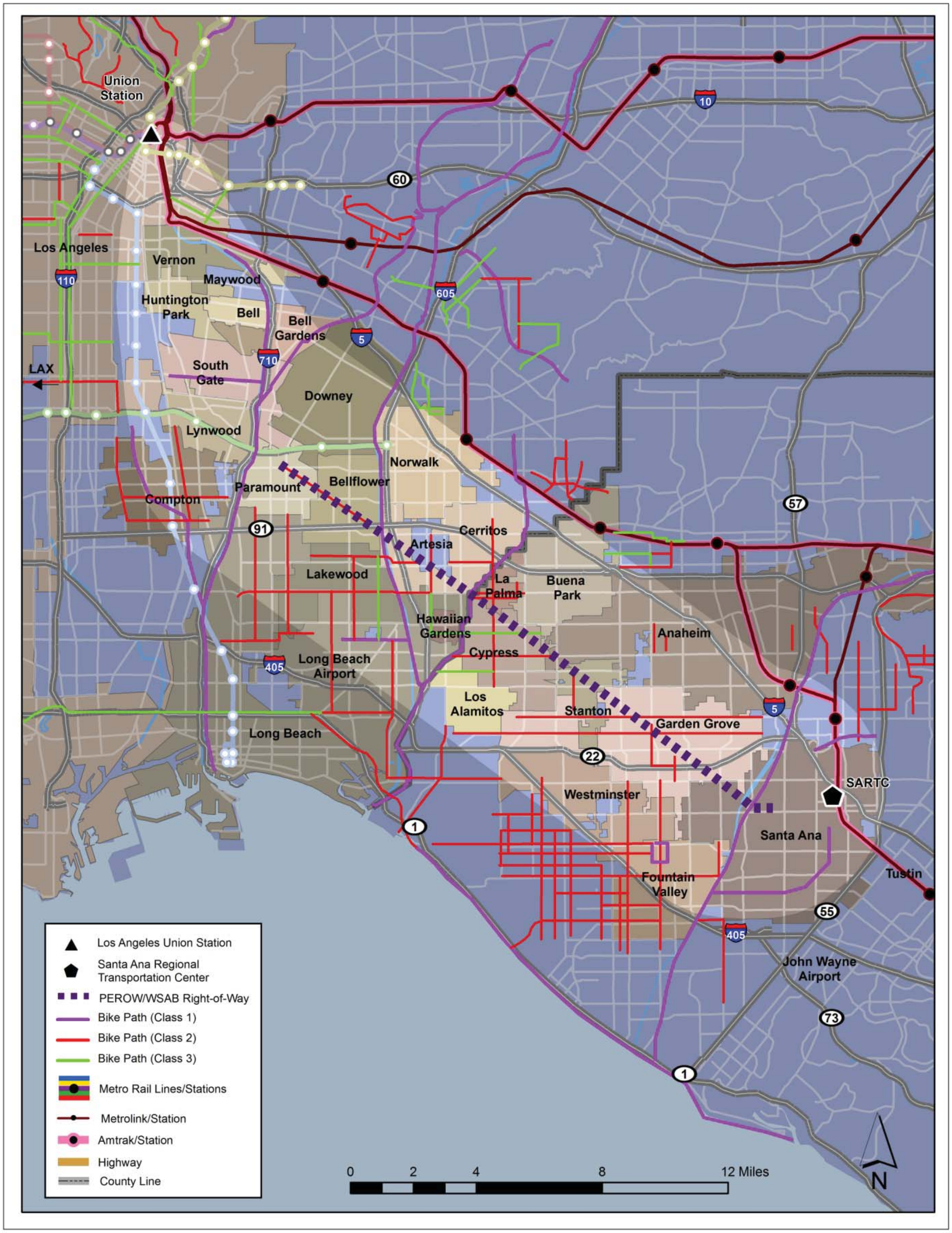
As shown in Table 3.30, any transportation improvement implemented in the Corridor would cross and/or interface with the following existing bicycle facilities:

- **Class I Bike Paths** – Five Class 1 facilities: Los Angeles River, San Gabriel River, Rio Hondo, Southern Avenue, and Bellflower Bike Trail;
- **Class II Bike Lanes** – Ten Class II facilities: Del Amo Boulevard, Woodruff Avenue, South Street, Crescent Avenue, Moody Street, Orangewood Avenue, Brookhurst Street, Lampson Avenue, Trask Avenue, and Newhope Street; and
- **Class III Bike Routes** – Four Class III facilities: Centralia Street, Pioneer Boulevard, Palo Verde Avenue, and Orange Avenue.

Table 3.30 – Summary of Bikeways Crossing the PEROW/WSAB Corridor

Bikeway	City	County
Class I Bike Paths		
Los Angeles River	Maywood/Bell/South Gate/Cudahy/Paramount	Los Angeles
San Gabriel River	Los Alamitos/Bellflower/Lakewood/Downey/Norwalk	Los Angeles
Coyote Creek	Cerritos/La Palma/Cypress/Los Alamitos	Los Angeles
Rio Hondo	Downey/Bell Gardens	Los Angeles
Southern Avenue	South Gate	Los Angeles
Bellflower Bike Trail	Bellflower	Los Angeles
Class II Bike Paths		
Del Amo Blvd.	Lakewood	Los Angeles
Woodruff Avenue	Lakewood	Los Angeles
South St. /Carmenita Rd.	Cerritos	Los Angeles
Crescent Avenue	La Palma/Cypress	Orange
Moody Street	Cypress/La Palma	Orange
Orangewood Avenue	Garden Grove	Orange
Brookhurst Street	Garden Grove	Orange
Lampson Avenue	Garden Grove	Orange
Trask Avenue	Garden Grove	Orange
Newhope Street	Garden Grove	Orange
Class III Bike Routes		
Centralia Street	Artesia	Los Angeles
Pioneer Blvd.	Artesia	Los Angeles
Palo Verde Avenue	Lakewood	Los Angeles
Orange Avenue	Cypress	Orange

Figure 3.16 – Existing Bikeways in Corridor Study Area



3.4.2 Future Pedestrian and Bicycle System Improvements

All of the trips made in the study area have a pedestrian component, with transit trips being dependent on safe, convenient, and pleasant walking connections, along with increased transit access by bicycle. Implementation of a carefully planned and designed pedestrian and bicycle access system through city policies and projects will be key components in the successful use of any of the transit options under consideration.

The PEROW/WSAB Corridor has the demonstrated population and employment density to support transit and related pedestrian activity. Implementation of design policies and projects that develop, protect, and foster the pedestrian-oriented nature of the proposed transit station areas and adjacent commercial and residential neighborhoods would encourage the pedestrian portion of the transit trip, and encourage transit system ridership. Cities typically provide pedestrian-related guidelines for commercial and residential areas, and in some cases, for transit station areas. For example, the City of Los Angeles identifies pedestrian requirements in the *Transportation Element of the General Plan* and the *Integrated Land Use and Transportation Policy* adopted with Metro. Both policies identify design objectives and guidelines such as minimum and preferred sidewalk widths in transit station areas, and calls for the establishment of Pedestrian Oriented Districts in higher use transit station areas. Many of the Corridor cities have adopted or are developing future plans to focus mixed use development in the proposed station areas to encourage and support increased pedestrian activity and transit access.

Provision of pedestrian and bicycle facilities in the PEROW/WSAB Corridor with any future transit system, such as the Class 1 Bikeway project successfully implemented by the City of Bellflower, can support pedestrian and bicyclist safety and encourage multi-modal travel to and from transit station areas, and interface with existing trails.

3.4.3 Pedestrian and Bicycle Impacts

Implementation of a new transit system with associated pedestrian and bicycle improvements would have benefits and impacts for Corridor pedestrians and bicyclists. Benefits could include proposed system-related improvements that would encourage and enhance pedestrian and bicycle activities through new improvements and increased safety tools and awareness. Possible benefits resulting from increased pedestrian and bicycle access to any new system may include:

- Reduced mobile source emissions and improved air quality and reduced Greenhouse Gas emissions.
- Reduced automobile traffic generated by a new transit system along with a possible decrease in related parking requirements.
- Increased pedestrian activity supporting land uses and activities and enhancing the sense of community in station areas and along the system's alignment.
- Enhanced community safety and security with more activity and "eyes" on the street.
- Improved health for study area residents.

All of the alternatives under consideration would have possible impacts on pedestrians and bicyclists with the introduction of a high-capacity transit system and related increased circulation activity in the station areas due to pedestrian, bicycle, bus or circulator, drop-off, or park-and-ride access activity. Possible impacts on pedestrian and bicyclist safety may include the following:

1. Conflicts between vehicular traffic and an increased number of pedestrians and bicyclists, particularly in station areas.
2. Conflicts between transit vehicles and bicyclists where they must share the street ROW.
3. Prevention of crossings of streets and rail tracks except at designated, protected locations for at-grade sections.
4. Concerns about the safety and convenience of pedestrians waiting in transit station areas.
5. Concerns about pedestrian crossing and waiting safety in areas with columns supporting grade-separated guideway sections.

3.4.3.1 Pedestrian Impacts

There are four primary areas of possible impacts to future transit pedestrians:

1. ***Street crossings*** – Address the safety and convenience of pedestrians interacting with transit and other vehicular traffic at crosswalks and other street crossings. It will be important to create identifiable and protected paths and zones dedicated to pedestrians that provide increased safety and capacity in crossing Corridor streets.
2. ***Sidewalks*** – Bus, BRT, and Street Car stations may be located on existing sidewalks, while LRT stations are operated in street medians or dedicated ROWs, whether at-grade or grade-separated, and Low Speed Maglev stations are all grade-separated. In order to create a successful pedestrian environment, provision of an appropriately-sized sidewalk and amenities such as shelters, lighting, and benches along with system information and fare machines as appropriate will be key to a successful transit system. Increased pedestrian activity and queuing needs may require additional sidewalk width in some station areas.
3. ***Walking to/from transit stations*** – This issue reflects the willingness of people to walk to/from their homes and jobs to transit stations when the pedestrian experience is safe and pleasant. This can be addressed by improving the safety and walkability of adjacent streets by creating a coordinated pedestrian system with related improvements including pedestrian crossing signage and signals along with cross walk improvements, street trees, lighting, and smooth pavement.
4. ***Crossing of transit tracks*** – Addresses the unique issue of transit operations with vehicles running at a high speed in some segments. The transit system components should be designed to encourage pedestrians and transit patrons to cross at protected crosswalk locations, while preventing crossing along the transit ROW between stations. Pedestrian access can be controlled through a combination of gates, signals, signage, walls, fences, and/or landscaping as appropriate.

3.4.3.2 Bicycle Impacts

Several of the alternatives under consideration would operate primarily at-grade within existing street ROWs which may have impacts on bicyclists including the following:

1. Conflicts between transit and automobile vehicular traffic and bicyclists, particularly on planned routes and in station areas.
2. Safety impacts due to the increased number of vehicles operating in station areas and along the Corridor alignment.
3. Safety and convenience of bicyclists at transit station areas.
4. Integration of Corridor bicycle facilities with existing and planned bicycle routes and trails.

3.5 Summary of Transportation Impacts

The following provides an overview of the highway system, pedestrian, and bicyclist impacts, including capacity constraints and safety impacts, possibly resulting from implementation of the No Build, TSM, and Guideway build alternatives. At this level of analysis, possible impacts have been noted, but are not specified nor are mitigation measures identified. The identified impacts are considered reasonably representative for the purpose of comparing alternatives. During any subsequent preliminary engineering work, the proposed system components and requirements would become more detailed, and impacts to Corridor vehicular traffic, pedestrians and bicyclists would be assessed accordingly, and described in any subsequent future environmental review efforts.

No Build Alternative

The No Build Alternative freeway and arterial improvement projects would have beneficial effects on the functioning of the Corridor's highway system. The transit component is comprised of the existing bus and rail systems with service and system improvements as required to meet projected 2035 ridership demands. The planned transit service improvements may have minor operational impacts on the functioning of the Corridor's arterial system, and conversely, are anticipated to have benefits with some daily trips shifting to transit. The minor increases in bus services may have a minor impact on Corridor highways, and pedestrian and bicycle facilities, and where necessary would be addressed in project-specific environmental documentation.

TSM Alternative

The TSM Alternative includes all of the projects in the No Build Alternative, plus the transit, arterial, and bikeway system improvement projects identified for implementation by 2035 with Metro and OCTA staff. The increase in bus transit services included in the TSM Alternative would operate along with the other vehicles in mixed-flow conditions on the Corridor's highway system, or in HOV lane conditions on the Corridor's freeway Transitway and HOV lane system. Implementation of related signal priority systems on arterials would facilitate the smooth flow of bus service, while minimizing the impact of the additional bus operations on arterial conditions. Freeway-based bus service may have some impact on freeway operations as the buses enter the freeway and circulate to and from the HOV lanes, but conversely may have highway system benefits with some daily trips shifting to transit. The Orange

County arterial improvements would have significant benefits on the arterial system and connections on to the SR-22 and I-5 freeways.

As this option would increase the number of buses operating in the study area over those identified under No Build conditions, implementation of the TSM Alternative may result in some or all of the following impacts:

1. Impacts to city street operations due to increased bus activity may result in impacts to traffic capacity and flow.
2. Conflicts between buses and pedestrians and bicyclists may occur due to the increased number of transit vehicles operating in the Corridor.
3. There may be an increase in conflicts between transit vehicles, other vehicles, pedestrians, and bicyclists along the arterial system and at crosswalks due to the anticipated increase in the number of transit patrons who would access the system as pedestrians or bicyclists.

BRT Alternatives

In the Corridor, the BRT Alternatives are defined as limited stop bus service operating in a combination of configurations:

- **Northern Connection Area** – street-running mixed-flow operations and/or freeway HOV lane operations;
- **PEROW/WSAB Area** – dedicated lane operations on the former PE Railway ROW; and
- **Southern Connection Area** – street-running mixed-flow operations.

In this AA study, the proposed BRT service consists of two alternatives: a Street-Running Alternative operating in mixed-flow conditions with signal priority improvements on city streets in the cities of Los Angeles, Vernon, Huntington Park, South Gate, Paramount, Bellflower, and Santa Ana; and a HOV Lane-Running Alternative primarily operating in HOV lanes on the I-110/Harbor Transitway and I-105 freeways, but with city street operations at both ends of study area. In the northern portion, this option would operate in Los Angeles north from the I-110/Harbor Transitway to the 7th/Metro Center Station serving the Metro Red, Purple, and Blue lines in existing peak period dedicated lanes (with some queue jumpers). In the southern end of the Corridor, this alternative would run on city streets with signal priority improvements through Santa Ana to connect with the SARTC.

Both of the BRT Alternatives would increase the number of buses operating in the study area over the No Build and TSM conditions. The Street-Running Alternative would be operated in 16 peak period 40-foot vehicles similar to the Metro Rapid system, and the HOV Lane-Running Alternative would utilize 32 peak period 45-foot vehicles similar to those used for the Metro Silver Line. When operating on city streets, a signal priority system would facilitate the smooth flow of bus service, while minimizing the impact of additional buses. In the Northern Connection Area, the impact of additional buses would have a negative impact on the operations along the physically-constrained Soto Street portion of the Street-Running Alternative alignment. Possible arterial impacts for some street cross-sections may include:

conflicts between buses and mixed flow traffic; some increase delay and congestion due to additional green time for BRT buses; and some impacts to automobile right turn movements at intersections. In addition, there may be some impact to the Corridor's arterial system operations due to increased station area vehicular activity related to drop-off and parking circulation. Detailed highway system impacts would be identified through possible future study efforts.

In the street-running sections, the BRT Alternative would utilize existing roadway space, and there may be some impacts to pedestrians and bicyclists along these street segments such as impacts to pedestrians crossing Corridor streets and bicyclists traveling along the streets. As this option would increase the number of buses operating in the study area over those identified under No Build conditions, implementation of the BRT Alternatives may result in some or all of the following impacts to Corridor pedestrians and bicyclists:

1. There may be an increase in conflicts between transit vehicles and pedestrians and bicyclists, particularly at crosswalks due to the anticipated increase in the number of transit patrons who would access the system as pedestrians or bicyclists.
2. Conflicts between vehicular traffic and pedestrians and bicyclists may occur due to the increased number of transit vehicles operating in the Corridor.
3. The safety and convenience of pedestrians and bicyclists at station stops, including the widening the sidewalks to accommodate lighting, shelters, emergency communication, fare equipment, and system information, provision of signage and striping improvement and/or bicycle rack or lockers, should be considered if more detailed plans are developed.

Guideway Alternatives

Introduction of a high-capacity transportation system improvement would have impacts to city street operations. In summary, at-grade systems may result in impacts to traffic capacity and flow, and the removal of on-street parking. Grade-separated systems may result in the loss of street capacity, left-turn lanes, and on-street parking due to column placement.

The Guideway alternatives consist of three modal alternatives: Street Car, LRT, and Low Speed Maglev options that are planned to operate in a range of street and active and inactive railroad ROWs. The guideway alternatives would have no impact on the study area's freeway system, and would have benefits with some daily trips shifting to transit. All three options would impact the Corridor's arterial system operations due to increased station area vehicular activity related to drop-off and parking circulation, along with feeder bus and circulator services.

As discussed above, the Low Speed Maglev Alternative would operate in an entirely grade-separated configuration and the only arterial system impacts would be related to the potential for column placement to affect on-street parking and median left-turn operations with some possible queuing impacts to street flow. During the AA study, the Street Car and LRT options were evaluated as operating in a combination of at-grade and grade-separated operations that would have impacts on the Corridor's arterial system. Possible impacts for some street cross-sections may include: conflicts between trains and vehicular traffic; reduction in street capacity; increased vehicular delays and congestion due to additional green time for trains, and/or new signals to accommodate and protect left-turning vehicles; and impacts to left and right turn movements due to transit facilities resulting in redistribution of traffic on parallel streets, including residential streets. Detailed highway system impacts and possible mitigation measures, along with resulting benefits, would be identified through future study efforts.

Street Car and LRT Alternatives

In the PEROW/WSAB Corridor, the Street Car Alternative was defined as rail service similar to that being planned by Santa Ana and operating in a combination of the following alignment configurations:

- **Northern Connection Area** – separate guideway in a combination of at-grade and grade-separated operations;
- **PEROW/WSAB Area** – dedicated guideway operations in either a combination of at-grade and grade-separated operations, or grade-separated operations-only on the former PE ROW; and
- **Southern Connection Area** – mixed-flow guideway operations in either an at-grade or a grade-separated configuration.

In the street-running operations in the cities of Los Angeles, Vernon, Huntington Park, and Santa Ana, the Street Car and LRT alternatives would utilize existing roadway space, and there may be some impacts to arterial traffic, pedestrians, and bicyclists along these street segments. There may also be some impacts to pedestrians crossing and bicyclists circulating along the streets. Along the PEROW/WSAB Corridor, there may be impacts due to the diagonal crossing of Corridor streets. Implementation of the Street Car or LRT alternative may result in some or all of the following impacts to Corridor pedestrians and bicyclists:

1. In the at-grade segments, there may be an increase in conflicts between transit vehicles and pedestrians and bicyclists, particularly at ROW crossings, particularly in the PEROW/WSAB Area. Pedestrians and bicyclists are accustomed to crossing a vacant ROW, and possible new hazards would be created with a rail system operating at an average speed of 30-35 mph. Vehicular and pedestrian gates, along with signs, signals, and noise devices, would be considered to reduce any impacts identified with the preparation of more detailed engineering and station plans.
2. There may conflicts between pedestrians and bicyclists and increasing station area vehicular traffic, due to bus, circulator, kiss-and-ride (drop-off), and park-and-ride access.
3. The safety and convenience of pedestrians circulating to and waiting at at-grade and grade-separated stations, including the widening of sidewalks and provision of street crossing improvements should be considered as more detailed plans are developed.
4. The safety and convenience of bicyclists in station areas, including the provision of signage and striping improvement and/or bicycle racks or lockers, should be considered as more detailed plans are developed.

Low Speed Maglev Alternative

In the Corridor, the Low Speed Maglev Alternative was defined as service similar to that operated as the Linimo system in Nagoya, Japan, and operating solely in a grade-separated configuration up to its Harbor Boulevard terminus. Implementation of the Low Speed Maglev Alternative may result in some or all of the following impacts to Corridor pedestrians and bicyclists:

1. There may conflicts between pedestrians and bicyclists and increasing station area vehicular traffic, due to bus, circulator, kiss-and-ride (drop-off), and park-and-ride access.
2. The safety and convenience of pedestrians circulating to (using stairs, escalators, and elevators) and waiting at grade-separated stations, including the widening of sidewalks and provision of street crossing improvements should be considered as more detailed plans are developed.
3. The safety and convenience of bicyclists in station areas, including the provision of signage and striping improvement and/or bicycle racks or lockers, should be considered as more detailed plans are developed.
4. The safety and convenience of bicyclists in station areas, including the provision of signage and striping improvement and/or bicycle racks or lockers, should be considered as more detailed plans are developed.

4.0 ENVIRONMENTAL CONSIDERATIONS

The PEROW/WSAB Corridor Alternatives Analysis (AA) transportation alternatives may have direct and indirect effects on the physical environment of the Corridor. This section analyzes the environmental consequences associated with the implementation of the No Build, Transportation Systems Management (TSM), Street Car, Light Rail Alternative (LRT) and Low Speed Maglev alternatives. Specific physical environment impact areas analyzed include: land use and economic development, acquisition and displacement, visual and aesthetics, cultural resources, air quality, climate change, noise and vibration, parks and recreation resources, environmental justice, and safety and security. The potential impacts on traffic and circulation and transit services are discussed separately in Section 3.0, Transportation Analysis.

Each environmental impact area assessment discusses existing conditions as well as possible effects of the Corridor alternatives during operation and construction. Operational impacts would generally be more substantial as they are on-going, while construction impacts would be temporary. Potential site-specific impacts are described based on planning efforts to date and currently available information. These impacts are considered reasonably representative for the purpose of comparing alternatives. During any subsequent preliminary engineering efforts, system design will become more detailed and revised assessments of environmental effects will be prepared and described in any subsequent Environmental Impact Report/Environmental Impact Statement (EIR/EIS) efforts. An example of this would be stormwater quality regulations both during construction and operation and all associated water quality controls boards, and state and local permits. Detailed information would be identified and addressed in future environmental phases.

The alternatives are evaluated based on study area section and alignment alternative within that study section and then the resulting benefits and impacts are summarized. The study area sections and alignment alternatives are previously described in Section 2.0 of this report.

4.1 Land Use and Economic Development

This section identifies the land uses around along the alignment and the potential station areas which demonstrate support for development of a transit system.

4.1.1 Affected Environment

The land use assessment identified existing and future land uses and their ability to support transit investment as well as any adopted transit-supportive plans within each city and future development and/or economic revitalization plans within a half mile radius of the station areas, regardless of alignment alternative. The study area has a diverse mix of land uses, including:

- Residential development is the highest percentage of land use with 50 percent of the property in the study area devoted to single-family homes and multi-family apartments and townhouses. Much of the housing in the Los Angeles County portion of the corridor was built during the

1930s to 1950s era. Southern California growth pushed south into Orange County in the 1960s; the Orange County portion of the corridor has a housing stock typically built during the 1960s and 1970s.

- Approximately 30 percent of the study area land is occupied with commercial and industrial uses, which is higher in the Northern Connections portion of the study area. This area was the manufacturing heart of Southern California up to the 1950s. A concentration of older industrial, manufacturing, and warehousing space is located in Los Angeles, Vernon, Bell, Bell Gardens, Cudahy, Downey, Huntington Park, Lynwood, and South Gate.
- The remaining study area land is occupied with a mix of uses including: public facilities, including civic centers, hospitals, and educational facilities; parks and recreational uses; freeways, streets, flood channels, and utilities; and other uses. A higher percentage of land in the Northern Connections Area is devoted to transportation and utility activities due to the freight rail and related intermodal facilities located in Los Angeles, Vernon, Huntington Park, and South Gate.

4.1.2 Applicable Laws and Regulations

There are no federal or state regulations governing land use, which are articulated primarily in regional and local plans. The Southern California Association of Governments (SCAG) defines the regional planning principles for the Corridor, while local municipalities define land uses for specific areas within their jurisdictional boundaries.

4.1.3 Evaluation Methodology

Land use data was used to identify current activities and uses, as well as apparently vacant and underutilized parcels, and to assess the extent to which opportunities for additional development exist within a 0.5 miles of the proposed stations. The evaluation takes into consideration known current and planned public and private development activities within each proposed station area. The compatibility of these opportunities with local land use policies that guide future land use and transportation planning was assessed.

Land Use Effects

A majority of the Corridor cities encourage and support development of transit through policies in their respective general plans, specific plans, and designation of redevelopment areas and development of related plans. Common objectives include:

- Serve Corridor activity centers;
- Achieve a high quality of life through a balanced mix of attractive residential neighborhoods, high-quality public services and economically viable and attractive commercial areas;
- Preserve residential neighborhoods and commercial and industrial districts; and
- Provide an integrated transportation system for the safe and efficient movement of people and goods with a minimal disruption to the environment within and through the city.

Economic Development Effects

The transportation investment can provide opportunities for transit-oriented development (TOD), which can serve as catalysts for public and private economic revitalization. As demonstrated by other transit projects, such as those completed by Metro, investments in transit station area development can provide economic benefits and enhanced quality of life to communities, while accommodating forecast population and employment growth. Analysis shows that many of the alternatives have a high number of possible TOD opportunities.

Additionally, the various city and community plans within the study area discuss goals and objectives for developing strong and competitive commercial sectors. Plans identify that development could include a mixture of land uses, promote economic vitality, and serve the needs of the community through well-designed, safe, and accessible areas, while preserving historic and cultural character.

4.1.4 Land Use and Economic Development Assessment

A station by station land use and policy assessment was completed in order to identify current land uses, compatible transit development, economic development opportunities, and redevelopment potential. Table 4.1 and Table 4.2 present the overview for which stations are associated with each alternative.

Additionally, a description of the Corridor cities' plans and policies located within a 0.5 mile radius of each proposed station area is presented, along with land use maps. The land use breakdown key is shown for reference in Figure 4.1.

Figure 4.1 – Land Uses

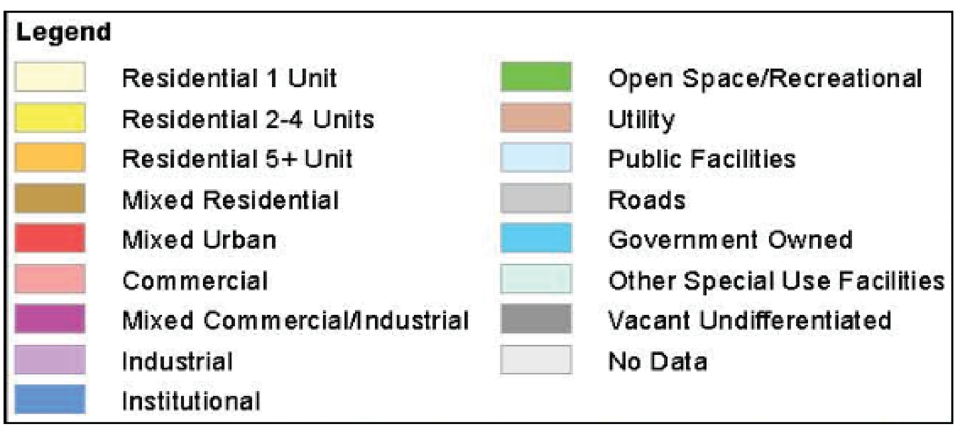


Table 4.1 – BRT Alternatives: Proposed Stations

Street-Running Alternative		HOV Lane-Running Alternative	
Northern Connection Area			
City	**Station**	**City**	**Station**
Los Angeles	Union Station	Los Angeles	7^{th}/Metro Center
	Metro Gold Line Soto Station		
	Soto St./Whittier Blvd.		
	Soto St./Olympic Blvd.		
Vernon	Soto St./Vernon Ave.		**Harbor Transitway Stations**
Huntington Park	Pacific Blvd./Slauson Ave.		37^{th} St./USC
	Pacific Blvd./Florence Ave.		Slauson/Harbor Freeway
South Gate	Long Beach/Firestone Blvds.		Manchester
	Firestone/Atlantic Blvds.		Harbor Freeway
Downey	Firestone /Lakewood Blvd.	Downey	
	Green Line Lakewood Station		Green Line Lakewood Station
PEROW/WSAB Corridor (common to both alternatives)			
Bellflower	Lakewood Blvd.	Bellflower	Lakewood Blvd.
	Bellflower Blvd.		Bellflower Blvd.
Cerritos	183^{rd} St. /Gridley Rd.	Cerritos	183^{rd} St. /Gridley Rd.
Artesia	Pioneer Blvd.	Artesia	Pioneer Blvd.
Cerritos	Bloomfield Ave.	Cerritos	Bloomfield Ave.
Cypress	Cypress College	Cypress	Cypress College
Anaheim	Knott Ave.	Anaheim	Knott Ave.
Stanton	Beach Blvd.	Stanton	Beach Blvd.
Garden Grove	Magnolia St.	Garden Grove	Magnolia St.
	Brookhurst St.		Brookhurst St.
	Euclid St.		Euclid St.
Garden Grove/ Santa Ana	Harbor Blvd.	Garden Grove/ Santa Ana	Harbor Blvd.
Southern Connection Area (common to both alternatives)			
Harbor Boulevard/1^{st} Street/SARTC			
Santa Ana	Harbor Blvd./1^{st} St.	Santa Ana	Harbor Blvd./1^{st} St.
	1^{st} St. /Fairview St.		1^{st} St. /Fairview St.

	1st St. /Bristol St.		1st St. /Bristol St.
	SARTC		SARTC
Westminster/17th Street/Main Street/SARTC			
Santa Ana	17th St./Bristol St.	Santa Ana	17th St./Bristol St.
	Main St./Civic Center Dr.		Main St./Civic Center Dr.
	SARTC		SARTC

Table 4.2 – Guideway Alternatives: Proposed Stations

City	Station	East Bank Alternative			West Bank Alternative 1			West Bank Alternative 2			West Bank Alternative 3		
		SC	LRT	MLV	SC	LRT	MLV	SC	LRT	MLV	SC	LRT	MLV
Northern Connection Area													
Los Angeles	Union Station	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Soto St.	✓	✓	✓									
	7thSt./Alameda St.										✓	✓	✓
Vernon	Leonis/District Blvds.	✓	✓	✓	✓	✓	✓						
	Vernon Ave.							✓	✓	✓	✓	✓	✓
Huntington Park	Pacific Blvd.							✓	✓	✓	✓	✓	✓
	Gage Ave.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
South Gate	Firestone Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Downey	Gardendale St.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PEROW/WSAB Corridor													
Paramount	Green Line (new)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Paramount Blvd./ Rosecrans Ave.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bellflower	Bellflower Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cerritos	183rd St./Gridley Rd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Artesia	Pioneer Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cerritos	Bloomfield Ave.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cypress	Cypress College	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Anaheim	Knott Ave.	✓	✓		✓	✓		✓	✓		✓	✓	
Stanton	Beach Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Garden Grove	Magnolia St.	✓			✓			✓			✓		
	Brookhurst St.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Euclid St.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Garden Grove/ Santa Ana	Harbor Blvd.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Southern Connection Area													
Santa Ana	**Harbor Boulevard/1st Street/SARTC Alternative**												
	Harbor Blvd./1st St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	1st St./Fairview St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	1st St./Bristol St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	SARTC	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	Westminster Boulevard/17th Street/Main Street Alternative												
	Westminster Blvd./ 17thSt./Bristol St.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--
	Main St./Civic Center Dr.	✓	✓	--	✓	✓	--	✓	✓	--	✓	✓	--

Note: SC – Street Car Alternative; LRT – Light Rail Transit Alternative; MLV – Low Speed Maglev Alternative.

Union Station

Description: This station is considered the transportation hub of Los Angeles as the central meeting point for various transit agencies in the county and across the western region. The station is adjacent to various culturally significant destinations as well as civic centers.

Predominant land uses surrounding the station area are industrial including rail yards and a federal jail. In addition, there is a balance of institutional uses in and around the civic center, as well as commercial and residential along culturally important corridors such as Olvera Street, Chinatown, and Little Tokyo.

Specific plans which support mixed use/TOD development in/around the station area include:

Central City North Community Plan: Part of the City of Los Angeles' Land Use Element the station area is located within Central City North Community Plan, which balances being a governmental, financial, and industrial hub while being the historic birthplace of the city.

Alameda District Specific Plan: Designated as a regional center, the plan envisions Union Station and its surrounding areas as the transportation hub of Southern California. Part of the Central City core, intensity of development stresses balance future transit investment while providing a livable community for its diverse residents and as the historical center of Los Angeles, to serve as a resource for tourists and city residents. Part of this plan encompasses the recent purchase of Union Station by Metro and through the Union Station Master Plan the agencies' continued effort to create a multi-modal, mixed-use urban district.

Clean Tech Corridor: A four mile district with areas surrounding Union Station, the goals are to support and create clean technology that will create jobs, stimulate the growth of a large marketplace for clean technology, and create a better quality of life through these new environmental solutions.

The Angels Walk Pedestrian Master Plan: Identifies specific networks to link the transit and pedestrian districts of historic downtown Los Angeles, including Little Tokyo, Bunker Hill, and the Music Center. It ties the public investment in bus and rail transit to urban design improvements which make the city more attractive to pedestrians.

The Project would be consistent with various General Plan policies including:

Transportation – Policy 2.20: Promote the multi-modal function of transit centers (bus and rail) through improved station design and management of curb lanes to facilitate transfers between modes (e.g. rail to bus or shuttle or taxi).

Transportation – Policy 2.21: Identify and develop transit priority streets which serve regional centers, major economic activity areas and rail stations to enhance the speed, quality and safety of transit service.

Transportation – Policy 5.7: Continue to expand the role of Union Station as the major regional hub for Amtrak, Metrolink, Metrorail, and high-speed rail service.

Housing – Policy 2.2.6: To accommodate projected growth to 2014 in a sustainable way, encourage housing in centers.

7th Street/ Alameda Street Station

Description: This station is located in an exciting area of downtown Los Angeles which is heavily influenced by the manufacturing history of the surrounding land uses but is evolving into an innovative corridor for new industry and capturing a diverse and eclectic art community as well.

Predominant land uses surrounding the station area are industrial and manufacturing, with pockets of commercial activities throughout. Much of the residential is occurring in converted industrial spaces.

Specific plans which support mixed use/TOD development in/around the station area include:

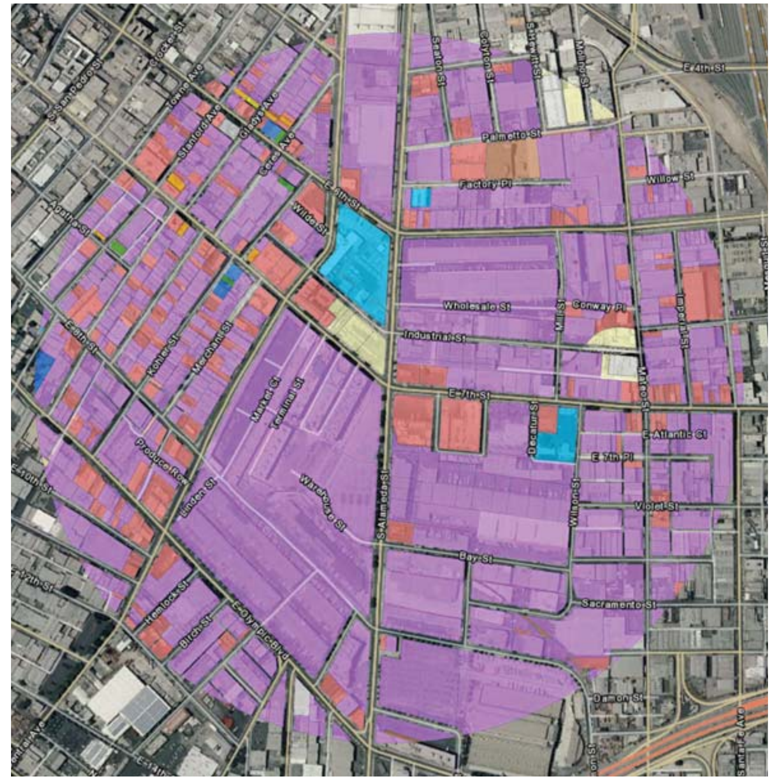
Central City North Community Plan: Part of the City of Los Angeles' Land Use Element and characterizes the station area within the Central City East district where heavy industrial and manufacturing jobs exist, while balancing the various social services and residential uses.

Alameda East Redevelopment Study Area: As identified by the CRA, the area involves an assessment of existing conditions and the potential to redevelop the Alameda East area as a "modern" industrial area.

Artists-in-Residence District: The station area is adjacent to an eclectic community of artists. The largest concentration of artists is located just northeast of the station between First and Palmetto Streets. This district is an integral part of the Central City North community.

Clean Tech Corridor: A four mile district encompassing the 7th/Alameda station area, the goals are to support and create clean technology that will create job opportunities, stimulate the continued growth of a large marketplace for clean technology, and create a better quality of life through these new environmental solutions. Immediately outside the half mile station area is the location of the CRA owned site designated as the Clean Tech Campus.

The Los Angeles River Revitalization Master Plan: The 20–year blueprint for development and management of the LA River, it's aim is to celebrate ecclectic neighborhoods, protect the health of the river, and leverage economic development and revialtzation projects.



The Project would be consistent with various General Plan policies including:

Transportation – Policy 1.7: Provide improved transportation services to support Citywide economic development activities and related economic revitalization initiatives.

Transportation – Policy 5.3: Actively support transportation projects which serve industrially designated districts.

Housing – Policy 2.2.3: Provide incentives and flexibility to generate new housing and to preserve existing housing near transit.

Soto Street Station

Description: This station is located on the outskirt of downtown Los Angeles in the community of Boyle Heights, adjacent to heavily trafficked corridors and industrial uses.

Predominant land uses surrounding the station area are industrial and manufacturing on the west and southwest; however, the station area also contains single and complex housing on the northeast.

Specific plans which support mixed use/TOD development in/around the station area include:

Boyle Heights Community Plan: Part of the City of Los Angeles' Land Use Element the station area is located within Boyle Heights Community Plan. The Plan promotes the vision of the community in preserving and enhancing characteristics of existing neighborhoods, improving economic vitality of commercial corridors, maximizing opportunities of future rail transit systems and planning the remaining commercial and industrial development opportunity sites for needed job-producing uses. Special Study areas located within the station area and identified as proposed concepts under the plan include: Sears: A major opportunity site for buildout or redevelopment opportunities which would significantly impact the surrounding uses and neighborhood; Wyvernwood: A new, mixed use/housing development; Mixed-Use node with incentives for neighborhood-serving uses; A proposed river improvement overlay zone.

Eastside Enterprize Zone: The station area is located within the zone which provides a variety of tax credits to eligible businesses as well as financing programs and other incentives to preserve existing businesses and encourage business expansion within the zone.

Los Angeles River Revitalization Master Plan: Identified as the Boyle Heights River Gateway Park, the Plan connects the large Sears site to the River and provide a much-needed multi-purpose park with both active and passive amenities in an underserved area. The project would result in improved River access, would complement and enhance the redevelopment of the Sears site and leverage economic development.

The Project would be consistent with various General Plan policies including:

Housing – Policy 1.4.1: Provide incentives to include affordable housing in residential development, particularly in mixed use development, Transit Oriented Districts and designated Centers.

Transportation – Policy 1.7: Provide improved transportation services to support Citywide economic development activities and related economic revitalization initiatives.

Transportation – Policy 2.8: Continue to integrate transit and environmental planning to enhance environmental preservation.

Vernon Avenue Station

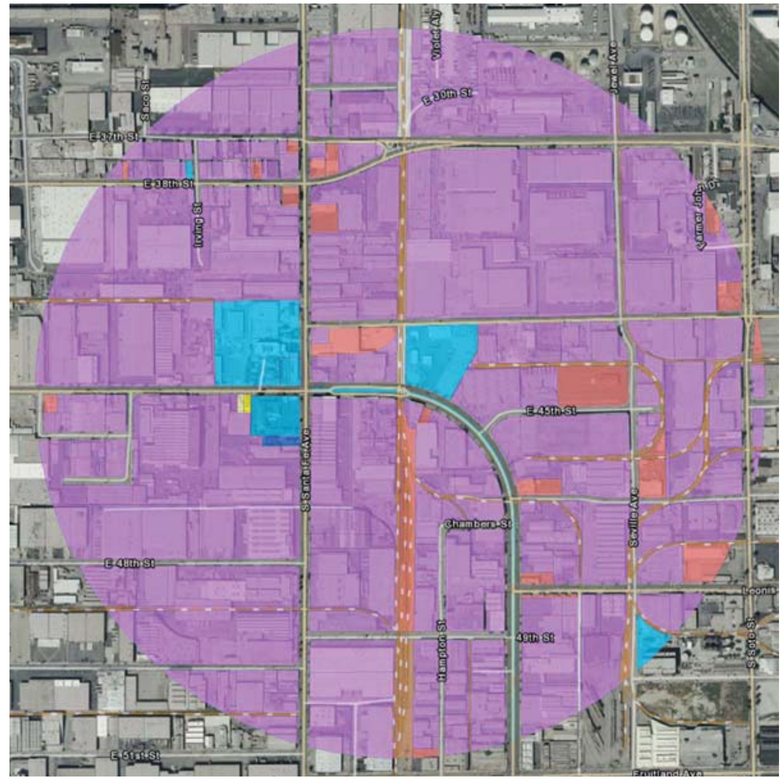
Description: This station is located in the heart of Vernon's industrial and manufacturing district which contributes to industries throughout the Southern California region, such as food and agriculture, apparel, steel, plastics, logistics and home furnishings.

The predominant land uses around the station area are industrial/manufacturing. The station is also adjacent to the city's civic center.

Specific plans which support mixed use/TOD development in/around the station area include:

Industrial Redevelopment Project Area: The station area is located within the city identified redevelopment area which emphasizes the importance of the maintenance of facilities to better aid the surrounding industries and their related workforce. The key policy objective of the city is to remain an exclusively industrial city, serving the needs of industry, including local, national, and international consumers of goods produced by manufacturers.

Commercial Overlay District: The Commercial Overlay District, encompassing 210 acres, is established along Santa Fe Avenue and along portions of Soto Street to accommodate retail, commercial, service, and restaurant uses that support the needs of the daily employee population.



The Project would be consistent with various General Plan policies including:

Circulation Policy 1.2: Continue to coordinate with the rail companies to provide for efficient rail service that minimizes impacts on the local street system.

Circulation Policy 1.7: Encourage the continued improvement of services provided by Metro to Vernon and adjacent cities to provide good access from home to job and job to home for persons employed in Vernon.

Circulation Policy 1.8: Encourage the use of ride sharing and public transit for persons employed in the City to reduce traffic congestion and the need for off-street parking in the City.

Leonis Boulevard/ District Boulevard Station

Description: This station is located within Vernon's employment dense manufacturing and industrial center.

The predominant land uses around the station area are industrial/manufacturing with some single and multi family residential on the southeast corner. The station area is also adjacent to the Los Angeles river.

Specific plans which support mixed use/TOD development in/around the station area include:

Industrial Redevelopment Project Area: The station area is located within the city identified redevelopment area which emphasizes the importance of the maintenance of facilities to better aid the surrounding industries and their related workforce. The key policy objective emphasizes the desire to remain focused on the needs to local industry and commerce while providing needed services to local residents.

The Los Angeles River Revitalization Master Plan: The 20–year blueprint for development and management of the LA River, it's aim is to celebrate ecclectic neighborhoods, protect the health of the river, and leverage economic development and revialtzation projects.

The Project would be consistent with various General Plan policies including:

Circulation Policy 1.7: Encourage the continued improvement of services provided by Metro to Vernon and adjacent cities to provide good access from home to job and job to home for persons employed in Vernon.

Circulation Policy 1.8: Encourage the use of ride sharing and public transit for persons employed in the City to reduce traffic congestion and the need for off-street parking in the City.

Circulation Policy 1.13: Cooperate with the Metropolitan Transportation Authority and other local agencies in their efforts to complete a bicycle path along the levee of the Los Angeles River connecting to adjacent jurisdictions.

Pacific Boulevard Station

Description: This station is located in a dynamic area of the City of Huntington Park, surrounded by an eclectic mixed use corridor and vibrant pedestrian activity including commercial, entertainment, and retail all while maintaining a vibrant cultural influence. Pacific Boulevard is a key transit hub servicing more than 14,000 weekly Metro and DASH users.

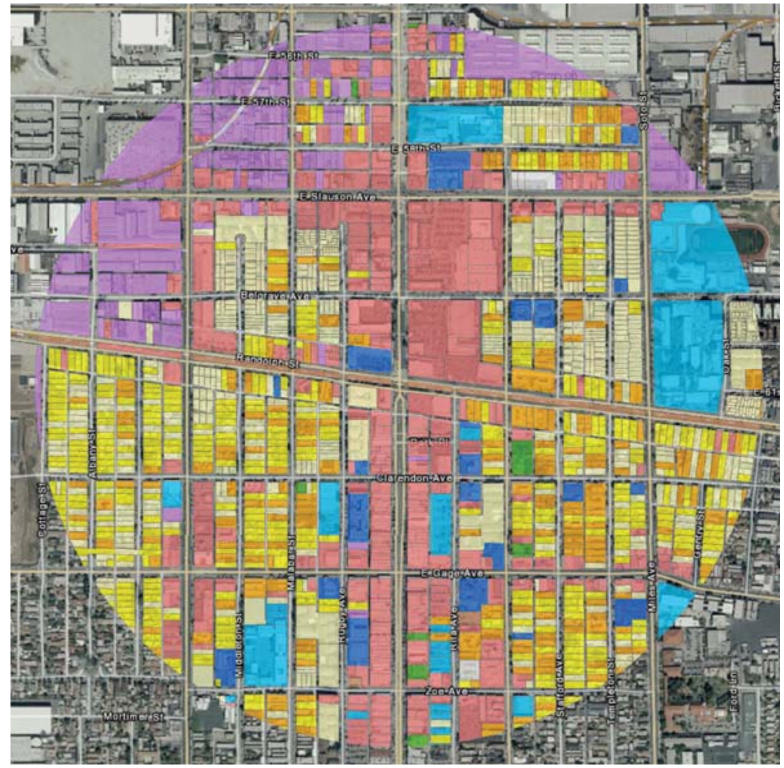
Commercial activities dominate along the major north-south corridor, Pacific Blvd, as well as smaller 'node' centers around the station area. Single and multi-family residential to the south are mixed with industrial land uses to the north and northwest with some institutional as well.

Specific plans which support mixed use/TOD development in/around the station area include:

Downtown Huntington Park Specific Plan: Downtown Huntington Park is one of the most successful and popular retail shopping areas in Southern California for the Latino population and revitalization is meant to strengthen the ties to the community and provide a place for events and street fairs. The vision for the Plan is to integrate Hispanic cultural needs with historical architecture and traditions through preservation, restoration, and promoting identity along storefronts, and businesses. Four distinct districts makes up the plan and provide the vision for development: A) Gateway, B) Festival, C) Neighborhood, and D) Zoe

Merced/ Santa Fe Redevelopment Area: Bound by the city limits to the west and north, State St. and Seville Ave. to the east, and Randolph St. and Florence Ave. to the south. The area was established to enhance the economic stability of the city through economic development and affordable housing programs.

Downtown Business Improvement District (BID): The strategic plan is a companion to the city's redevelopment plans and Downtown Specific Plan to guide efforts for downtown beautification, promotion/ marketing strategies, economics /business forecasts, cleanliness/ security issues, and parking/transportation.



The Project would be consistent with various General Plan policies including:

Land Use Element Policy 1.2: Encourage community-oriented retail in Huntington Park while continuing to revitalize Pacific Boulevard as a regional retail destination.

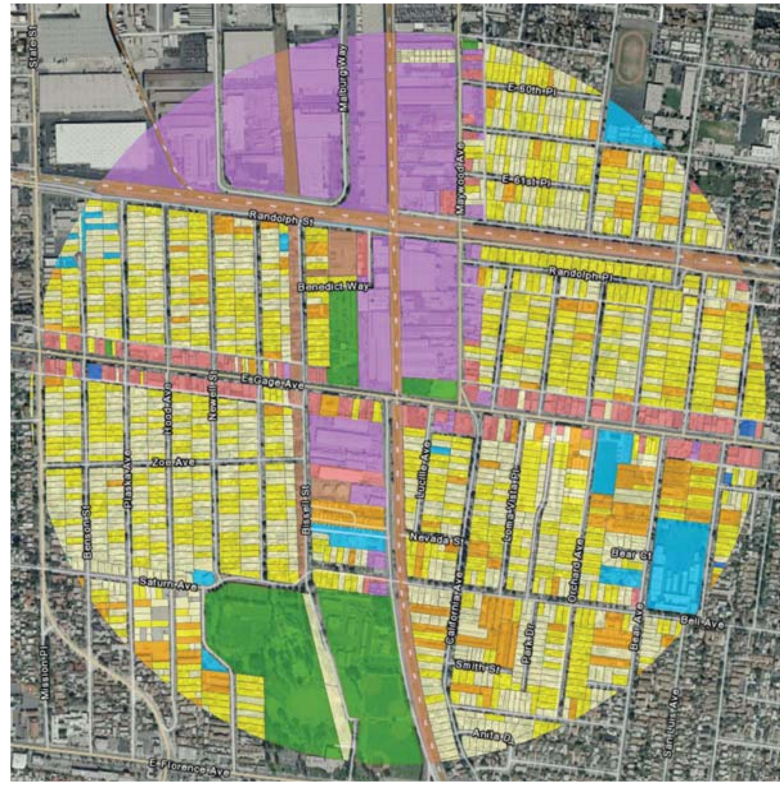
Circulation Element Policy 4.2: Work with the Southern California Rapid Transit District to coordinate connections to the light rail Blue Line running from Long Beach to Los Angeles west of Huntington Park.

Circulation Element Policy 5.7: Pursue alternative uses of the Southern Pacific Railroad ROW on Randolph St., such as green space, parking areas, and bike paths, if the right-of-way is abandoned for rail use.

Gage Avenue Station

Description: This station is located adjacent to the City of Huntington Park's major industrial centers in addition to being surrounded by long established communities and large open spaces/parks.

The predominant land uses surrounding the station area are single and multi family residential on the east and west with large industrial/manufacturing parcels and parks along the north –south corridor, Salt Lake Ave. Commercial land uses align the east-west Gage Ave. corridor.



Specific plans which support mixed use/TOD development in/around the station area include:

Neighborhood Preservation Redevelopment Project Area: Objectives of the plan include providing affordable housing and homeownership opportunities, revitalize rundown neighborhoods, improve street lighting, and improve the overall quality of life for residents.

Economic Development Strategic Plan: Conclusions of the Plan identify industrial development and contemporary retail development as the key economic opportunities in the city. Based on the city's job growth, the market has potential to absorb considerable industrial uses; this includes the areas north of the Gage station.

Existing Park Opportunities and Constraints: The city identified potential redevelopment areas for the largest park in Huntington Park, Salt Lake Park, adjacent to the Gage station area. The park is the most developed and offers the most recreational opportunities however support exists for musical and theatrical performance centers and pavilions. The proposed station area is within walking distance and would be an asset to children and seniors who are frequent users of the park services.

The Project would be consistent with various General Plan policies including:

Circulation Element Policy 5.1: Maintain existing pedestrian facilities and encourage new development to provide pedestrian walkways to adjacent developments.

Open Space Element Policy 4.8: Increase access to all City open space and recreational areas, including for the disabled and those who depend on public transit.

Open Space Element Policy 1.6: Encourage bike paths and lanes to reduce vehicular travel and air pollution. Bike paths could be developed along portions of the LADWP utility easement and along the Southern Pacific Railroad ROW on Randolph St., should the ROW be abandoned.

Firestone Boulevard Station

Description: This station is located along one of the City of South Gate's busiest thoroughfares, Firestone Blvd., within a major industrial district and adjacent older neighborhoods.

Predominant land uses surrounding the station area consist of industrial on the north and southeast along with a large recreational parcel and single/multifamily residential on the southwest.

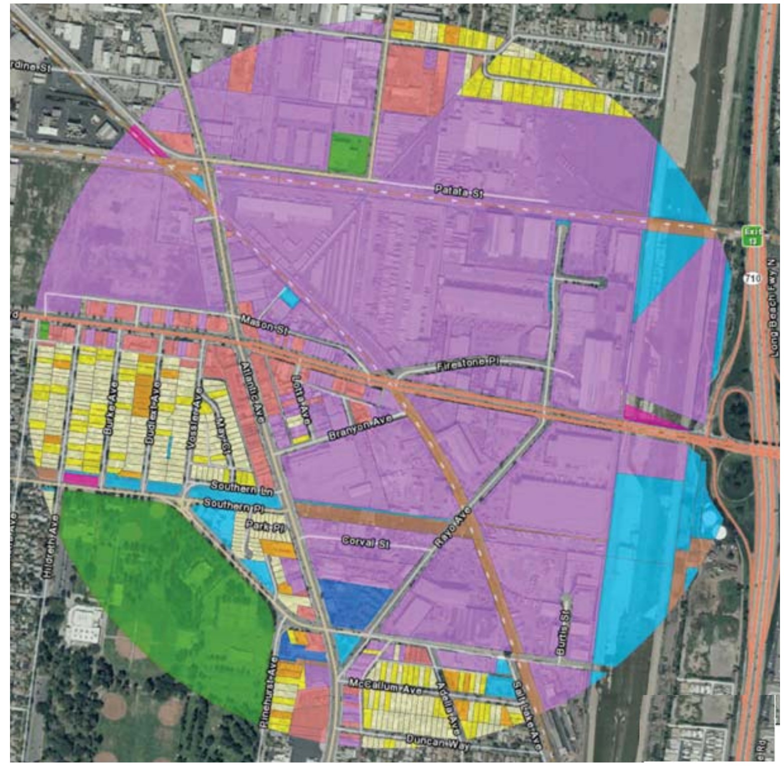
Specific plans which support mixed use/TOD development in/around the station area include:

Rayo Industrial District: As identified in the City of South Gates General Plan, the station is located within the Rayo Industrial District. The various districts identified throughout the city are areas intended to be higher intensity development. This particular area is seen as a new transit-oriented village near the intersection of Firestone and Atlantic, to create a pedestrian and transit-oriented environment. New transit uses should be explored for the area and a mixed use district with high density housing, retail, and office use.

Gateway District: The Gateway District will be transformed from an industrial area into a retail, entertainment and transit-oriented mixed use District that serves as the visual gateway to South Gate. The District will also support the city's vision of creating a destination retail and entertainment corridor on Firestone between San Miguel and the Rio Hondo Channel. The district has 4 sub-areas : 1)regional retail destination 2) multimodal station 3) higher intensity employment uses and 4) mixed use with ground floor retail uses below office and residential uses.

South Gate Enterprise Zones: The station area is located within an established enterprise zone which offers special state and local incentives to encourage investment and promote the creation of new jobs.

Firestone Blvd Corridor: Firestone Blvd is the main east to west arterial roadway through South Gate and is considered the city's "window to the world." The corridor is envisioned as having major destination retail centers, streetscape improvements, and gateway treatments.



The Project would be consistent with various General Plan policies including:

Mobility Element 2.1– Policy 8: The City should coordinate the provision of the non-motorized networks (bicycle and pedestrian) with adjacent jurisdictions to maximize connectivity.

Mobility Element 2.2 – Policy 2: The City should encourage Metro to enhance regional transit connections in South Gate through additional routes and increased service frequency.

Mobility Element 2.2 – Policy 7: The City should encourage and support all potential rail transit serving the City, including a high speed, grade separated, environmentally friendly transit system along the Union Pacific Railroad right-of-way.

Gardendale Street Station

Description: This station is located in a dynamic area of the City of Downey where redevelopment and revitalization plans are creating a visionary mixed-use regional employment and destination center

The predominant land uses surrounding the station area are single institutional to the north and northeast and single family residential south and southwest. Industrial uses dominate the main north-south corridor.

Specific plans which support mixed use/TOD development in/around the station area include:

Rancho Los Amigos Specific Plan: The business center, located in the southwest corner of the city, is a public/private joint venture between the County and Fremont Properties on County-owned Rancho Los Amigos Medical Center land. The concept involves phasing out the existing medical center and replacing it with commercial manufacturing, including professional offices, research and development activities, light manufacturing, financial institutions, and restaurants. Retail uses would also be of convenience to employees and visitors of the other uses in the area.

Redevelopment Plan for the Downey Redevelopment Project: The proposed station is located within *SITE A*, *Gardendale/Paramount Area*. The Plan includes the city's desire to improve, upgrade, and revitalize all areas of the city which have become blighted because of deterioration, disuse and unproductive conditions. Objectives include providing construction and employment opportunities in the new industrial/ commercial establishments as well as encouraging existing, surrounding owners, businesses, and tenants to participate in the redevelopment activities, thus sustaining the existing economic base of the community.

The Project would be consistent with various General Plan policies including:

Land Use Policy 1.2.1 – Program 1.2.1.2: Promote mixed-use developments with housing on the same site or in proximity to commercial services to reduce the need for trips by vehicles.

Economic Development Policy 9.1.2 – Program 9.1.2.2: Capitalize on the regional draw generated by Stonewood Mall, Downey Landing site, and other regional-oriented land uses.

Circulation Element Policy 2.4.1 – Program 2.4.1.1: Coordinate with Caltrans, MTA, SCAG, Gateway Cities COG and other agencies to promote multi-modal improvement strategies to improve the regional transportation network.

Metro Green Line Station

Description: This station is located at the intersection of the 105 FWY and Lakewood Boulevard, at the existing Metro Green Line station. The station is between the City of Downey and the City of Paramount.

The currently running Green Line serves predominantly surrounding residential uses, followed by commercial and mixed uses along the major thoroughfares on the northern and southern edges of the half mile area. There also exists a number of institutional/education uses.

Specific plans which support mixed use/TOD development in/around the station area include:

Downey Specific Plan: The station area is located along Lakewood Boulevard, which is identified as a major connection corridor to the City of Downey's downtown and the Specific Plan area. The Plan establishes five districts in the approximately 85-acre Downey downtown area and intensifies residential uses by 79 percent and commercial uses by 58 percent in the downtown. New development would be within proximity of major regional transportation opportunities, including several major highways and the Metro Green Line. Therefore, the Specific Plan would be consistent with SCAG goals to reduce the prominence of the suburban development pattern that exists throughout the region.

The Project would be consistent with various General Plan policies including:

Circulation Policy 2.2.2 – Program 2.2.2.2: Establish a bikeway master plan to link employment centers, recreational facilities, and bikeways along Rio Hondo River, the San Gabriel River, Union Pacific Railroad Line, and those neighboring communities via a network of bike routes, lanes and paths.

Circulation Policy 2.2.4 – Program 2.2.4.4: Evaluate providing a transit stop for the intercommunity transit service (DowneyLINK) at the Green Line Metro Rail Stations at Lakewood & 105 FWY and at Studebaker Road in the City of Norwalk to provide added convenience for transfer passengers to MTA routes.

Paramount Boulevard/Rosecrans Avenue Station

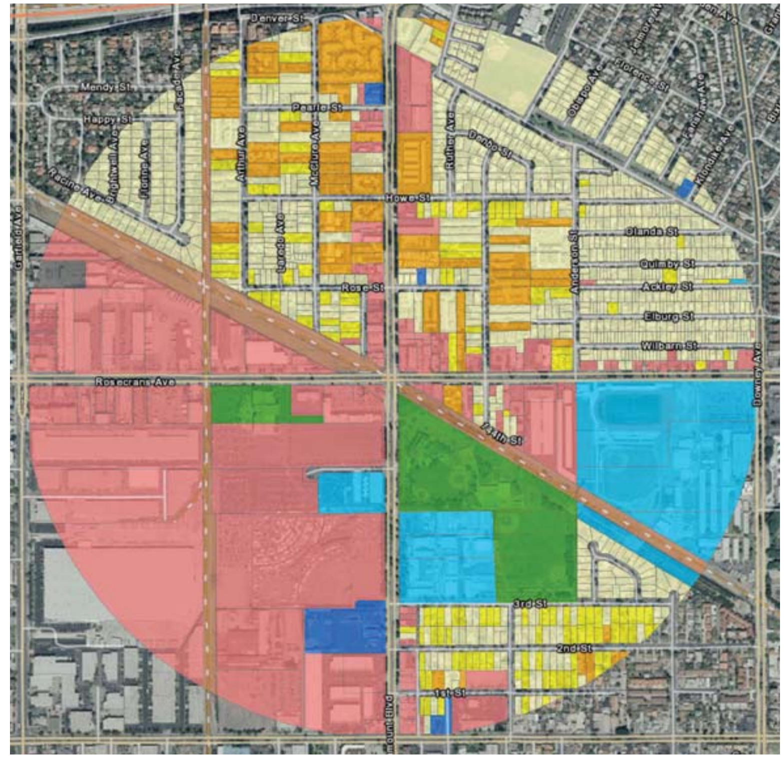
Description: This station is located at the northern end of the PEROW/WSAB Corridor, the nearest connection to the 105 FWY, adjacent to the heart of the City of Paramount's commercial core.

Predominant land uses surrounding the station area consist of commercial and institutional/open space on the southeast and southwest and high single/multifamily on the north.

Specific plans which support mixed use/TOD development in/around the station area include:

Paramount Area Plans (Redevelopment Areas): The station area falls between Redevelopment Area 1 and Area 2 which are targeted for special revitalization opportunities; The Clearwater East Area Plan, the Clearwater North, and Howe Orizaba Area Plan. Area 1 promotes offices, commercial and light industrial uses and adjacent to the arterials and ROW. Area 2 Plans are designed to encourage the development of high quality residential that are compatible with existing neighborhoods.

Paramount Area Plans (Redevelopment Areas): The commercial rehabilitation program is the city's tool to achieve its urban landscape goals. It's aimed at revitalizing commercial and industrial properties, including many within the station area. Utility and railroad corridors were identified as presenting special opportunities for beautification.



The Project would be consistent with various General Plan policies including:

Transportation Element – Policy 6: The City of Paramount will continue to support the development and expansion of the region s public and mass transit system.

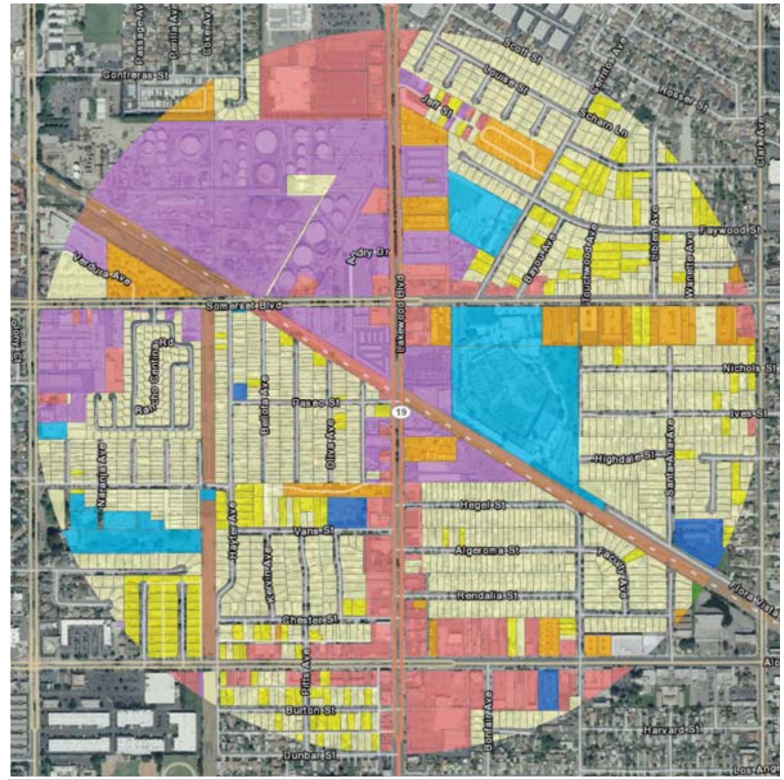
Transportation Element – Policy 11: The City of Paramount will continue to support the local public transit system and ongoing efforts to improve connections with other regional transit facilities and services (MTA bus service, Long Beach Transit, Green Line, etc.)

Land Use Element – Policy 17: The City of Paramount will develop new open space area in utility rights-of-way, along the Los Angeles River, and as part of future park development.

Lakewood Boulevard Station

Description: This station is located adjacent to major industrial/manufacturing while still maintaining a neighborhood scale feel.

The land uses around the Lakewood station area are quite a mix of single and multifamily on the southwest and east while immediately adjacent there are industrial uses and commercial along the north-south corridor. The Bellflower bike path intersects the station location and is an excellent example of recreational uses along and underutilized corridor and provides opportunities for creative synergy with future transit systems.



The Project would be consistent with various General Plan policies including:

Circulation Element – Policy 4.3: Provide pollution–free and congestion-reducing bicycle, jogging, walking, handicapped-accessible pathways and lanes which link major destination centers within the City as practical.

Circulation Element – Policy 4.1: Promote the use of alternative forms of transportation other than single passenger cars to reduce congestion, traffic, noise and air quality impacts.

Land Use Goal 1 – Policy 1.2: Encourage opportunities to sensitively integrate different, but compatible, land uses.

Bellflower Boulevard Station

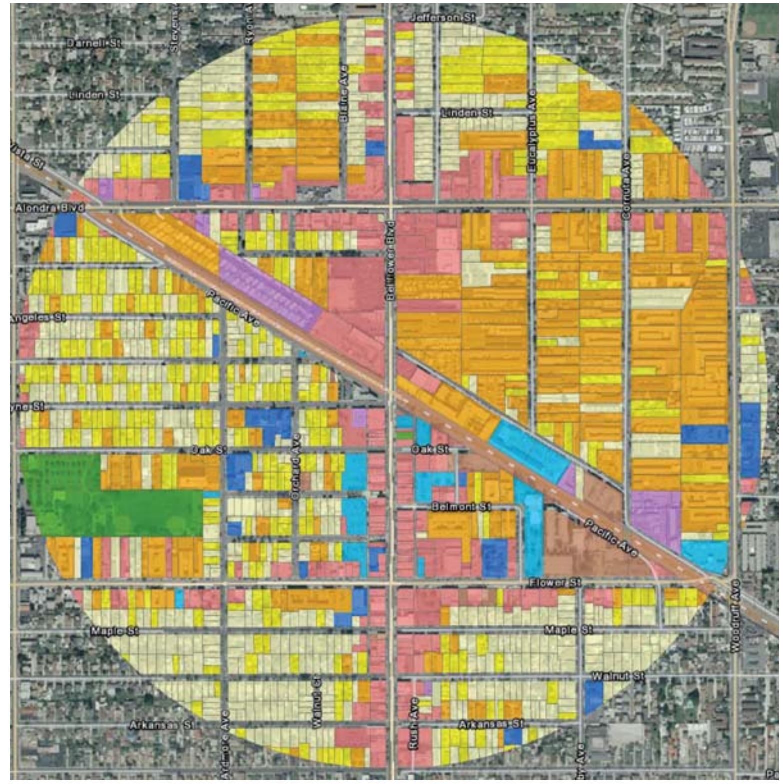
Description: This station is located in the heart of the City of Bellflower's main street which consists of small scale, pedestrian friendly corridor aligned with mixed commercial and gives an "old town" feel. The location is adjacent to the city's civic center and is surrounded by extremely walkable small streets which lead to close knit residential neighborhoods.

There is an eclectic mix of land uses around the station area. The main north-south corridor and east-west arterials consist of mixed-uses and commercial while single and multifamily residential make up the fabric throughout. Various institutional uses are located within the station area as well, including Bellflower City Hall, a courthouse and various schools.

Specific plans which support mixed use/TOD development in/around the station area include:

Downtown Bellflower Revitalization Vision Strategy: The station area is located within the Project Area 1, the original impetus for identifying revitalization and redevelopment opportunities with emphasis on eliminating blight and creating affordable housing. The Strategy contributes to pedestrian plazas and mixed use development and current plans include adoption of a future specific plan and/or overlay zone through SCAG Compass Blueprint, which will include TOD and sustainable development language and provisions.

Bellflower Village Overlay Zone – North: The intent of the overlay zone is to emphasize the importance of Downtown Bellflower in providing a tangible link to the city's rich historical past, geographic central focal point, a recognizable town center and a hope for renewed civic vitality. The zone establishes location and intensity and character of uses for redevelopment as well as connectivity, whether through transit, pedestrian linkages, or bike paths. Additionally, the existing Bellflower bike path which crosses through the zone provides great linkage opportunities for the local communities and possibly a regional connection.



The Project would be consistent with various General Plan policies including:

Land Use Element – Town Center - Policy 3: Accommodate uses and provide for physical features which induce and enhance positive social uses and high levels of pedestrian activity in Town Center.

Land Use Element – Commercial – Policy 3: Through zoning overlay districts or specific plans, create unique commercial shopping opportunities.

Open Space – Policy 3.6: Work with the MTA and local agencies to complete the "West Santa Ana Branch Bikeway – Greenway" project.

183rd Street/Gridley Road Station

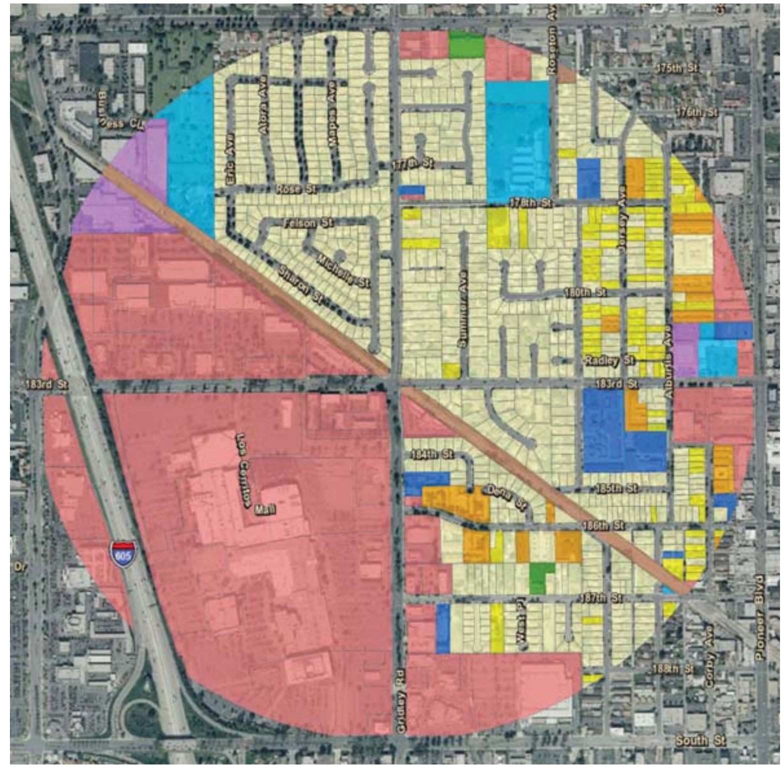
Description: This station is located adjacent to one of the City of Cerritos' major commercial and employment centers, Cerrito's Auto Square. This center is a regional powerhouse, attracting people from outside the city while providing considerable employment to the community.

The land uses in the station area are split almost evenly with commercial making up the entire southwest and single and multi family to the east and northeast. Institutional and open spaces are found throughout as well.

Specific plans which support mixed use/TOD development in/around the station area include:

Los Cerritos Development Plan (Redvelopment Area) : The main objectives of the Plan are to promote new community development that is viable, both physically and economically. The Plan strives to assist the private sector in providing the type of development that will maximize development and prevent reoccurrence of blighted conditions.

Specific Plan - Area Development Plan Five (ADP-5): Cerritos Auto Square : Located within the Los Cerritos Redevelopment Area, the objectives are to establish a regional automobile shopping complex, establish cooperation and coordination of local participants, establish a long-range and ongoing source of economic strength for the community, protect and enhance all attributes of development so as not to detrimentally affect existing developments, and incorporate innovative and quality site planning and architectural features. The Auto Square is a regional destination center and fully developed.



The Project would be consistent with various General Plan policies including:

Circulation Element Policy 6.6: Encourage the provision of additional regional public transportation services and support facilities, including park-and-ride lots near the freeway interchanges and within village centers.
Circulation Element Policy 6.3: Require new development to incorporate design features which facilitate transit service and encourage transit ridership such as bus stop facilities, and efficient pedestrian paths through projects to transit stops.
Circulation Element Policy 8.6: Participate in local and regional transit system/commuter-rail/transportation demand management planning and implementation activities to improve connections between the systems and ease of use of systems

Pioneer Avenue Station

Description: This station is located at the end of the City of Artesia's main commercial corridors with an integrated mixed use of retail plazas, cultural destinations, restaurants, and adjacent single family residential.

Various types of existing land uses are found around the station area including commercial corridors along Pioneer Blvd and South St., multi and single family housing on the north and south and a regional park.

Specific plans which support mixed use/TOD development in/around the station area include:

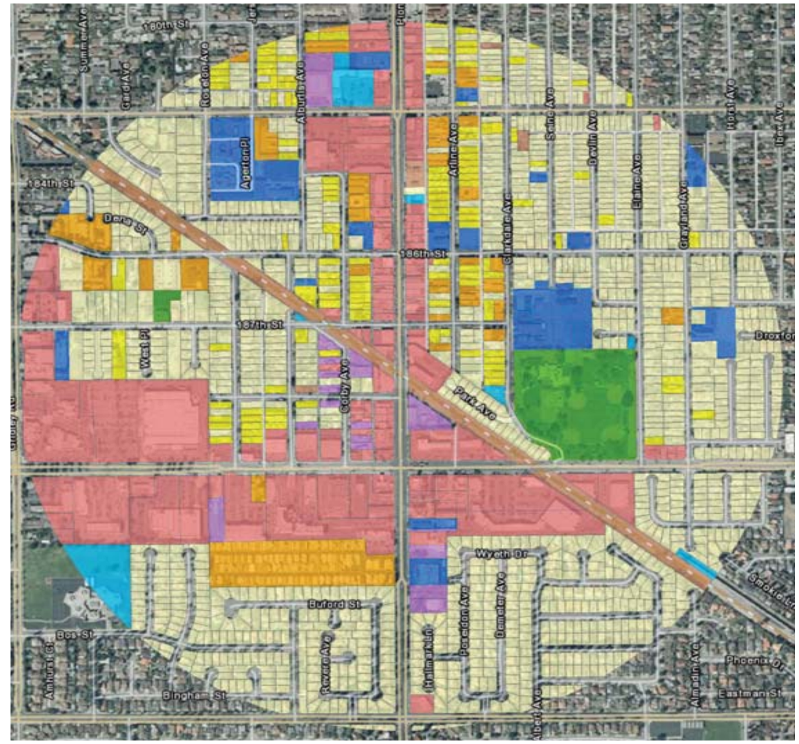
Pioneer Specific Plan: The plan encourages locally serving commercial retail development that enhances functional integration of adjacent single family neighborhoods with this major mixed-use, pedestrian friendly corridor.

Artesia Blvd (Corridor) Specific Plan: Establishes and strengthens the future commercial development for the corridor.

South Specific Plan: The South Street Gateway commercial area is envisioned as a commercial node that enhances functional connectivity with the City Center Mixed Use Area with the focus of introducing higher intensity and integrated development.

Downtown Specific Plan: The City Center mixed use designation encourages the development and redevelopment of a complementary mix of commercial retail, office and residential uses to expand economic vibrancy and livability in the city's core commercial area.

Auto Center Corridor Specific Plan: The Plan was established to help promote the continued development of auto dealerships along Artesia Blvd. and provide continued preservation, and enhancement of related commercial/retail uses in an attractive setting that is unique and distinctive.



The Project would be consistent with various General Plan policies including:

Circulation Policy 4.1: Promote a balance of residential, commercial, institutional and recreational uses with adjacencies that reduce vehicle miles traveled.

Circulation Policy 5.1: Promote the use of public transit.

Circulation Policy 6.3: Continue to foster partnerships with adjoining cities and regional agencies, as well as utility companies and transportation agencies with right-of-ways within the City, in order to facilitate transit opportunities.

Bloomfield Avenue Station

Description: This station is located adjacent the City of Cerritos' regional park, as well as various recreational facilities and schools, and surrounding established neighborhoods.

The predominant land uses in the station area are single family residential throughout the north and south and open space/institutional immediately adjacent to the station and to the southwest.

Specific plans which support mixed use/TOD development in/around the station area include:

Los Coyotes Development Plan (Redvelopment Area) : The main objectives of the Plan are to promote new community development that is viable, both physically and economically. The Plan strives to assist the private sector in providing the type of development that will maximize development and prevent reoccurrence of blighted conditions.

Specific Plan - Area Development Plan Four (ADP-4): Shadow Park: Located within the Los Coyotes Redevelopment Area, residential development is the main category of land use. The intent of the area is to capitalize upon the highly desirable characteristics of the area and its vicinity by integrating common open space with low density single family residential. The objectives are to provide a residential environment that fosters human interaction, neighborhood identity and pedestrian-oriented uses all while complimenting the beauty of Cerritos Regional Park.

The Project would be consistent with various General Plan policies including:

Open Space Policy 1.1: Promote the development of aesthetically pleasing landscaped corridors that promote a sense of the natural environment.

Circulation Element Policy 8.2: Promote an increase in the use of public transit and para-transit services.

Community Design Element Policy 2.5: Promote pedestrian circulation throughout the community through the provision of sidewalks and other pedestrian paths that connect neighborhoods, parks, schools, shopping, employment centers and other major activity centers.

Cypress College Station

Description: This station is located adjacent to the City of Cypress' college, along one of the city's main commercial corridors, Lincoln Blvd., lined by various mixed use uses and development.

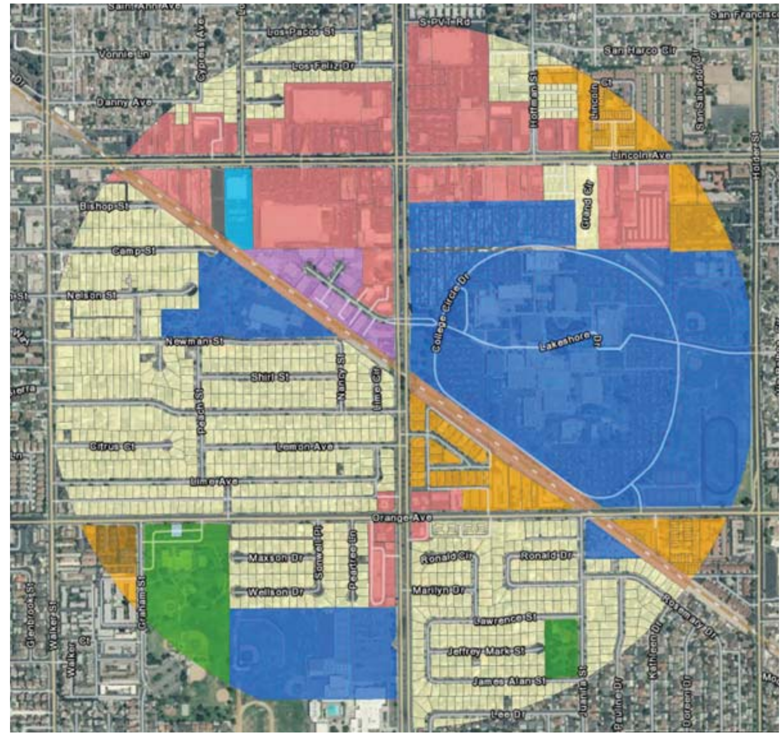
Immediately around the station area there is a mix of mixed-use commercial surrounded by medium to high density residential neighborhoods .

Specific plans which support mixed use/TOD development in/around the station area include:
Lincoln Avenue Specific Plan: The Specific Plan promotes the creation of unique "activity nodes" along the corridor to encourage economic stimulation, including higher density residential and plazas. The plan also stresses the importance of upgrading the visual image and creating an exciting atmosphere to visit.

Lincoln Avenue Redevelopment Area: The station area falls within the Redevelopment Area which highlights Lincoln Avenue as one of the major commercial corridors in the City of Cypress and consists mainly of mixed-use and highway-oriented businesses.

Civic Center Redevelopment Area: Within the 0.5 mile station area, the Redevelopment Area consists of five project areas, focusing on expanding civic and governmental services, developing underutilized parcels, and enhancing a variety of educational and open space resources.

Cypress College Comprehensive Master Plan: The Plan is part of a District-wide approach to the development of an organized plan for the future – including education and facilities plan forecasted for the next 10 years. The Plan recognizes the potential for transit uses along the ROW for both students, faculty, and community residents.



The Project would be consistent with various General Plan policies including:

Land Use Policy 4.1: Develop citywide visual and circulation linkages through strengthened landscaping, pedestrian lighting, and bicycle trails.

Land Use Policy 19.1: Encourage the extension of Light Rail through the City to serve Lincoln Avenue and Cypress College.

Circulation Policy 2.1: Encourage development and improvements which incorporate innovative methods of accommodating transportation demands.

Circulation Policy 2.2: Give high priority to the establishment of a high-quality public transit system that minimizes dependency on the automobile.

Knott Avenue Station

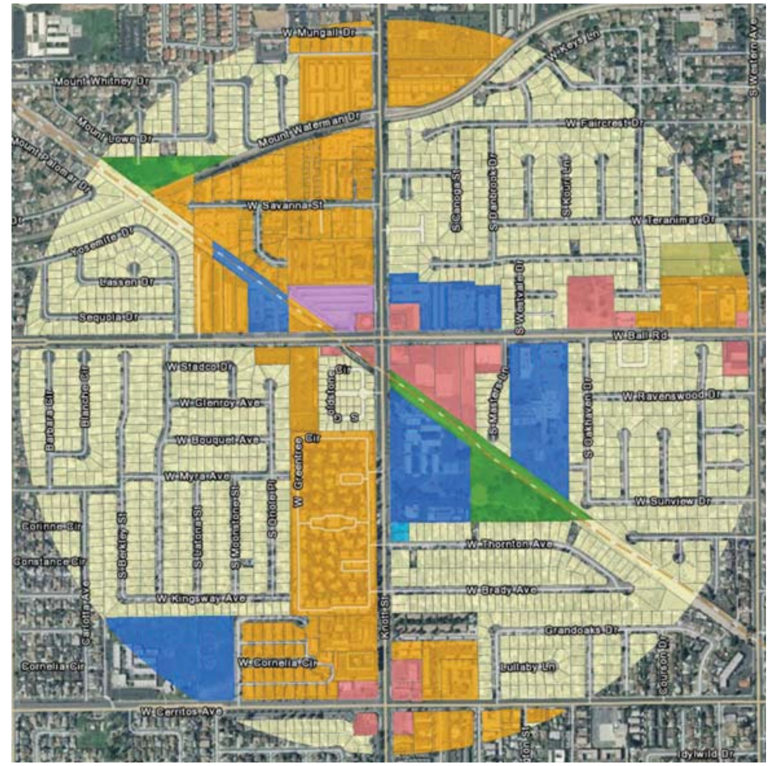
Description: This station area is located at the western edge of one of the City of Anaheim's main transportation corridors. This key arterial provides connections to the cities world class tourist destinations, and commercial centers.

Adjacent land uses within the station study area include a variety of institutional and recreational/open space as well as higher density residential along the north-south corridor and high number of single family residential.

Specific plans which support mixed use/TOD development in/around the station area include:

West Anaheim Commercial Corridors Redevelopment Area: The station area is located within one of the City of Anaheim's six redevelopment project areas. The focus is to encourage new residential development along focused commercial corridors concentrating and enhancing commercial uses at strategic intersections, creating recognizable mixed-use areas.

City of Anaheim Bicycle Master Plan: The Plan emphasizes the importance of linkages between bicycling and other modes of transportation, including bus services, commuter rail service, and park-and-ride locations. The Plan identifies Knott Ave. at Ball Rd. as a proposed Class II bikeway as well as the location of bicycle parking amenities.



The Project would be consistent with various General Plan policies including:

Circulation Goal 5.1 –Policy 3: Support transit supportive land uses in new development.

Circulation Goal 6.1 –Policy 1: Support efforts to enhance intercity and commuter rail systems and services.

Circulation Goal 7.1 –Policy 7: Maximize the use of easements and public rights-of-way along flood channels, utility corridors, rail lines and streets for bicycle and pedestrian paths.

Beach Boulevard Station

Description: This station is located in the heart of the City of Stanton's Town Center, which includes a balance of business, office, and residential uses.

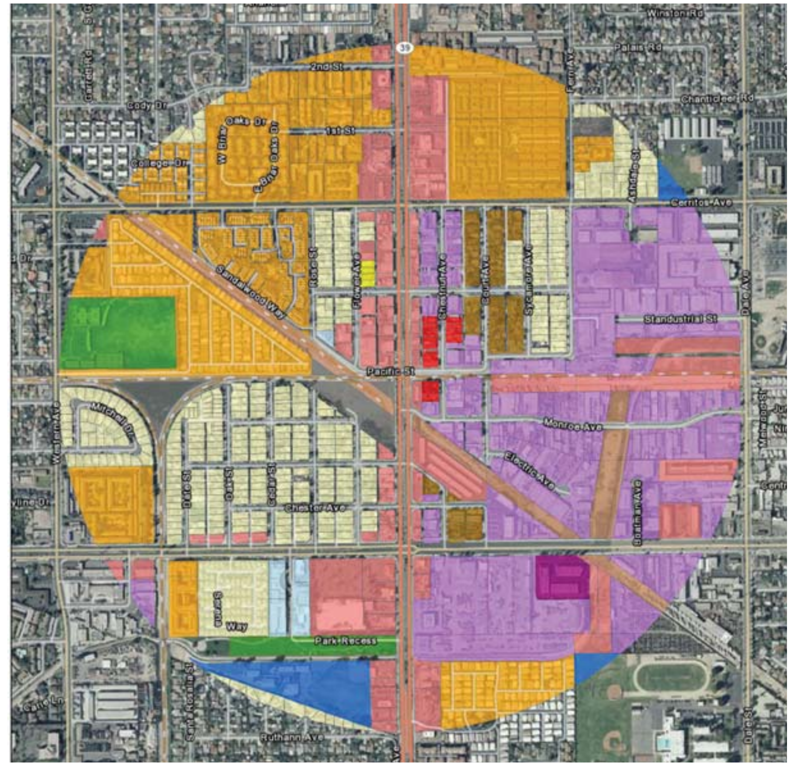
There exists a mix of high-mid density residential to the northeast and southeast and industrial uses dominate the southeast. Mixed uses exist along the main north-south corridor.

Specific plans which support mixed use/TOD development in/around the station area include:

The Town Center Mixed-Use Redevelopment District: Focused on community-serving uses in a transit supportive environment, with emphasis on a balance of residential, office, and commercial uses. The District is intended to be a pedestrian friendly district with strong linkages between different uses and easy access to future transit.

Stanton Civic Center District: This District emphasizes the evolving, redevelopment of the District's several older commercial centers. Mixed-use designations along Beach Blvd. and Katella Blvd. build upon the city's vision to encourage development and higher densities in key areas. Additionally, Beach Blvd. is a Caltrans-designated "Super Street" and serves as a primary corridor transecting the center of the city and Katella Blvd. is an OCTA "Smart Street".

Stanton Plaza Specific Plan: The site is located in the central portion of the city and is envisioned to serve as a recognizable place with its own unique character that portrays a positive aesthetic image to residents and visitors alike. It is an especially valuable asset to the city's most important corridor. Intended to capture regional traffic along Beach Blvd. as well as linking with surrounding neighborhoods by creating a special, mixed-use place attractive as a destination as well as a neighborhood serving complex.



The Project would be consistent with various General Plan policies including:

Community Dev Action CD-4.1.2 (b): Utilize areas such as railroad rights-of-way and flood control channels to provide additional multi-use paths for both pedestrians and bicyclists.

Economic Dev Action 5.1.2 (b): Conduct and implement a plan for expanding transit opportunities and transit supportive development within the City.

Transportation Action ICS-1.2.2 (a): In conjunction with OCTA, conduct preliminary planning for several alternative uses of the Pacific Electric and Union Pacific Corridors that take advantage of future opportunities to place Stanton as a regional mass transit center, and ensure the safety and convenience of Stanton residents.

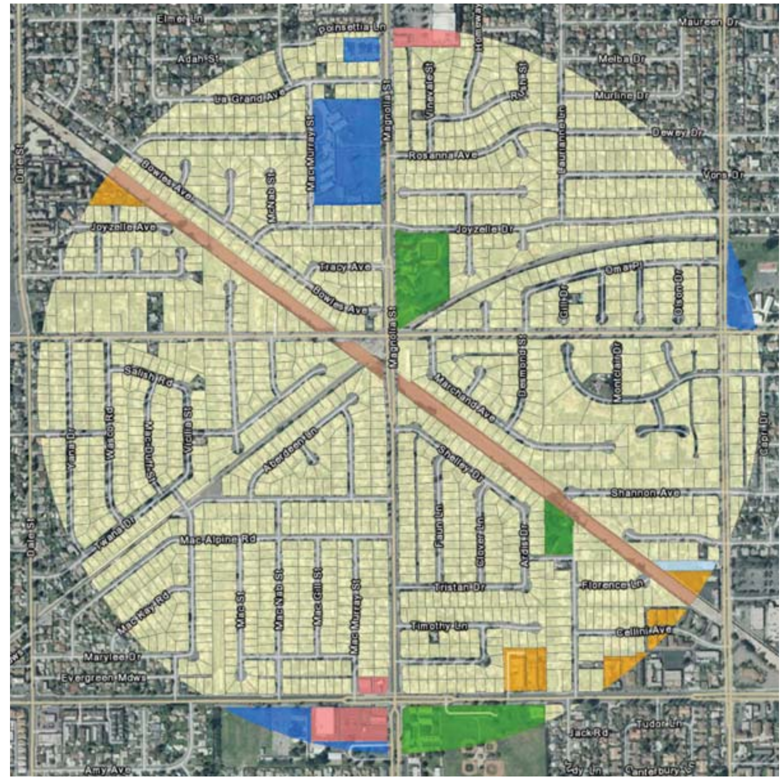
Magnolia Street Station

Description: This station is located within established residential neighborhoods where smaller scale development and pedestrian amenities enhance the "hometown" feel and character of the community.

The predominant land use in the station area is single family residential with a few open space/parks and schools on the northern and southern edges.

Specific plans which support mixed use/TOD development in/around the station area include:

Garden Grove General Plan 2035: Although currently not designated as a mixed-use district, the Magnolia station area is seen as high potential for a small scale, neighborhood station which could incorporate pedestrian and bike amenities along the ROW and connections to the two major stations east. The diverse range of neighborhoods includes areas with the city's older homes and beatifically maintained communities and this is where it is key to balance the needs of these residents while revitalizing unused parcels.



The Project would be consistent with various General Plan policies including:

Land Use Policy 1.4: Encourage active and inviting pedestrian-friendly street environments that include a variety of uses within commercial and mixed use areas.

Land Use Policy 2.1: Protect residential areas from the effects of potentially incompatible uses where new commercial or industrial development is allowed adjacent to residentially zoned districts, maintain standards for circulation, noise, setbacks, buffer areas, landscaping and architecture, which ensure compatibility between the uses.

Circulation Policy 5.3: Provide appropriate bicycle access throughout the City of Garden Grove.

Brookhurst Street Station

Description: This station is located adjacent to one of the City of Garden Grove's main commercial/mixed-use centers, including entertainment and shopping that is walkable from the surrounding neighborhoods.

The ROW intersects the station area at a key location along a major thoroughfare, and surrounded by commercial uses along the north-south corridor and surrounded by single family residential.

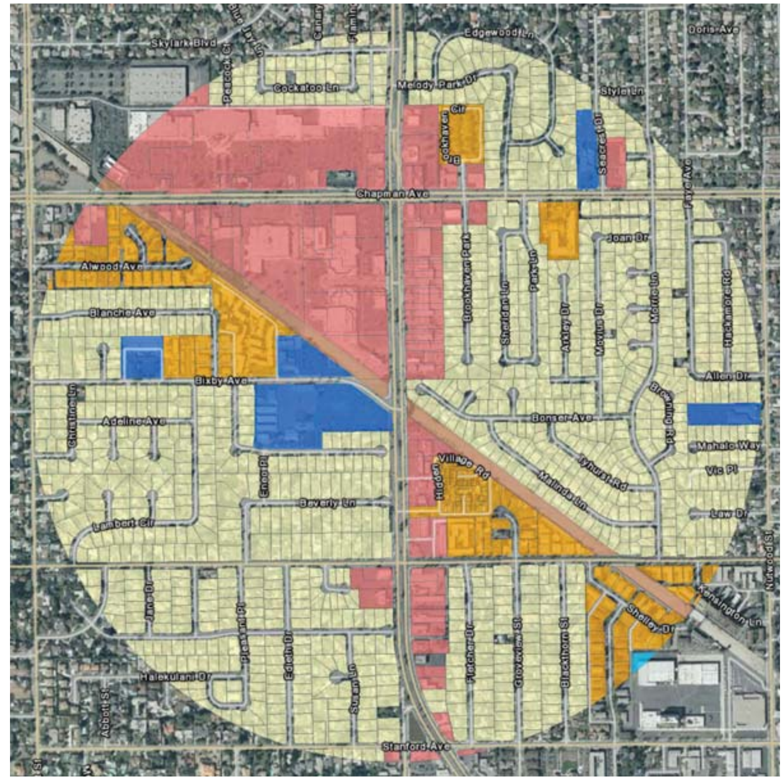
Specific plans which support mixed use/TOD development in/around the station area include:

Garden Grove General Plan 2035 – Focus Area I: The station location is located within *Focus Area I – Brookhurst St. and Chapman Ave.* which currently houses multi-tenant strip mall development. The intent is to change the area to mixed-use land use designations, and adding residential uses to help revitalize the areas that surround the two large shopping centers.

Garden Grove General Plan 2035 – Focus Area F: The station location is located within a city identified "Focus Area". *The Focus Area F – Brookhurst Triangle Area* is located at a major crossing of two main commercial thoroughfares and is at the entrance to the Korean Business District. It is identified as a prominent location for taller, mixed-use development, modern buildings, and vibrant streetscape.

Brookhurst/Chapman Specific Plan – "The Triangle": The site is seen as a mixed-use, multi-generational, multi-modal development with enhanced pedestrian infrastructure and respond to future utilization of the PEROW, and a future stop, through fixed guideway applications.

Community Redevelopment Project Areas: One of the six identified mixed-use districts throughout the city where rezoning will occur in order to accommodate the mix of land uses. The Brookhurst station area is located within the Neighborhood Mixed Use District.



The Project would be consistent with various General Plan policies including:

Land Use Policy 6.4: Work with property owner(s) of commercial developments that have been, or are currently, in a state of deterioration to revitalize these centers. This includes areas in Focus Areas I,J, K, M, and N.

Land Use Policy 8.2: Prepare a plan for the first phase of use of the OCTA right-of-way that lies between Chapman Avenue to the north and Garden Grove Boulevard to the south.

Circulation Policy 4.1: Strive to achieve a balance of land uses whereby residential, commercial, and public land uses are proportionally balanced.

Euclid Street Station

Description: This station is located in the "Heart of Garden Grove" amongst the city's main civic center, commercial and retail centers, mixed-use corridors while maintaining a balance of a pedestrian friendly environment within a busy destination district.

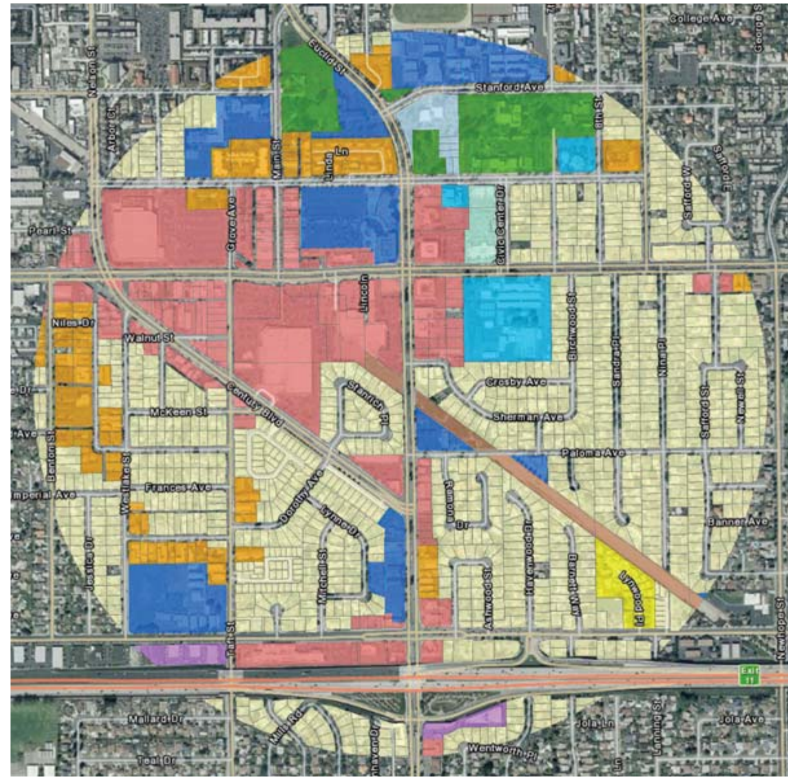
There is an eclectic mix of land uses within the station area including commercial/mixed-use adjacent to the station, institutional, open space, and having single family residential to the east.

Specific plans which support mixed use/TOD development in/around the station area include:

Garden Grove General Plan 2035 – Focus Area E1: The station location is located within a city identified "Focus Area". *The Focus Area E1 – Civic Center (Area 1)* includes City Hall, Acacia St., Garden Grove Blvd., Main St., the Community Meeting Center, and Village Green. The goal for the area is a mixed use designation that promotes civic, commercial, open space, and residential uses while maintaining a human scale while providing a balance between vehicular and pedestrian needs.

Community Center Specific Plan (Streetscape Overlay District): One of the initial efforts to identify areas/corridors for redevelopment. Twelve use districts were established by the Specific Plan. The Plan emphasized the importance of the community centers physical, social, and economic potential as well as promoting a sense of place and a place of special character, historically, culturally, and aesthetically.

Community Redevelopment Project Areas: One of the six identified mixed-use districts throughout the city where rezoning will occur in order to accommodate the mix of land uses. The Euclid St. station area is located within the Civic Center Mixed-Use District.



The Project would be consistent with various General Plan policies including:

Circulation Policy 13.1: Coordinate with the OCTA to facilitate the potential development of an alternative transportation system along the OCTA right-of-way. The City shall support such a use while recognizing that any impacts to the community must be appropriately mitigated.

Land Use Policy 1.2: Encourage modern residences in areas designated as Mixed Use. Mixed use housing should minimize impacts on designated single-family neighborhoods.

Land Use Policy 4.2: Ensure that infill development is well-planned and allows for increased density in Focus Areas along established transportation corridors.

Harbor Boulevard Station

Description: This station area is located at the southern end of the PEROW, blocks away from the City of Santa Ana's vibrant and dynamic urban center. Additionally, this would be a potential gateway to the connection of two transit systems.

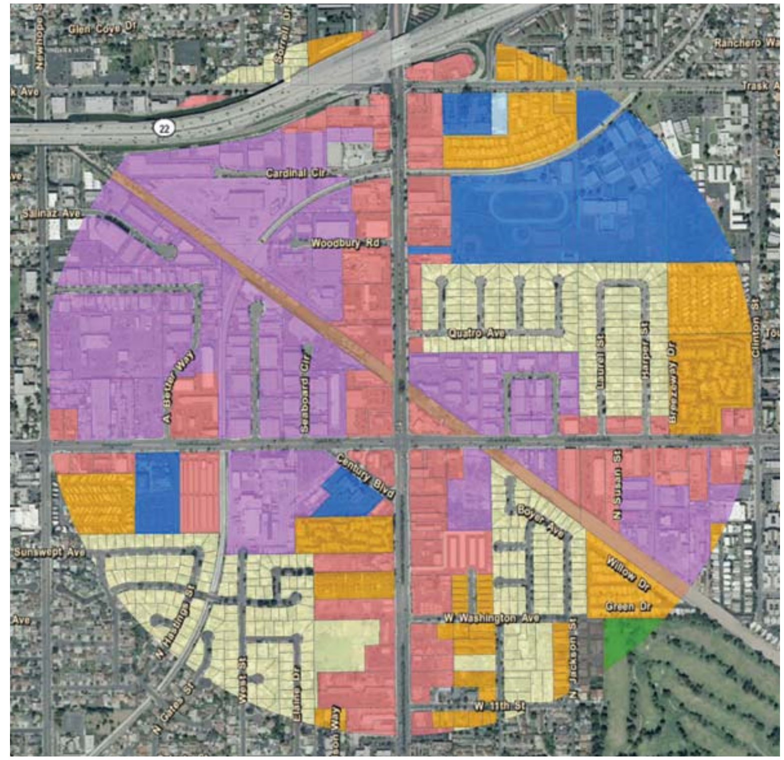
The main north-south Harbor Blvd. corridor is dominated by mixed commercial uses. Within the station area there also exist large number of industrial/manufacturing uses to the north east, and residential in the form of single family and higher density.

Specific plans which support mixed use/TOD development in/around the station area include:

North Harbor Specific Plan: The Plan promotes quality commercial development and land use compatibility along Harbor Blvd. while respecting and preserving the historical and cultural features of the area. Additionally, it encourages uses that have high-quality design values and emphasizes the balance of shopping and employment opportunities for local residents and the region. The Plan identifies Focus Areas that have potential for development that can alter the economic viability along the corridor – whether culturally significant, automotive oriented, recreation or commercial.

Santa Ana Transit Zones: The station area is adjacent to city identified Transit Zones whose objective is to establish and maintain attractive distinctions between each neighborhood zone, such as Transit Village, Urban Center Zone, Corridor Zones, and Urban Neighborhoods.

Santa Ana Renaissance Specific Plan: The station area is adjacent to the 421-acre plan area which lays out the master plan for the future of Santa Ana's downtown and its development into a regional attraction for employment, tourism and commerce. The Plan area straddles several economically-related boundaries including Central City Redevelopment Area, Inter City Redevelopment Area, Enterprise Zone, Business Improvement District, Empowerment Zone, and International Foreign Trade Zone.



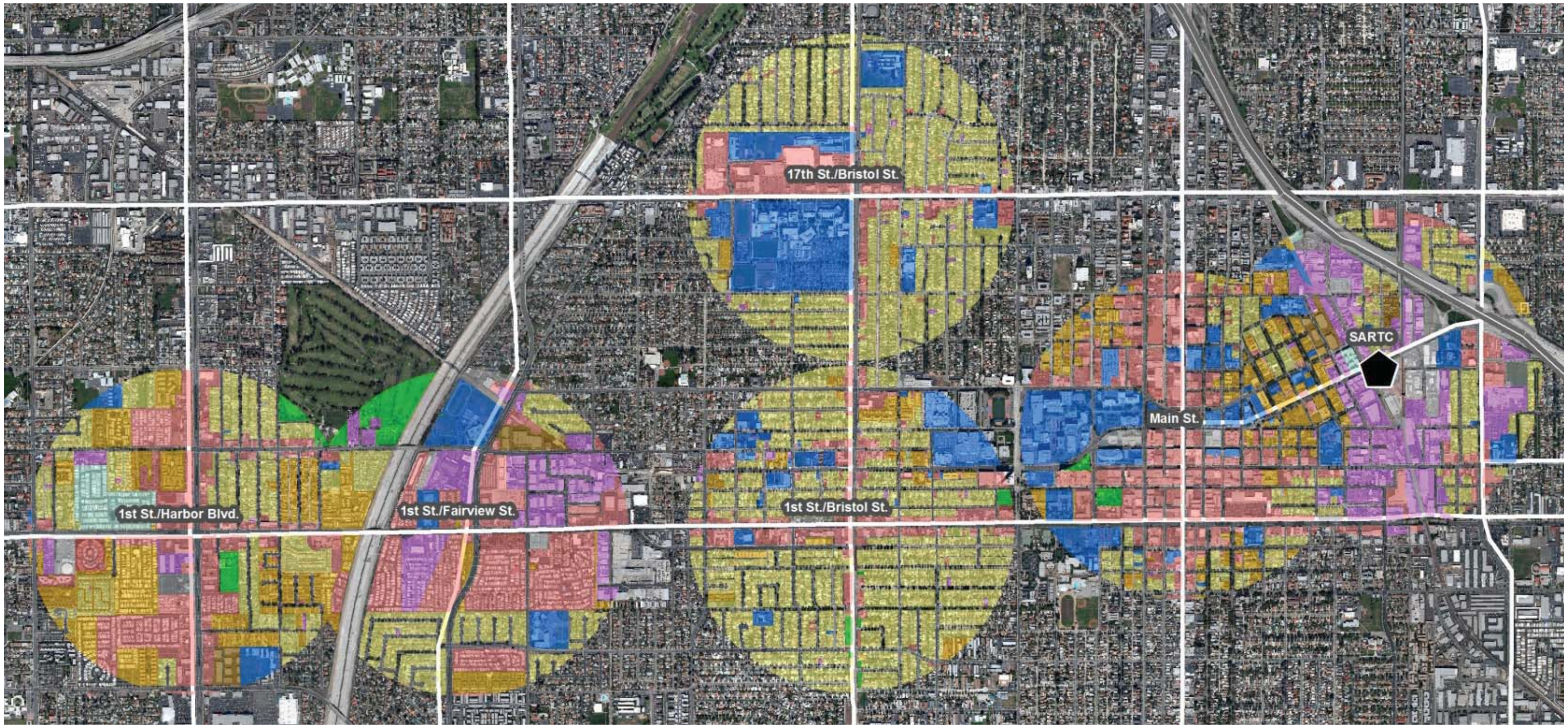
The Project would be consistent with various General Plan policies including:

Land Use Element – Policy 4.5: Encourage development of employment centers and mixed use projects within targeted areas adjacent to major arterial roadways, transit and freeway corridors.

Circulation Element –Policy 1.9: Program future use of the Pacific Electric Railroad right-of-way as a transportation corridor.

Circulation Element –Policy 3.4: Encourage the development of multi-modal transit opportunities within major development areas.

Circulation Element –Policy 3.8: Develop bicycle paths that maximize access to major activity centers, neighboring jurisdictions, and regional bicycle paths.



Currently, the cities of Santa Ana and Garden Grove are studying reuse of a portion of the PEROW/WSAB Corridor Right of Way (ROW), along with connections through the City of Santa Ana from where the ROW ends at Raitt Street, to provide Street Car service. The Fixed Guideway study is scheduled for completion in 2011, with preparation of a draft environmental document by the Summer of 2012. The Santa Ana-Garden Grove Fixed Guideway Project, which will utilize a portion of the PEROW/WSAB Corridor, is funded through the "Transit Projects" portion of the Orange County's LRTP. For the Street Car Alternative included in this AA study, there is an opportunity to interline service (operate both street car systems on the same track), but all of the other alternatives will require a transfer between the PEROW/WSAB and SAGGFG systems.

The stations located within the city include a station at 1st Street and Harbor Boulevard, 1st and Fairview Street, 1st and Bristol Street, 17th Street and Bristol Street, Main Street, and a terminus at SARTC. As shown, the predominant land uses are residential and commercial. These are followed by institutional uses, including downtown Santa Ana, City Hall, Santa Ana city services and courthouses, and various schools and medical centers.

Summary

During the Final Screening phase, a summary of TOD opportunities at station areas along the proposed alignments was completed and is presented below in Table 4.3. At this level of analysis, station-related sites offering development opportunities were defined as city-adopted plans and policies, property that was vacant, used for surface parking, or was underutilized when compared to both the current surrounding land uses and future land use plans.

All of the jurisdictions which contain a station in the study area have developed policies in support of the incorporation of transit service. In addition, policies call for specific land use types, such as multi-family housing, to be concentrated around station areas for a multi-modal transit center and TOD. All jurisdictions within the project study area have one or more plans guiding future development around proposed stations. The plans include guidelines for both TOD as well as anticipated land uses. As stated in the SCAG Regional Transportation Plan (RTP), TOD at new or improved transit stations can work so long as the appropriate combinations of higher-density, mixed-use zoning, parking policies, urban design guidelines, and redevelopment investments are implemented. This type of high density and mixed residential and commercial development should facilitate attracting residents and workers with higher propensities for transit trips.

As shown in the detailed station descriptions, improving the existing transportation network and encouraging multiple modes of transportation are shared goals of the jurisdictions. Each has invested considerable time and effort in developing policies and plans for transportation improvements. As described above, all improvements involve multi-modal solutions.

Methodology

The impact analysis was based on information collected during the affected environment analysis, field research in the project study area, site visits to proposed stations, in-depth review of aerial photography of the project study area, and information provided by local planners gathered as part of the proposed station area planning process. The station area planning process included direct discussions with city representatives, city planners, city websites and resource libraries and planning charrettes. Using this information, evaluation criteria were developed that analyzed the impacts of both short-term construction and long-term operations.

Table 4.3 – Summary of Transit Supportive Land Use Plans

City	Station Location	TOD Compatible	Specific Plans	Redevelopment Area
Los Angeles	Union Station	✓	✓	✓
	7th St./Alameda St.	✓	✓	✓
	Soto St./Olympic Blvd.	✓	✓	✓
Vernon	Leonis Blvd./District Blvd.	-	-	✓
	Vernon Ave.			

City	Station Location	TOD Compatible	Specific Plans	Redevelopment Area
Huntington Park	Pacific Blvd.	✓	✓	✓
	Gage Ave.	✓	✓	✓
South Gate	Firestone Blvd.	✓	✓	✓
Downey	Gardendale St.	✓	✓	✓
	Metro Green Line Station	✓	✓	-
Paramount	Paramount Blvd./Rosecrans Ave.	✓	✓	✓
Bellflower	Bellflower Blvd.	✓	✓	✓
Cerritos	183rd St./Gridley Rd.	✓	✓	✓
Artesia	Pioneer Blvd.	✓	✓	✓
Cerritos	Bloomfield Ave.	✓	✓	✓
Cypress	Cypress College	✓	✓	✓
Anaheim	Knott Ave.	✓	-	✓
Stanton	Beach Blvd.	✓	✓	✓
Garden Grove	Magnolia St.	-	-	-
	Brookhurst St.	✓	✓	✓
	Euclid St.	✓	✓	✓
Santa Ana/Garden Grove	Harbor Blvd.	✓	✓	✓

4.2 Acquisition

A majority of the proposed transit system improvements will be located within the public ROW including the former PE Railway ROW, city streets, the Metro-owned Harbor Subdivision, and active and inactive railroad ROWs. This section presents the initial findings for parcels outside of the public ROW that may potentially be impacted.

4.2.1 Affected Environment

Currently, land use types adjacent to the Corridor alignments consist of residential, commercial, industrial, public facilities, open space, and transportation/utilities. Refer to the Land Use Section 4.1. for an overview of station area uses and land use policies.

The affected environment for the analysis was limited to the areas within and directly adjacent to the Corridor alignments. For this conceptual level of analysis, an estimate of potentially impacted parcels was identified through the use of the engineering and station concept plans. Future phases of the project may provide further detail on the types of land uses, square footage of properties, potential acquisitions, and any other parcel characteristics.

When an acquisition occurs, it typically results in either a full or partial take of a parcel. A partial taking would occur if the project did not require the acquisition of the entire parcel, but just enough of the parcel to accommodate the proposed project. This would occur if, for example, only a portion of a lot fronting the alignment is required, but not the building itself. Full takings occur when either the majority of a property is required for horizontal alignment because of insufficient public ROW or when damage to a property is great, causing to it be deprived of beneficial use.

4.2.2 Applicable Laws and Regulations

The Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) of 1970, as amended (Public Law 91-646), mandates that certain relocation services and payments be made available to eligible residents, businesses and nonprofit organizations displaced as a direct result of projects undertaken by a federal agency or with federal financial assistance. The Uniform Act provides for uniform and equitable treatment, either through just compensation or other means, for persons displaced from their homes and businesses and establishes uniform and equitable land acquisition policies.

The provisions of the California Relocation Assistance Law (Government Code, Section 7260, et seq.) apply if a public entity undertakes a project for which federal funds are not present. The Relocation Act seeks to:

- Ensure the consistent and fair treatment of owners of private property;
- Encourage and expedite acquisitions by agreement to avoid litigation and relieve congestion in the courts; and
- Promote confidence in public land acquisitions.

4.2.3 Evaluation Methodology

For this level of the analysis, parcels that may be potentially impacted by implementation of a transit system were summarized based on each alternative, and ROW requirements for the proposed alignments and station sites. Although a majority of the project would be located within the public ROW, there are areas where parcels may be impacted or property acquisitions would be required. To identify properties not located on public ROW that would be needed for the project, conceptual engineering drawings with detailed locations of the proposed alignments and stations were reviewed. Additional resources included aerial photographs and assessor maps.

4.2.4 Real Estate and Acquisitions Assessment

Conceptual station locations and plans were identified in working sessions with the affected Corridor cities. A total of eight working sessions with multiple cities were conducted, in the Conceptual Screening and Initial Screening phases. In the future, with development of preliminary engineering plans and in the environmental document, more detailed acquisition plans may be defined.

When building a transportation system, property acquisition may be required for:

- Alignment and system requirements; and
- Stations, bus and circulator transfer plazas and layover spaces, parking, and other facilities.

As presented below in Table 4.4, possible acquisition at a parcel level was identified for the alternatives. The possible acquisition of property primarily occurs where the alignments of the proposed alternatives transition at the northern terminus of the PEROW/WSAB Corridor ROW to travel north along the San Pedro Subdivision ROW, and at the southern end of the Corridor to travel through the City of Santa Ana to the Santa Ana Regional Transportation Center (SARTC).

Table 4.4 – Possible Property Acquisition (Parcels)

TSM	BRT		Street Car	LRT	Low Speed Maglev
	Street-Running	HOV-Running			
0	TBD	TBD	15 - 20	15 - 20	50 – 70

The BRT Alternative would not require any property acquisition for alignment purpose as it is proposed to travel in either city streets or freeway High Occupancy Vehicle (HOV) lanes after leaving the Corridor. The Street Car Option also would not require any acquisition as its tight turning radius, approximately 50-65 feet, could be accommodated within the PEROW/WSAB Corridor ROW, while the wider turning radius needs of the LRT, approximately 100 feet, and Low Speed Maglev Alternative, approximately 246 feet, would require acquisition of approximately between 15 and 70 parcels. For all of the alternatives, property acquisitions would be required for each alternative and alignment curves as well as provision of a maintenance and storage facility. Table 4.4 provides an approximate number of parcels needed for a maintenance and/or storage facility in an undetermined location along the alignment. Under the BRT alternative, opportunities may exist to store buses along the actual ROW; however this will be analyzed further.

4.3 Visual and Aesthetic

This section discusses the existing visual and aesthetic character throughout the Corridor and provides a preliminary assessment of the local character as well as the visual quality and aesthetic resources surrounding each alignment alternative.

4.3.1 Affected Environment

This effort evaluated potential impacts to views and vistas, natural landscapes, monuments, parks, historic structures, and the aesthetic compatibility of the introduced transit system with the surrounding environment. Transportation infrastructure can often result in visual impacts to a community through obstruction of views by overhead catenaries, and possible inconsistencies with local architectural scale when considering an elevated system. However, it can also introduce positive effects such as opportunities for increased lighting, enhanced streetscape and landscape opportunities, as well as development of more inviting pedestrian environments.

4.3.2 Applicable Laws and Regulations

There are several regulations that govern the assessment and consideration of visual quality and aesthetic character. These regulations consider the protection and enhancement of existing resources and aesthetic character, as well as the incorporation of design considerations in the development and construction of projects. The following federal and state regulations and policies apply to the evaluation of visual effects for the proposed project.

- The U.S. Environmental Protection Agency (USEPA) (42 United States Code (USC) Section 4231) puts regulatory responsibility on the federal government to “use all practicable means” to “assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.”
- The Federal Highway Administration (FHWA) and the Urban Mass Transportation Administration, now the FTA, established Environmental Impact and Related Procedures (23 Code of Federal Regulations 771) for the evaluation of urban mass transit projects and the compliance of these projects with 23 USC 109(h) and 303, as well as other federal statutes.
- FTA Circular 9400.1A, Design and Art in Transit Projects, encourages the use of design and artistic considerations in transit projects. The FTA recognizes that specific types of transit projects require an assessment of visual effects. The circular provides guidance on opportunities for incorporating art and design into transit projects.
- The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Sections 6002-6009, places additional emphasis on environmental considerations such as mitigation, enhancement activities, context sensitive solutions and Section 4(f). It also advances the idea of coordinating public and agency involvement and promoting the use of visualization techniques to improve stakeholder understanding of the proposed alternatives.
- The United States Department of Transportation (USDOT) Act, Section 4(f) applies to agencies within the USDOT and is generally referred to as 49 USC 303. Section 4(f) focuses on the preservation of public parks and recreation lands, wildlife and waterfowl refuges, and historic sites, and includes the preservation of their aesthetic integrity.
- Section 106 of the Historic Preservation Act of 1966 furthers the preservation of historic resources, including resources that any Indian Tribe or Native Hawaiian Organization has attached religious and cultural significance to or with. This is applicable to a visual impacts analysis because historic resources are often considered to be potential visual resources.
- California Environmental Quality Act (CEQA) requires an evaluation of several aspects of visual and aesthetic issues including: effects on scenic vistas; damage to scenic resources, including, but not limited to, trees, rock outcroppings and historic buildings within a state scenic highway; effects on the visual character or quality of the site and its surroundings; and effects from new light or glare which may affect nighttime views in the area.

4.3.3 Evaluation Methodology

A preliminary analysis of existing visual and aesthetic qualities in the study area and potential changes to these qualities resulting from implementation of a transit system improvement has been completed as all of the alternatives have the potential to affect visual and aesthetic resources. Aesthetic resources and visual character were evaluated at a conceptual qualitative level. This evaluation was based on field observations as well as through preliminary identification of culturally significant structures. Each alignment alternative was analyzed based on its potential impact to the visual quality of the immediate environment. A more detailed analysis may be provided through possible future study efforts.

4.3.4 Assessment of Visual Character

Residential properties represent more than 50 percent of the land uses along the PEROW/WSAB Corridor ROW. Reuse of the ROW, the San Pedro Subdivision among other active and inactive railroad ROWs, and city streets to accommodate the northern and southern system connections would have significant visual and privacy impacts on adjacent residential and other properties. The following section discusses the potential visual impacts of each alignment through all three segments of the Corridor study area.

Aerial structures for the Low Speed Maglev Alternative and aerial sections of the LRT and Street Car alignments would have the most notable impacts on privacy and visual character. Construction of an aerial alignment structure and stations would impact the scale, visual character, and privacy of adjacent neighborhoods. Overhead catenary wires and poles, as well as station platforms and substations, are components of at-grade LRT and Street Car systems may have impacts on visual character. However, these elements would not contribute to major obstruction of views and would be less invasive. A BRT system would have the least visual impacts, as no significant permanent structures are required, and buses are proposed to travel in existing streets and freeways when leaving the PEROW/WSAB Corridor ROW.

Northern Connection Area

BRT Alternatives The alternatives would travel in mixed-flow traffic north of the PEROW/WSAB Corridor ROW from Lakewood Boulevard with minor to no visual and aesthetic impacts. The Street-Running BRT option would operate through dense residential and industrial communities, but there are no major transit structures along city streets that would obstruct views or impact aesthetic resources. The HOV Lane-Running option would operate primarily along highways and the existing Harbor Transitway on the I-110 Freeway and the HOV lanes of the I-105 Freeway, as well as through Downtown Los Angeles, resulting in no new impacts to the existing visual character.

Guideway Alternatives The alternatives would use a combination of railroad ROWs and city streets. All of the guideway alternatives would operate on the San Pedro Subdivision north to Randolph Street, and their impacts would depend primarily on their vertical configuration, whether at-grade or grade-separated. A majority of the land uses adjacent to the San Pedro ROW in the cities of Downey, South Gate, Cudahy, Bell, and Huntington Park are a combination of residential and industrial with some commercial. Because this portion of the alignment proposes to operate on a currently active ROW, the impacts to the surrounding residential and industrial communities would be minor with the at-grade LRT and Street Car alternatives. The Low Speed Maglev Alternative would operate in an entirely elevated configuration and would pose greater impacts to the existing visual character, especially to the one- and two-story residential communities in the previously mentioned cities.

Tracks infrequently used along Salt Lake Avenue in Cudahy, Bell, and Huntington Park.

Several single family homes adjacent to the tracks through South Gate, Cudahy, and Bell.

East Bank and West Bank 1 Alternatives The alternatives would continue north from Randolph Street on the San Pedro Subdivision through a heavily industrial landscape along Downey Road to approximately Vernon Avenue, where they split to run along either bank of the Los Angeles River. The East Bank alignment operates within a railroad ROW used by passenger and freight rail services, while the West Bank 1 alignment would operate along a utility ROW and then along tracks used by Metrolink, Amtrak, and Metro into Union Station. These alternatives would not significantly alter the existing visual character in the cities of Huntington Park, Vernon and Los Angeles. Small pockets of residential properties south of Fruitland Avenue may incur privacy impacts.

The Low Speed Maglev Alternative would have significant visual impacts along the Los Angeles River, as it would need to cross over six historic bridges and two highway bridges – I-10 and US-101. This would negatively impact the view of historic resources and potentially obstruct views of Downtown Los Angeles to the west and the San Gabriel Mountains to the east. An aerial structure may be out of character and significantly out of scale with the distinct architecture of these historic bridges. While both alignment alternatives would primarily operate through highly industrialized rail corridors, existing residential pockets throughout this area would be significantly impacted.

Pockets of residential complexes exist between heavy and light industrial uses along Downey Road.

Historic bridges cross the Los Angeles River adding visual interest among the dense industrial landscape.

West Bank 2 and West Bank 3 Alternatives The alternatives would turn west on Randolph Street and then north on Pacific Boulevard and onto the Metro-owned Harbor Subdivision before diverting at the Redondo Junction. Currently, inactive rail tracks in the median of Randolph Street mark a clear boundary between the residential and industrial uses in Huntington Park. Introducing a new transportation system within the existing rail corridor infrastructure, would nominally alter the local character. Farther east on Randolph Street, residential properties may experience privacy impacts, especially near a proposed aerial transition section by the San Pedro Subdivision.

Mature trees along the median of Randolph Street enhance Corridor visual character.

Distinct architecture and a dense mix of commercial uses make Pacific Boulevard a key destination.

Implementing a new at-grade transportation system may generate low visual and aesthetic impacts along Pacific Boulevard, given its extended width and densely urbanized commercial and industrial character. Proposed to travel along the northern end of Pacific Boulevard's commercial corridor, these transit system alternatives would avoid visually disturbing the historic architecture along the main retail corridor. North of Randolph Street, Pacific Boulevard is lined with large scale commercial, light industrial and manufacturing uses that may experience a lower level of visual and aesthetic impacts.

Farther north along the Harbor Subdivision, the impacts would be minimal as the alignments are proposed to operate on an existing ROW faced by the back walls of manufacturing and industrial buildings. Despite that the LRT, Street Car, and Low Speed Maglev alternatives are proposed to operate in an elevated configuration here, their impacts would almost be seamless, given the existing dense industrial landscape of the local environment. Minerva Street north of the Harbor Subdivision, however, may experience visual effects from the proposed elevated structure due to its narrow width.

At the north end of the Harbor Subdivision, West Bank Alternative 2 would veer northeast to follow the West Bank Alternative 1 alignment along existing passenger rail tracks to Union Station. West Bank Alternative 3 would head northwest to travel along Santa Fe Avenue in an aerial configuration and transition to below-grade service at 8th Street to resurface in Little Tokyo and use the existing Metro Gold Line tracks to access Union Station. The majority of visual impacts would occur on Santa Fe Avenue between 8th and 12th Streets. Land uses along that portion of Santa Fe Avenue are predominantly industrial and manufacturing; however, the proposed aerial structure of all the guideway alternatives would impact the architectural scale of its one- and two-story buildings, including the historic Southern California Gas Company Administration Building. The limited width of Santa Fe Avenue has a high potential to impede any views north to Downtown Los Angeles, as well as significantly cover natural lighting due to the 49 foot width of an aerial structure. The underground portion would have no impacts to visual quality since it would not require any permanent infrastructure on the surface, this includes the underground station at 7th and Alameda Streets.


American Apparel textile factory overlooks downtown Los Angeles northwest of 7th and Alameda Streets.


A mix of residential, commercial, and institutional buildings surrounds Little Tokyo Gold Line Station.

In Little Tokyo, the alignment would operate from Traction Avenue to 1st Street along Alameda Street. The guideway is proposed to resurface through a tunnel portal approximately at the intersection of Traction Avenue and Alameda Street and continue to run at-grade level. The area's existing transit oriented development elements include high density housing, commercial, and institutional uses and create a highly urbanized environment supportive of new transit infrastructure.

PEROW/WSAB Area

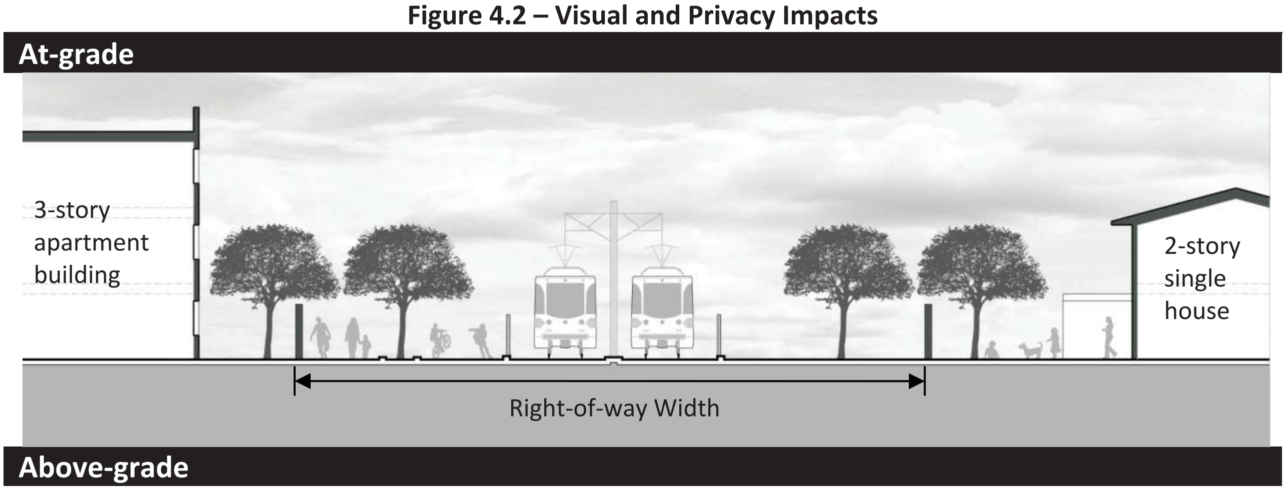
All of the modal alternatives are proposed to operate along the same alignment through the PEROW/WSAB Corridor. BRT would operate completely at-grade; while the LRT and Street Car would operate in a combination of at-grade and aerial service due to some proposed grade-separation at major street intersections. The Low Speed Maglev option would operate completely above-grade.

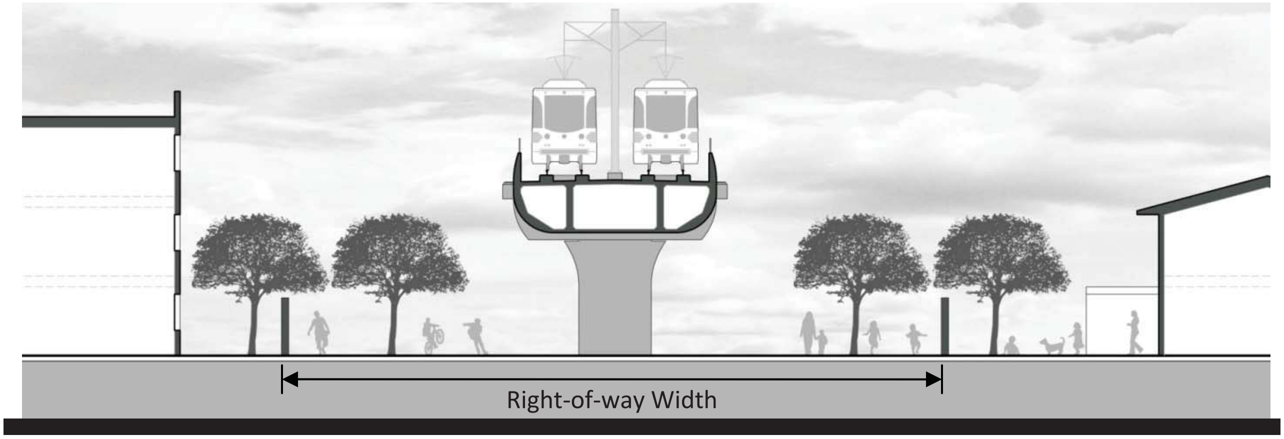
The average width of the PEROW/WSAB Corridor ROW is 100 feet, with approximately 30 feet required for an at-grade system and 12-15 feet for an above-grade alternative, except at station locations. Where ample space is vacant, the remainder of the ROW could be used for an integrated pedestrian and bicycle facility, and provide space for landscaping and sound walls to mitigate visual and privacy impacts. Such measures would be most effective on the at-grade alignment and to a lesser degree on the aerial alignment.

For an aerial alignment, the height would be approximately 30 feet to the top of the structure and 40 feet to the top of the vehicles. Mature, 45 foot and higher trees could mitigate the visual and privacy impacts along the ROW. As previously mentioned, the width of an aerial structure is typically 49 feet from edge to edge, as shown in Figure 4.2.

Visual and aesthetic impacts would vary by city depending on their unique character. The following discusses individual sections of the PEROW/WSAB Corridor ROW and possible impacts to the visual and aesthetic character of the area.

Figure 4.2 – Visual and Privacy Impacts





Paramount to Cerritos This part of the alignment is composed of a variety of land uses including low and high density residential, commercial with various retail options, as well as some industrial and manufacturing uses. The City of Paramount is densely developed, and given the combination of residential, commercial, and institutional land uses along Rosecrans Avenue and Paramount Boulevard, the proposed transit system would not be out of character with the local landscape. Impacts to Paramount would be most notable near residential properties, schools, and parks where elevated structures may cause scale inconsistencies with existing infrastructure.

A mix of commercial retail along Pioneer Avenue contributes to the visual character of Little India.

Plazas and outdoor seating just off Bellflower Boulevard create a distinct streetscape.

The cities of Bellflower and Artesia would experience similar visual impacts to adjacent homes. However, Bellflower Boulevard's quaint commercial core and heavily-used bike path along the Corridor may be visually suited with the introduction of new transportation infrastructure. Such development as the Belmont Court mixed use project will further enhance and reinforce TOD style development along the Bellflower Boulevard downtown area, all within easy walking distance to the proposed station. With a mix of retail uses complemented by wide sidewalks and outdoor plazas, Bellflower Boulevard enhances the pedestrian experience. Artesia's Pioneer Boulevard offers a mix of retail and commercial uses that mark Little India as a landmark for cultural and commercial activities, and additional transportation infrastructure may be successfully integrated into the visual character of its unique commercial core.

The City of Cerritos, while predominantly residential, also has a variety of large scale commercial development, including the Cerritos Town Center and Cerritos Auto Square near Gridley Road, where visual impacts would be less pronounced. Farther south on Bloomfield Avenue, Cerritos' visual character is comprised of a combination of public green space, commercial, and housing uses. Careful integration of a transit system could fit the character and diversity of land uses.

The grade-separated Low Speed Maglev Alternative would have significant visual impacts on these predominantly residential communities. Given the lower scale of residential and retail corridors in the cities of Bellflower and Artesia, a 30-plus foot transit structure would visually dominate an urban streetscape lined by one- and two-story buildings.

La Palma to Garden Grove The Corridor travels through many residential neighborhoods that would face similar privacy impacts as previously mentioned. The character in La Palma and Cypress, specifically, is almost entirely suburban and single-family residential, with the exception of some small-scale commercial and Cypress College.

Farther south, cities also have high levels of single family homes adjacent to the Corridor with large scale commercial and mixed retail along major corridors like Knott and Katella Avenues in Anaheim, Beach Boulevard in Stanton, as well as Brookhurst and Euclid Streets in Garden Grove. Specifically, Katella Avenue and Dale Street; Brookhurst Street and Chapman Avenue; and Euclid Street and Garden Grove Boulevard are notable intersections with a wide variety of land uses. Areas such as Garden Grove's Historic Main Street and Cypress College's weekend Swapmeet add distinct visual qualities and community character to their cities.

Cypress College's main entrance serves as a key destination for the college's day and evening students.

Historic Main Street provides distinctive visual character to Garden Grove.

While the majority of the alignment through this section may operate at-grade, some of the most notable effects would be privacy impacts to homes adjacent to the Corridor, as well as visual and aesthetic impacts by an aerial structure proposed to extend from Nelson Street to just east of Euclid Street. While this area has large scale commercial development, such a structure would affect surrounding residential neighborhoods, as well as alter the distinct aesthetic character of the general area and specifically to the Historic Main Street just north of the corridor.

Southern Connection Area

Two potential alignments have been identified to operate on Santa Ana's city streets after leaving the south end of the PEROW/WSAB Corridor ROW: the Northern Alignment would run east on Westminster Boulevard/17th Street and south on Main Street to end at the Santa Ana Street Car station; and the Southern Alignment would operate south on Harbor Boulevard, east on 1st Street, north on Santiago Street to the SARTC.

The visual quality and urban ambiance of the City of Santa Ana has multiple elements. With a heavily commercial urban landscape on the west, a well defined Civic Center, and historic core in the center, and a combination of industrial and low and high density residential to the east, this city's character is variable and distinct. The City of Santa Ana is currently studying the implementation of a Street Car system to connect its Civic Center with the City of Garden Grove, adding a local transit component to its unique aesthetic and visual character.

Modern lofts adjacent to industrial complexes serve as a buffer for single family homes near SARTC.

The distinct architecture along Broadway creates a unique space for walking and shopping.

Santa Ana's history is well preserved through its architecture and urban landscape. Its visual character is distinguished by its historic landmarks including the City Hall Building, the Old Orange County Courthouse, and the immediate historic commercial buildings along Broadway. The Civic Center complex has a dominant presence and unique landscape with curvilinear streets and modern civic structures. Beyond the historic and civic districts, recent loft housing development near the SARTC has diversified a dense industrial landscape and even created a transitional barrier for surrounding single-family homes.

Historic Orange Courthouse on Civic Center Drive just west of Main Street.

Mature trees and landscaping along the median of Harbor Boulevard.

Considering modal alternatives on either alignment, a BRT system would operate in mixed flow traffic and would have no aesthetic impacts to the visual character of the city. An at-grade rail system through the streets of Santa Ana would cause impacts mostly to narrow streets such as Main Street, but fewer visual impacts compared to an aerial system.

Harbor Boulevard as well as 1^{st} and 17^{th} Streets are wide arterials lined by dense and large scale commercial development. Generally, introducing rail along Harbor Boulevard, 1^{st} and 17^{th} Streets would fit with the wide and urbanized character of those areas. While historic structures are within a short distance from both alignments, an at-grade system would minimally obstruct any views or cause any major streetscape alterations. However, an aerial system for any of the modal alternatives would have more significant visual impacts to the local character especially along Main Street and possibly to residential properties adjacent to major corridors. The area near the SARTC may experience fewer visual impacts, as its current aesthetic quality is predominantly industrial.

4.4 Cultural Resources

This section describes the cultural resources in the study area and along the potential ROW of each alternative, and identifies the potential effects of the alternatives. Those alternatives that minimize disruptions to cultural resources are typically preferred. An evaluation of the consequences of the alternatives on cultural resources is presented.

4.4.1 Affected Environment

Potential impacts to cultural resources include any archaeological, historical, or paleontological resources. A brief description of each cultural resource is provided below:

- Archaeological Resource: Remnants of human activity from an earlier time.
- Historical Resources: Buildings, structures, improvements, and remnants associated with a significant historic event or person(s) and/or have a historically significant style, design, or

achievement. Generally, any resource more than 50 years old has the potential to be considered a historical resource.

- Paleontological Resource: Remnants of prehistoric plants and animals (e.g. fossils)

4.4.2 Applicable Laws and Regulations

NEPA directs federal agencies to use all practicable means to "preserve important historic, cultural, and natural aspects of our national heritage" (Section 101[b][4]).

The National Historic Preservation Act (NHPA) established a program for the preservation of historic properties throughout the United States. The NHPA establishes the National Register of Historical Properties (NRHP), which is "an authoritative guide to be used by federal, state, and local governments, private groups and citizens to identify the nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment" (36 CFR 60.2). To be eligible for listing in the NRHP, a property must be at least 50 years old (or have reached 50 years old by the project completion date) and possess significance in American history and culture, architecture, or archaeology to meet one or more of four established criteria:

- Association with events that have made a significant contribution to the broad patterns of our history;
- Association with the lives of persons significant in our past;
- Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and/or
- Have yielded, or may be likely to yield, information important in prehistory or history.

Historic resources eligible for listing in the NRHP are considered "historic properties", and may include buildings, sites, structures, objects and historical districts.

The FTA established Environmental Impact and Related Procedures (23 CFR 771) for evaluation of public transit projects and compliance of these projects with 23 USC 109h) and 303, as well as other USCs.

Section 4(f) of the Department of Transportation Act (40 USC 303) affords protection to parks, recreation areas, wild refuges and historic sites. Section 4(f) properties can include historic sites that are in or eligible for NRHP (23 CFR Section 771.135). The Department of Transportation (DOT) will not approve the use of a Section 4(f) property unless: 1) there is no feasibly and prudent avoidance alternative to use land from a property and; 2) all possible planning has been done to minimize harm from the use. However, the DOT may authorize the use of a property protected under Section 4(f) if it will have a negligible impact, as further defined in the rule.

Section 21084.1 of CEQA states that a project that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment. CEQA defines a historic resource as any resource listed, or determined to be eligible for listing, in the

California Register of Historical Resources. In addition, historic resources included in a local register of historic resources or otherwise deemed significant per Public Resources Code 5024.1 are presumed to be historically or culturally significant unless the preponderance of the evidence demonstrates that the resource is not historically or culturally significant.

4.4.3 Evaluation Methodology

Identification of cultural resources in the vicinity of the proposed routes and modes, as well as potential issues that should be addressed, is important during the alternatives analysis phase of the project. This will help determine the relative potential for concerns that each refined alternative may present so that appropriate actions may be taken early in project development to avoid adverse impacts on these precious resources.

To identify resources in the vicinity of the refined alternatives being considered, a review of readily available information was conducted. For this task, the following sources were reviewed:

- National Register Information System (NRIS) – website database contains information on historic properties listed in the NRHP, July 2011.
- California State Office of Historic Preservation (OHP) – Historic Resource Information – public website database contains information regarding State Historic Landmarks and points of historical interest, July 2011.
- California Department of Transportation (Caltrans) – Historical Bridge Registry – website database contains information on statewide historic bridges, July 2011.
- Searches of the Los Angeles County website and websites of the following municipalities: Garden Grove, Bellflower, Huntington Park, South Gate, Stanton, Cypress, La Palma, Hawaiian Gardens, Cerritos, Artesia, Norwalk, Downey, Cudahy, Bell, and Maywood, August 2011.

4.4.4 Cultural Resources Assessment

Cultural resources in the vicinity of the proposed alternatives were identified and documented based on a review of readily available information, including city, regional, state, and federal lists. Note that additional work will need to be undertaken in future environmental phases to determine locations of all cultural resources in the vicinity of the alternatives that will be studied in that environmental document. The identified cultural resources along all of the alternatives as listed in Table 4.5 and illustrated in Figure 4.3, Figure 4.4, and Figure 4.5. The following sections identify cultural resources within 0.5 miles of each alternative being considered.

Table 4.5 – Cultural Resources Adjacent to the Alternatives

Alternative	Cultural Resource	Address[1]	City
	NRHP		
WB1, WB2, WB3, EB, BRT	Atchison, Topeka, and Santa Fe Railway Steam Locomotive No. 3751	2435 E. Washington Blvd.	Los Angeles
WB1, WB2, WB3, EB, BRT	Bridge: Cesare Chavez Ave (Macy Street) beneath Union Station	Bridge ID: 53C-0131	Los Angeles
WB1, WB2, EB	Bridge: First Street Bridge over the LA	Bridge ID: 53C-1166	Los Angeles

Alternative	Cultural Resource	Address[1]	City
	River[2]		
WB1, WB2, EB	Bridge: Fourth Street over the LA River[2]	Bridge ID: 53C-0044	Los Angeles
WB1, WB2, EB	Bridge: North Main Street Bridge[2]	Bridge ID: 53C-1010	Los Angeles
WB1, WB2, EB	Bridge: North Spring Street Bridge[2]	Bridge ID: 53C-0859	Los Angeles
WB1, WB2, EB	Bridge: Olympic Boulevard over LA River[2]	Bridge ID: 53C-0163	Los Angeles
WB1, WB2, EB	Bridge: Seventh Street over LA River[2]	Bridge ID: 53C-1321	Los Angeles
WB1, WB2, EB	Bridge: Sixth Street Bridge over the LA River[2]	Bridge ID: 53C-1880	Los Angeles
WB1, WB2	Bridge: Washington Boulevard over the LA River[2]	Bridge ID: 53C-1375	Los Angeles
BRT	Congregation Talmud Torah of Los Angeles/Breed Street Shul	247 N. Breed St.	Los Angeles
WB3	Fire Station No. 23	225 E. 5th St.	Los Angeles
WB3	Fire Station No. 30--Engine Company No. 30	1401 S. Central Ave.	Los Angeles
WB1, WB2, WB3, EB, BRT	Little Tokyo Historic District	301--369 First and 106--120 San Pedro Sts.	Los Angeles
WB1, WB2, WB3, EB, BRT	Los Angeles Union Passenger Terminal	800 N. Alameda St.	Los Angeles
WB1, WB2, WB3, EB, BRT	Los Angeles Plaza Historic District	10 Olvera St.	Los Angeles
WB3	San Fernando Building, The	400--410 S. Main St.	Los Angeles
WB1, WB2, BRT	Santa Fe Coast Lines Hospital	610-30 S. Louis St.	Los Angeles
WB2, WB3	Santa Fe Freight Depot	970 E. 3rd St.	Los Angeles
WB1, WB2, EB, BRT	Sears, Roebuck & Company Mail Order Building	2650 E. Olympic Blvd.	Los Angeles
WB1, WB2, WB3, EB, BRT	Spring Street Financial District	401 S. Main St. and 405-11 S. Main St.	Los Angeles
WB1, WB2, WB3, EB, BRT	US Court House and Post Office	312 N. Spring St.	Los Angeles
WB3	US Post Office--Los Angeles Terminal Annex	900 Alameda St.	Los Angeles
Westminster/17th Street Harbor/1st Street	Builders Exchange Building	202--208 N. Main St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Downtown Santa Ana Historic Districts (North, Government/Institutional and South, Retail)	Roughly bounded by Civic Center Dr., First, Ross, and Spurgeon Sts.	Santa Ana
Westminster/17th Street Harbor/1st Street	Ebell Society of Santa Ana Valley	625 N. French St.	Santa Ana
Westminster/17th Street Harbor/1st Street	French Park Historic District	Roughly bounded by N. Bush, E. Washington, and N. Garfield Sts., and Civic Center Dr. E.	Santa Ana
Westminster/17th Street Harbor/1st Street	Harmon-McNeil House	322 E. Chestnut St.	Santa Ana
Westminster/17th Street	Howe-Waffle House and Carriage	Sycamore and Civic	Santa Ana

Alternative	Cultural Resource	Address[1]	City
Harbor/1st Street	House	Center Dr.	
Westminster/17th Street Harbor/1st Street	Lighter-than-Air Ship Hangars	Valencia and Redhill Aves.	Santa Ana
Westminster/17th Street Harbor/1st Street	Minter, George W., House	322 W. 3rd St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Odd Fellows Hall	309-311 N. Main St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Orange County Courthouse	211 W. Santa Ana Blvd.	Santa Ana
Westminster/17th Street Harbor/1st Street	Pacific Electric Sub-Station No. 14	802 E. 5th St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Rankin Building	117 W. 4th St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Santa Ana City Hall	217 N. Main St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Santa Ana Fire Station Headquarters No. 1	1322 N. Sycamore St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Santora Building	207 N. Broadway	Santa Ana
Westminster/17th Street Harbor/1st Street	Smith-Tuthill Funeral Parlors	518 N. Broadway	Santa Ana
Westminster/17th Street Harbor/1st Street	Southern Counties Gas Co.	207 W. 2nd St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Spurgeon Block	206 W. 4th St	Santa Ana
Westminster/17th Street Harbor/1st Street	US Post Office Station--Spurgeon Station	605 Bush St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Walkers Orange County Theater	308 N. Main St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Wright, George L., House	831 N. Minter St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Yost Theater--Ritz Hotel	301--307 N. Spurgeon St.	Santa Ana
Westminster/17th Street Harbor/1st Street	Young Men's Christian Association--Santa Ana-Tustin Chapter	205 W. Civic Center Dr.	Santa Ana
California Register of Historic Properties			
WB1, WB3, EB	La Mesa Battlefield	4490 Exchange Avenue at Downey Road	Vernon
WB1, WB2, WB3, EB, BRT	No. 156 Los Angeles Plaza	500 Block of North Main Street	Los Angeles
WB2, WB3, BRT	No. 656 Bella Union Hotel Site; Fletcher Bowron Square	300 block of N Main, between Temple and Aliso Street	Los Angeles
WB3	No. 744 The Mirror Building (Site of Butterfield Stage Station)	145 South Spring Street	Los Angeles

Alternative	Cultural Resource	Address[1]	City
WB2, WB3, BRT	Fox West Coast California Theater	6524 Pacific Boulevard	Huntington Park
WB2, WB3, BRT	The Woman's Club of Huntington Park	6828 Rugby Avenue	Huntington Park
WB2, WB3, BRT	Warner Brothers Huntington Theater	6710 Pacific Boulevard	Huntington Park
Historic Places under Local Listings			
WB1, WB2, EB	Boyle Hotel - Cummings Block	101-105 North Boyle Avenue	Los Angeles
WB1, WB2, EB	Commerce Engineer Co Foundry Company	2416-2454 Porter Street	Los Angeles
BRT	Ellis Residence	1914 Michigan Avenue	Los Angeles
WB1, WB2, EB	Gless Farmhouse	131 South Boyle Street	Los Angeles
WB1, WB2, EB	Granite Block Paving (between Alameda and N Main Street)	Bruno Street	Los Angeles
WB1, WB2, EB	International Institute	435 South Boyle Avenue	Los Angeles
WB1, WB2, EB	National Biscuit Company	1850 Industrial Street	Los Angeles
BRT	Old 6th Street Wooden Bridge (Former Site of)	Across Hollenbeck Park Lane	Los Angeles
WB1, WB2, EB	Residence	2700 Eagle Street	Los Angeles
WB1, WB2, EB	Residence	1030 Cesar E. Chavez Avenue	Los Angeles
WB1, WB2, EB	Residence of 1620 Pleasant Avenue (Former Site of)	1620 Pleasant Avenue	Los Angeles
WB1, WB2, EB	Rhodes Residence	325-327 South State Street	Los Angeles
WB1, WB2, EB	River Station Area	1231 North Spring Street	Los Angeles
WB1, WB2, EB	Santa Fe Inbound Freight House	355 South Santa Fe	Los Angeles
WB1, WB2, EB	Southern California Gas Company Administration Building	1700 South Santa Fe Avenue	Los Angeles
WB1, WB2, EB	Union Station Passenger Terminal Grounds	357 Aliso Street	Los Angeles
WB1, WB2, WB3, EB, BRT	Brownell-Carlson House	7030 Marconi Street	Huntington Park
WB2, WB3, BRT	Civic Center	6550 Miles Avenue	Huntington Park
WB2, WB3, BRT	Garlow House	6610 Malabar Avenue	Huntington Park
WB2, WB3, BRT	Home	6125 Rugby Avenue	Huntington Park
WB2, WB3, BRT	Home	6139 Rugby Avenue	Huntington Park
WB2, WB3, BRT	Home	6205 Rugby Avenue	Huntington Park
WB2, WB3, BRT	Laguna Residence	2743 East 57th Street	Huntington Park
BRT	Malabar Street Historic District (MSHD) : 1926 One Colonial bungalow	2468 Saturn Avenue	Huntington Park
BRT	Moore-Sanchez House	6727 Santa Fe Avenue	Huntington Park
BRT	MSHD: 126 two building Spanish court	7111-7113 Malabar Street	Huntington Park
BRT	MSHD: 1921 Craftsman bungalow	6915 Malabar Street	Huntington Park
BRT	MSHD: 1921 Craftsman bungalow	7029 Malabar Street	Huntington Park

Alternative	Cultural Resource	Address[1]	City
BRT	MSHD: 1922 Spanish duplex	6914-9616 Malabar Street	Huntington Park
BRT	MSHD: 1923 Colonial bungalow	7005 Malabar Street	Huntington Park
BRT	MSHD: 1923 four building Colonial court	7110-7112 Malabar Street	Huntington Park
BRT	MSHD: 1923 four building Spanish court	7016-7018 Malabar Street	Huntington Park
BRT	MSHD: 1923 Spanish duplex	7012-7014 Malabar Street	Huntington Park
BRT	MSHD: 1924 Six building English court	7103-7105 Malabar Street	Huntington Park
BRT	MSHD: 1924 Spanish Court	7017-7019 Malabar Street	Huntington Park
BRT	MSHD: 1925 Tudor half court	7120 Malabar Street	Huntington Park
WB2, WB3, BRT	MSHD: 1926 Spanish duplex	2472-2746 Saturn Avenue; 6901 Malabar Street	Huntington Park
BRT	MSHD: 1940 U-shaped minimal traditional court apartment	6920-6922 Malabar Street	Huntington Park
BRT	MSHD: 1946 Minimal Half Court	7023 Malabar Street	Huntington Park
BRT	MSHD: Two 1921 & 1923 colonial bungalow with garage; 1948 Apt building	6909 Malabar Street	Huntington Park
WB1, WB3, EB	Newell Residence	6700 Newell Street	Huntington Park
WB2, WB3, BRT	Post Office	6606 Sevile Avenue	Huntington Park
WB2, WB3, BRT	Queen Anne Residence	2458 Randolph Street	Huntington Park
WB1, WB2, WB3, EB	Squire Residence	3427 Olive Street	Huntington Park
WB1, WB2, WB3, EB	St. Matthias Church	3095 East Florence Avenue	Huntington Park
WB2, WB3, BRT	Warner Theater	6714 Pacific Boulevard	Huntington Park
PEROW/WSAB ROW	Pacific Electric Train Depot	Mayne Street & Bellflower Boulevard	Bellflower
PEROW/WSAB ROW	Garden Grove Historic Main Street	Main Street	Garden Grove

Source: AECOM 2011
[1]Historic properties located within 0.5 mile of the proposed alignments and stations.
[2]These properties are eligible for inclusion to NHRP.
CRHP = California Register of Historic Places; NRHP = National Register of Historic Places;
WB1 = West Bank Alternative 1; WB2 = West Bank Alternative 2; WB3 = West Bank Alternative 3; EB = East Bank Alternative; BRT = Bus Rapid Transit Northern Alignment Alternative; Westminster Boulevard/17th Street/Main Street Alternative; Harbor Boulevard/1st Street/SARTC Alternative

Figure 4.3 – Los Angeles County Historical Resources

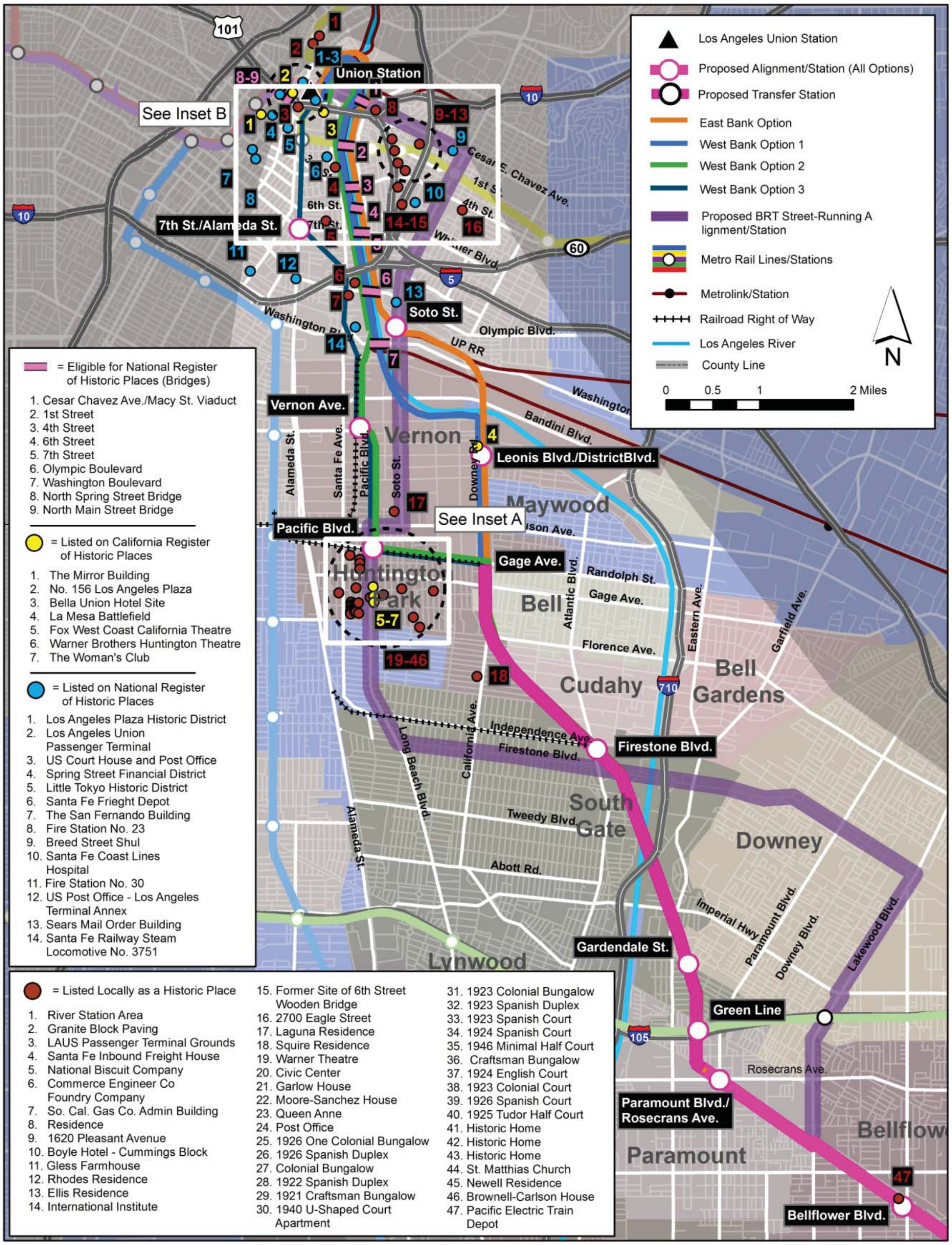


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Figure 4.4 – Historic Resources Huntington Park and Los Angeles Insets

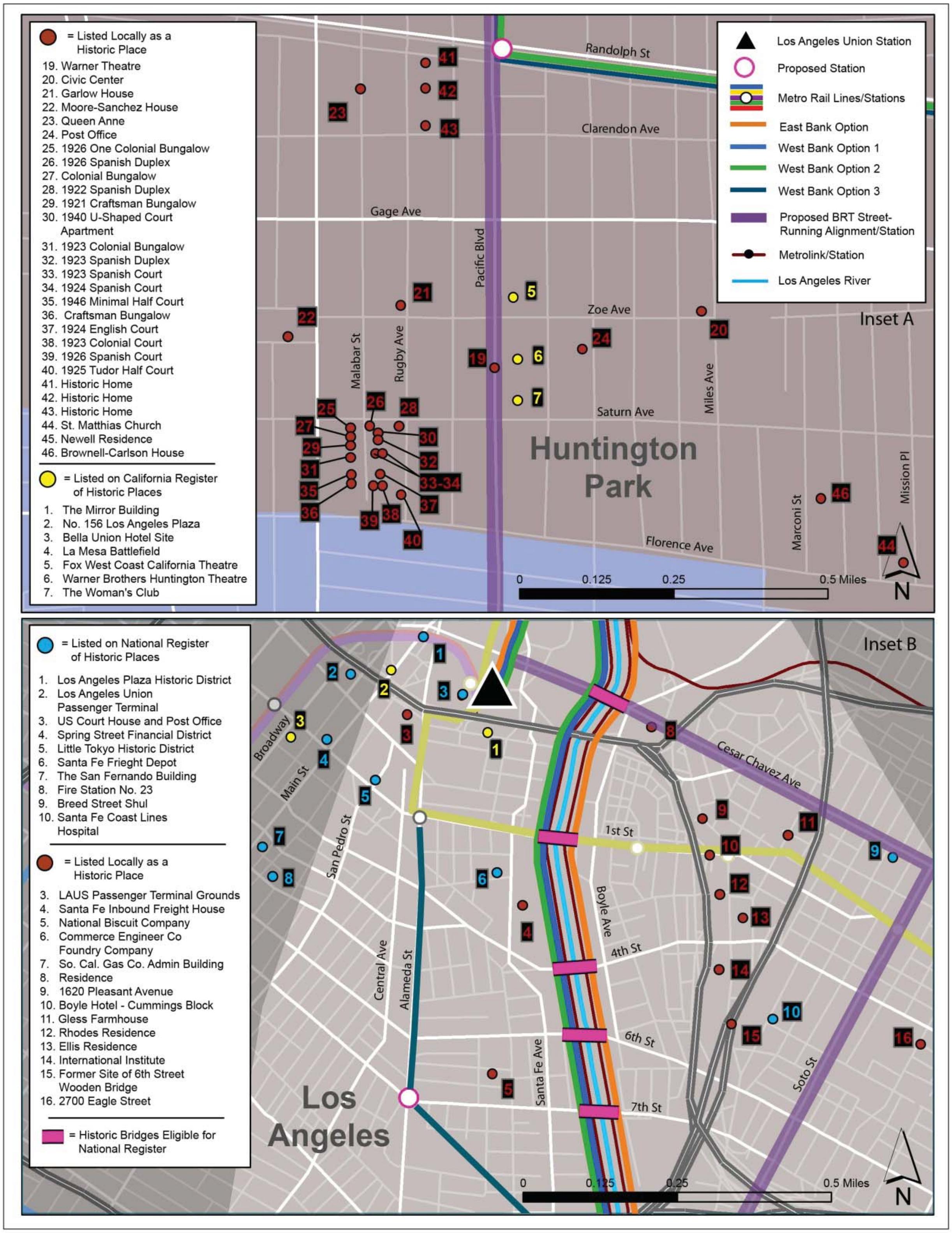
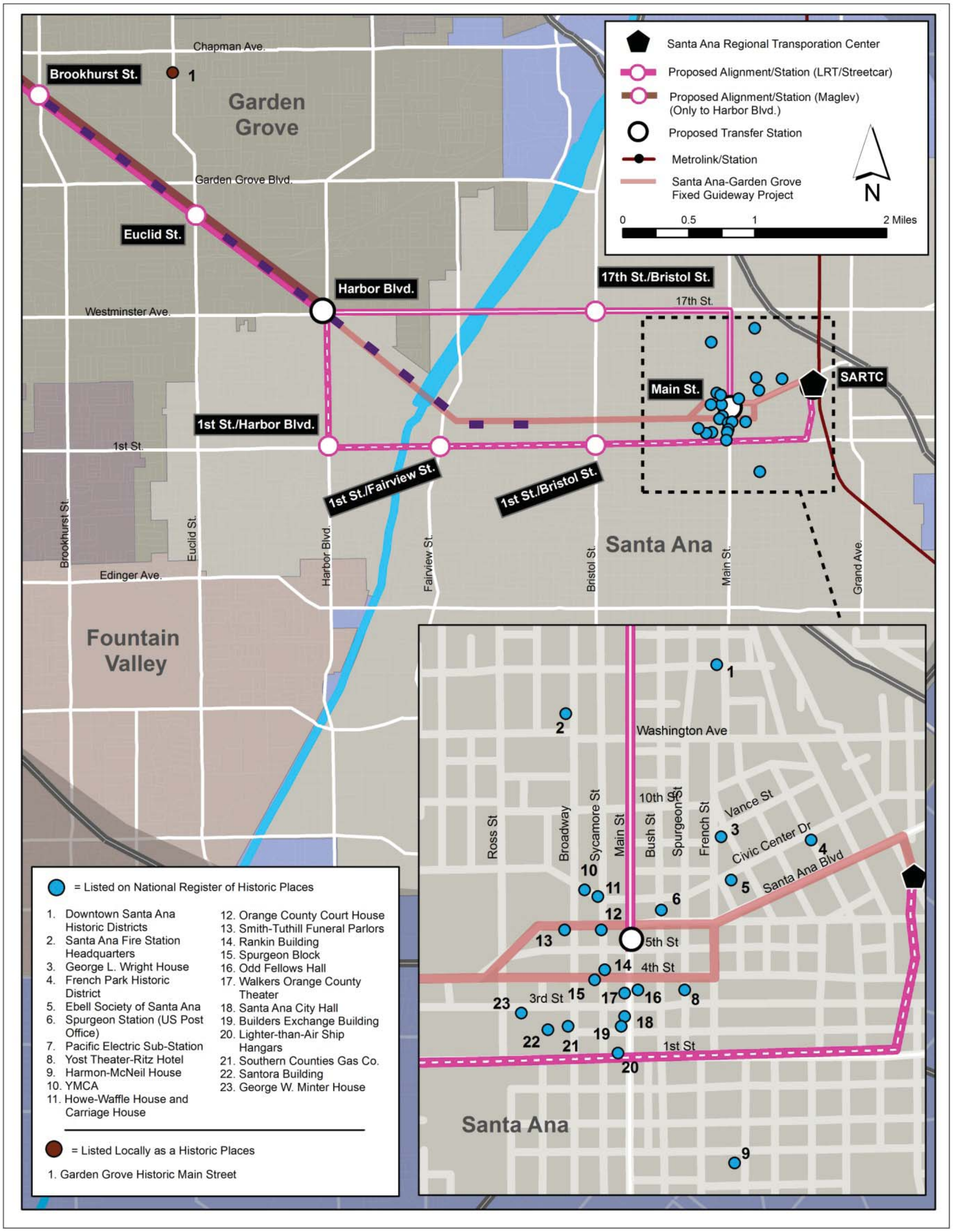


Figure 4.5 – Orange County Historical Resources



Cultural Resources Potential Impacts

Conditions in the PEROW/WSAB Corridor vary from densely-developed areas obscured by buildings, pavement and concrete to vacant properties with unmaintained landscaping. Potential impacts to cultural resources are when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that quality for the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. Some examples of these impacts include, but are not limited to:

- Physical destruction of or damage to all or part of the property;
- Alternation of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access;
- Removal of the property from its historic location;
- Change of the character of the property's use or physical features within the property's setting that contributes to its historic features; and
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features.

The criteria above apply to "historic properties": archaeological, historic and architectural resources that are listed in or eligible for listing in the NRHP.

In areas containing archaeological and paleontological sensitive units, certain ground disturbance has the potential to impact known and unknown surface and subsurface fossils and/or resources. These resources will be identified and analyzed in detail in proceeding environmental phases of the project.

4.5 Air Quality

This section describes existing air quality conditions, the regulatory framework, and potential impacts from the construction and operation of the TSM and build alternatives. Air emissions will primarily be generated during construction, with minimal operational impacts. The significance of potential air quality impacts were determined using criteria established through CEQA and adopted by the South Coast Air Quality Management District (SCAQMD).

4.6.1 Affected Environment

The proposed TSM and build alternatives are located in the counties of Los Angeles and Orange, within the South Coast Air Basin (SCAB). The SCAB is a sub-area of the SCAQMD jurisdiction that is bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. It is a 6,600-square-mile area that encompasses all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino counties. In terms of overall air quality, the SCAB is considered to have some of the worst air quality in the U.S. The SCAQMD is the regulatory agency responsible for ensuring that the SCAB meets or has plans to meet both Federal and State air quality standards.

Ambient Air Quality

Health-based air quality standards have been established by the U.S. Environmental Protection Agency (USEPA) and the California Air Resources Board (CARB) for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter less than 10 microns (PM_{10}) and 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead. The Federal standards are called National Ambient Air Quality Standards (NAAQS), and the California standards are called California Ambient Air Quality Standards (CAAQS).

The USEPA classifies air basins as either attainment or “non-attainment” for each criteria pollutant based on whether or not the NAAQS have been achieved. Some air basins have not received sufficient analysis for certain criteria air pollutants and are designated as “unclassified” for those pollutants. Similarly, areas have been designated as attainment, non-attainment, or unclassified with respect to the CAAQS. The CAAQS and NAAQS and the corresponding attainment status for the SCAB are listed in Table 4.6. The SCAB is non-attainment for both the Federal and State ozone, PM_{10}, and $PM_{2.5}$ standards.

The SCAB has until 2021 to achieve the Federal 8-hour ozone ambient air quality standard, and has requested a 5-year extension from the USEPA due to the severity of the $PM_{2.5}$ problem.

Table 4.6 – State and Federal Ambient Air Quality Standards

South Coast Air Basin Attainment Status					
Pollutant	**Averaging Time**	**California Standards (CAAQS)**		**Federal Standards (NAAQS)**	
		Concentration	**Attainment Status**	**Concentration**	**Attainment Status**
Ozone	1-hr	0.09 ppm	Non-attainment (moderate)	--	--
	8-hr	0.070 ppm	Non-attainment (moderate)	0.075 ppm	Non-attainment (Severe-17)
PM_{10}	24-hr	50 µg/m^3	Non-attainment	150 µg/m^3	Non-attainment (Serious)
	Annual Arithmetic Mean	20 µg/m^3	--		--
$PM_{2.5}$	24-hr	No separate state standard	Non-attainment	35 µg/m^3	Non-attainment
	Annual Arithmetic Mean	12 µg/m^3	--	15 µg/m^3	--
Carbon Monoxide (CO)	8-hr	9.0 ppm	Attainment/ Unclassifiable	9 ppm	Attainment/ Unclassifiable
	1-hr	20.0 ppm	--	35 ppm	--
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm	--	0.053 ppm	--
	1-hr	0.18 ppm	Attainment/ Unclassifiable	0.1 ppm	Attainment/ Unclassifiable
Sulfur Dioxide (SO_2)	24-hr	0.04	Attainment/ Unclassifiable	--	Attainment/ Unclassifiable
	1-hr	0.25 ppm	--	0.075 ppm	--

Source: California Air Resources Board; USEPA Green Book

The SCAQMD has 38 air quality monitoring stations that monitor and collect ambient air quality measurements for these specific pollutants within the basin. The nearest monitoring station to the study area is located in Anaheim, 4 miles northeast of the proposed alignment. Peak ambient air quality concentrations and the number of monitored days above the designated standard for the latest 3 years for which data are available, 2007–2009, are presented in Table 4.7.

As shown in Table 4.5, CO, NO_2 and SO_2 concentrations recorded at the nearby monitoring station are well below federal and state standards. Ozone concentrations have exceeded federal and state AAQS between 2006 and 2008. Measured PM_{10} and $PM_{2.5}$ concentrations at the monitoring stations have also exceeded state standards over the past three years.

Table 4.7 – Background Air Quality Data (2007 - 2009)

Maximum Observed Concentration (Number of Standard Exceedances - most restrictive)					
Constituent	State Standard	Federal Standard	2007	2008	2009
CO					
1-hr	20.0 ppm	35.0 ppm	4 (0)	4 (0)	3 (0)
8-hr	9.0 ppm	9.5 ppm	2.9 (0)	3.6 (0)	2.7 (0)
Ozone					
1-hr	0.09 ppm	0.12 ppm	0.127 (2)	0.105 (2)	0.093 (0)
8-hr	0.07 ppm	0.08 ppm	0.099 (7)	0.086 (10)	0.077 (2)
NO_2					
1-hr	0.25 ppm	---	0.10 (0)	0.09 (0)	0.07 (0)
Annual	---	0.053 ppm	0.0208 (0)	0.0203 (0)	0.0179 (0)
SO_2					
1-hr	0.25 ppm	---	--	--	--
3-hr	---	0.5 ppm	--	--	--
24-hr	0.04 ppm	0.14 ppm	--	--	--
Annual	---	0.03 ppm	--	--	--
PM_{10}					
24-hr	50 $\mu g/m^3$	150 µg/m3	75 (5)	61 (3)	63 (1)
Annual	20 $\mu g/m^3$	--	31.0	28.6	30.9
$PM_{2.5}$					
24-hr	12 $\mu g/m^3$	65 $\mu g/m^3$	79.4 (14)	67.9 (13)	64.6 (4)
Annual	--	35 $\mu g/m^3$	14.5	13.7	11.8

Notes: '---' denotes insufficient or no data.
Source: SCAQMD Historical Data; available at: www.aqmd.gov/smog.

4.5.2 Applicable Laws and Regulations

Most federal programs to monitor and regulate stationary source emissions are delegated to regional air quality management districts, such as the SCAQMD, in California. State programs administered through the CARB primarily control air quality pollutants from the operation of mobile sources. Federal, state and local authorities have adopted various rules and regulations requiring evaluation of the impact on air quality of a planned project and appropriate mitigation for air pollutant emissions. There are several federal regulations that govern the assessment and consideration of regional and local air quality impacts. These regulations establish health-based standards and evaluation criteria for assessment of impacts.

The Federal Clean Air Act (CAA) was adopted in 1963 to improve air quality and protect citizen's health and welfare. The CAA established two types of national air quality standards: primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly, and secondary standards set limits to protect public welfare, including protection against decreased visibility, or damage to animals, crops, vegetation, and buildings. The USEPA has established NAAQS for six principal or "criteria" pollutants.

The EPA's Transportation Conformity Rule (40 Code of Federal Regulations (CFR) Parts 51 and 93) was established to implement requirements set forth in the CAA specific to transportation plans, programs and projects. The Conformity Rule requires Metropolitan Planning Organizations (e.g., SCAG), the Federal Highway Administration (FHWA) and the FTA to make conformity determinations on transportation and transit projects prior to approval. Projects that are funded or approved by the FTA must conform to the regulatory requirements by resulting in operational emissions below the applicable conformity thresholds (de minimus thresholds).

The California Clean Air Act (CCAA), administered by the CARB, requires that each area exceeding the state ambient air quality standards develop a plan aimed at achieving those standards. The California Health and Safety Code, Section 40914, requires air districts to design a plan that achieves an annual reduction in district-wide emissions of 5 percent or more, averaged every consecutive 3-year period. To satisfy this requirement, the local Districts' are required to develop and implement air pollution reduction measures, which are described in their Air Quality Management Plans (AQMPs) and outline strategies for achieving the state ambient air quality standards for criteria pollutants for which the region is classified as non-attainment.

The CARB establishes and enforces emission standards for motor vehicles, fuels, and consumer products; establishes health-based air quality standards; conducts research; monitors air quality; identifies and promulgates control measures for Toxic Air Contaminants (TACs); provides compliance assistance for businesses; produces education and outreach programs and materials; and oversees and assists local air quality districts that regulate most non-vehicular sources of air pollution.

The CARB is responsible for regulating and reducing emissions from mobile sources. Specifically, the CARB's In-Use Off-road Diesel Vehicle Regulation establishes various requirements for owners of off-road diesel vehicles equipped with engines of 25 horsepower (HP) or greater, including reporting and recordkeeping, limits on non-essential idling (5 minute limit), and emission performance requirements effective January 2014.

CEQA requires projects to evaluate the potential local level of CO impacts of a project. Elevated levels of CO typically occur in urbanized areas and are typically measured at roadway intersections where there is increased congestion from mobile sources including cars and trucks. CO concentrations vary considerably over longer distances; therefore, areas with higher levels of CO concentrations are referred to as “hot spots.” Projects that could increase CO concentrations, such as transportation-related projects, are required to evaluate the potential for a CO hotspot at roadway intersections. Per 40 CFR Part 93.123 (c)(5), analysis of CO hotspots are not required to consider construction-related activities, which result in temporary increases in emissions.

The SCAQMD is the regional agency responsible for regulation and enforcement of federal, state, and local air pollution control regulations in the South Coast Air Basin (SCAB). The SCAQMD operates monitoring stations in the SCAB, develops and enforces rules and regulations for stationary sources and equipment, prepares emissions inventory and air quality management planning documents, and conducts source testing and inspections.

Each of the local jurisdictions within the study area have established goals and policies within the General Plan, designed to achieve regional attainment status with the NAAQS and CAAQS, as well as goals to reduce fugitive dust generated during construction activities.

4.5.3 Evaluation Methodology

Emission sources during operation include regional vehicle miles traveled (VMT), worker commute trips, and transit service. Based on limited data availability prior to project design, air quality impacts have been evaluated based on predicted regional VMT reductions due to implementation of the TSM, BRT, and build alternatives compared to existing conditions.

4.5.4 Air Quality Assessment

This section evaluates the potential air quality and climate change impacts and benefits from implementation of the various modal alternatives considered in this AA study, compared to the No Build Alternative. The alternatives include No Build, TSM, BRT, Street Car, LRT and Low Speed Maglev. Various alternatives include alignment options, which have also been evaluated to identify the alternative which could result in the greatest air quality and/or climate change benefit. A detailed description of each alternative and alignment is included in Section 1.0 and 2.0 of this report.

Operational impacts of each alternative have been evaluated based on the reduction in VMT compared to the No Build Alternative, as presented in Table 4.8.

Table 4.8 – Daily Emissions Summary (lb/day)

Incremental Change in Daily Emissions Compared to No Build Alternative						
Alternative	Criteria Pollutant					
	VOC	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
No Build	133,788.75	144,697.65	1,634,870.21	5,770.04	938,283.25	181,617.40
TSM	(186.00)	(201.16)	(2,272.79)	(8.02)	(1,304.40)	(252.49)
BRT-HOV	(381.24)	(412.32)	(4,658.58)	(16.44)	(2,673.65)	(517.82)
BRT-Street	(298.11)	(322.42)	(3,642.83)	(12.85)	(2,090.69)	(404.68)
LRT East Bank	(389.52)	(421.28)	(4,759.81)	(16.80)	(2,731.75)	(528.77)
LRT West Bank 2	(376.61)	(407.32)	(4,602.01)	(16.24)	(2,641.18)	(511.24)
LRT West Bank 3	(386.35)	(417.86)	(4,721.12)	(16.66)	(2,709.54)	(524.47)
Street Car West Bank 3	(353.70)	(382.54)	(4,322.04)	(15.25)	(2,480.50)	(480.14)
Low Speed Maglev West Bank 3	(361.49)	(390.97)	(4,417.30)	(15.59)	(2,535.17)	(490.72)

Implementation of the proposed alternatives would reduce commuter VMT and mobile source exhaust emissions generated during daily commuter trips, when compared to the No Build Alternative. Reducing mobile source exhaust emissions would result in local and regional air quality benefits and would be consistent with regional air quality attainment goals.

Summary

The proposed TSM and build alternatives will result in emissions of criteria pollutants, TACs, and greenhouse gases during construction and operation. GHG emissions and their potential impacts are evaluated in the Climate Change Section. Metro has adopted the Green Construction Policy which would result in NOx, PM_{10}, PM_{25} and GHG emissions reductions. However, due to the level of anticipated construction activity associated with the Build Alternatives, it is anticipated that construction emission impacts would result in a potentially significant impact for NOx emissions.

Annual regional VMT is expected to decrease as a result of the TSM or build alternatives. Therefore, emissions generated from on-road vehicles are anticipated to decrease, resulting in a regional and localized air quality benefit.

4.6 Climate Change

The regulatory framework, methodology and significance thresholds used to analyze climate change impacts are described in the following sections.

4.6.1 Affected Environment

Climate change, often referred to as "global warming" is a global environmental issue that refers to any substantial change in measures of climate including temperature, precipitation, or wind which extends for a period (decades or longer) of time. Climate change is a result of both natural factors, such as volcanic eruptions, and anthropogenic, or man-made, factors including changes in land use and burning of fossil fuels (EPA, 2010). Anthropogenic activities, such as deforestation and fossil fuel combustion, emit heat-trapping GHG emissions. GHGs are defined as any gas that absorbs infrared radiation within the atmosphere, which is referred to as a "Global Warming Potential" (GWP). Each GHG has a GWP, which is a value based on the heat-absorbing ability of each gas relative to the heat trapping potential of CO_2. GHGs include, but are not limited to: water vapor, CO_2, CH_4, N_2O, and chlorofluorocarbons (CFCs).

GHGs, both naturally-occurring and anthropogenic, prevent heat from escaping the atmosphere and thereby regulate the Earth's temperature. Anthropogenic sources of GHGs have elevated GHG concentrations within the atmosphere, which has led to an increase in the Earth's average surface temperature. According to National Oceanic and Atmospheric Administration and National Aeronautics and Space Administration data, the Earth's average surface temperature has increased by about 1.2 to 1.4 degrees Fahrenheit (ºF) in the last century. The eight warmest years on record (since 1850) have all occurred since 1998, with the warmest year being 2005. Based on available data, the rise in temperature is most likely due to anthropogenic sources (EPA, 2010). Unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern, GHGs are global pollutants and climate change is a global issue. Six recognized GHGs are described below.

- **Carbon Dioxide (CO_2)** is a colorless odorless gas. Natural sources include: decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic degassing. Anthropogenic sources of carbon dioxide include burning fuels, such as coal, oil, natural gas and wood.
- **Chlorofluorocarbons (CFCs)** are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. CFCs are nontoxic, nonflammable, insoluble and chemically nonreactive in the troposphere (the level of air at the Earth's surface).
- **Methane (CH_4)** is a gas that is the main component of natural gas used in homes. Methane forms naturally from the decay of organic matter.
- **Nitrous Oxide (N_2O),** also known as laughing gas, is a colorless gas. N_2O is produced by microbial processes in soil and water, including those reactions which occur in nitrogen-rich fertilizers.

- **Ozone (O_3)** is a GHG; however, unlike the other GHGs, ozone in the troposphere is relatively short-lived and, therefore, is not global in nature.
- **Water Vapor** is the most abundant and variable GHG in the atmosphere. It is not considered to be a pollutant; it maintains a climate necessary for life in the atmosphere.

National and State Greenhouse Gas Inventories

The EPA publication Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2008, provides a comprehensive emissions inventory of the nation's primary anthropogenic sources of GHG emissions. In 2008, total US GHG emissions were approximately 6,956.8 million $MTCO_2e$, 84.1 percent of which was from the combustion of fossil fuels. Sources of fossil fuel combustion include electricity generation, transportation sources, industrial processes and residential/commercial sources (EPA, 2010).

California is the second largest contributor in the U.S. and the 16th largest in the world. In 2004, CARB conducted a detailed inventory of statewide sources and estimated a statewide emission of 484 million $MTCO_2e$; the two largest contributors were the transportation and industrial sectors, accounting for 38 and 20 percent, respectively, of total CO_2e emissions. Transportation sources are the fastest-growing source of GHG emissions in the U.S., accounting for 47 percent of the net increase in total emissions since 1990 (EPA, 2010). Nearly 97 percent of transportation GHG emissions are generated through direct combustion of fossil fuels, while the remaining 3 percent is generated through electric-driven services, such as rail service (United States Department of Transportation, 2006). Electricity production, agriculture, forestry, commercial and residential activities comprise the balance of California's GHG emissions inventory.

4.6.2 Applicable Laws and Regulations

The Intergovernmental Panel on Climate Change (IPCC) is the leading body for the assessment of climate change. The IPCC is a scientific body that reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. The scientific evidence brought up by the first IPCC Assessment Report of 1990 unveiled the importance of climate change as a topic deserving a political platform among countries to tackle its consequences. It, therefore, played a decisive role in leading to the creation of the United Nations Framework Convention on Climate Change (UNFCCC), the key international treaty to reduce global warming and cope with the consequences of climate change.

The CAA is the law that defines the USEPA responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. Until recently, GHG emissions have not been regulated under the CAA; however, a 2007 Supreme Court case, Massachusetts v. EPA (Supreme Court Case 05-1120), found that GHG emissions from motor vehicles were air pollutants covered by the CAA. In response to the ruling, the EPA and the U.S. Department of Transportation's National Highway Traffic Safety Administration announced a joint final rule establishing a "National Program," which was designed to decrease GHG emissions and improve fuel economy through implementation of carbon dioxide (CO_2) emission standards for motor vehicles.

On December 7, 2009, the EPA Administrator signed two distinct findings regarding GHGs under Section 202(a) of the CAA. These included:

- The Endangerment Finding: The current and projected concentrations of the six key well-mixing GHGs – carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride – in the atmosphere threaten the public health and welfare of current and future generations.
- Cause of Contribute Finding: The EPA Administrator finds that the combined emissions of these well-mixing GHGs from new motor vehicles and (new motor) engines contribute to GHG pollution which threatens public health and welfare.

Assembly Bill 32 California Global Warming Solutions Act of 2006 California's major initiatives for reducing climate change or GHG emissions are outlined in Assembly Bill (AB) 32 (signed into law in 2006). These initiatives require GHG emissions to be reduced to 1990 levels by 2020 – a reduction of about 25 percent – and to be reduced 80 percent below 1990 levels by 2050. The AB 32 Scoping Plan contains the main strategies California will use to reduce the GHG emissions that cause climate change. Pursuant to AB 32, the CARB adopted the Climate Change Scoping Plan (CCSP) which outlines how emissions reduction will be achieved from significant sources of GHGs via regulations, market mechanisms, and other actions.

Senate Bill (SB) 375, which was signed into law in September 2008, establishes regional targets for reducing GHG emissions from passenger vehicles. Recommendations and strategies designed to support metropolitan planning organizations (SCAG in the case of the Los Angeles area) in the development of effective regional targets are provided in the 2009 Final Regional Targets Advisory Committee Report. Specific regional targets have yet to be developed; however, the AB 32 Scoping Plan presents a general regional transportation-related GHG reduction target of five million $MTCO_2e$ by 2020.

4.6.3 Evaluation Methodology

The methodology used to analyze the proposed project alternatives' contribution to global climate change includes an evaluation based on predicted regional VMT reductions due to implementation of the TSM, BRT, and build alternatives compared to existing conditions. Mobile source GHG emissions were evaluated using the CARB-approved URBEMIS model, version 9.2.4. Emissions from the proposed alternatives were compared to existing conditions (2011) to determine the net decrease in VMT and subsequent emissions reductions resulting from project implementation. Following completion of the AA study, a more detailed GHG emissions impact analysis would be included in future study efforts.

4.6.4 Climate Change and Emissions Assessment

Annual regional VMT is expected to decrease as a result of implementation of the TSM or build alternatives. Therefore, GHG emissions, evaluated in Metric Tons of Carbon Dioxide Equivalents (MTCO2/Yr) per year, generated from on-road vehicles are anticipated to decrease, resulting in a regional reduction in GHG emissions and climate change impacts, as presented in Table 4.9.

Table 4.9 – Annual Emissions Summary (MTCO2)

Incremental Change Compared to No Build	
Alternative	**$MTCO_2$/Yr**
No Build	91,316,365.0
TSM	(126,947.7)
BRT HOV-Running	(260,207.4)
BRT Street-Running	(203,472.1)
LRT East Bank	(265,879.6)
LRT West Bank 2	(257,047.3)
LRT West Bank 3	(263,700.6)
Street Car West Bank 3	(241,409.4)
Low Speed Maglev West Bank 3	(246,730.3)

It is anticipated that the net emissions impacts from construction and operation would not result in a significant contribution to regional or global climate change. In addition, based on the reduction in regional VMT, it is anticipated that the TSM and build alternatives would contribute to the state-wide reduction targets for the transportation sector per AB 32. Therefore, consistency with existing plans and policies geared towards reducing GHG emissions and climate change impacts is expected based on implementation of any of proposed modal alternatives.

Summary

The proposed TSM and build alternatives will result in emissions of GHG during construction and operation. It is anticipated that the net emissions impacts from construction and operation would not result in a significant contribution to regional or global climate change. Based on the reduction in regional VMT, it is anticipated that the TSM and build alternatives would contribute to the state-wide reduction targets for the transportation sector per AB 32. In addition, Metro's Green Construction Policy is geared towards the use of new model construction equipment, consistent with the CARB's In-Use Off-Road Diesel Regulation, and would result in reductions of CO_2 during equipment operation. Therefore, consistency with existing plans and policies geared towards reducing GHG emissions and climate change impacts is expected.

Climate Change and Air Quality Comparative Summary

The preliminary analysis is based on reductions in regional VMT, which represents the best available data at the time of the AA study. Additional onsite and offsite sources of operational emissions contributing to the impacts and benefits of each alternative would be evaluated as part of future study efforts.

A comparative summary of each alternative is presented in Table 4.10, based on the level of criteria pollutant and GHG emission reduction, compared to the No Build Alternative. The comparative summary is presented on a "rating scale." The rating scale ranges from 1 to 5; a rating of "5" indicates the greatest reduction in criteria pollutant and GHG emissions, and a rating of "1" indicates the least reduction in criteria pollutant and GHG emissions. The ratings are presented by general modal type in Table 4.10.

Table 4.10 – Air Quality and Climate Change Benefits - Comparative Summary

Modal Option	Rating[1]	Description
TSM Alternative	1	Could adversely impact air quality and climate change because it produces some mobile source emissions from combustion of natural gas or other alternative fuel type.
BRT Alternatives(HOV-Running)	4	Could adversely impact air quality and climate change because it produces some mobile source emissions from combustion of natural gas or other alternative fuel type.
LRT Alternatives	5	Does not adversely impact air quality because it is electrified and does not result in mobile source emissions. Could adversely impact climate change because it requires off-site electricity generation for transit power; electricity is assumed to meet renewable portfolio standard (RPS).
Street Car Alternative	2	Does not adversely impact air quality because it is electrified and does not result in mobile source emissions. Could adversely impact climate change because it requires off-site electricity generation for transit power; electricity is assumed to meet RPS.
Low Speed Maglev Alternative	3	Does not adversely impact air quality because it is electrified and does not result in mobile source emissions. Could adversely impact climate change because it requires off-site electricity generation for transit power; electricity is assumed to meet RPS.

Notes: 1. Rating is based on reduction in commuter VMT compared to the No Build Alternative, which represents the best available data at the time of the Alternative's Analysis.

In conclusion, the electrified modes, including LRT and Low Speed Maglev, and BRT alternatives are anticipated to provide the greatest benefit in terms of air quality and GHG emissions, while the TSM and Street Car modes would result in a lesser beneficial impact due to lower reductions in commuter VMT. While the electric-driven options would result in climate change impacts due to electrical demand, compared to the TSM and BRT options, it has been assumed that these alternatives would receive power from generators meeting the California RPS. Therefore, any offsite impacts would continue to be reduced through statewide efforts aimed at reducing GHG emissions from power generators.

4.7 Energy

This section describes the affected environment, regulatory framework, evaluation methodology, and alternative energy analysis by mode.

4.7.1 Affected Environment

Transportation is a major consumer of energy in the Southern California region with various energy service providers serving the region. Within the study area, the Los Angeles Department of Water and Power (LADWP), City of Anaheim Public Utilities Department, and Southern California Edison (SCE) provide electricity, and the Southern California Gas Company (TGC) provides natural gas. Electrical and natural gas services are readily available to the study area.

4.7.2 Applicable Laws and Regulations

The United States Department of Energy (DOE) is committed to reducing America’s dependence on foreign oil and developing energy efficient technologies for buildings, homes, transportation, power systems and industry. The mission of the Office of Energy Efficiency and Renewable Energy is to strengthen America’s energy security, environmental quality and economic vitality in public-private partnerships that:

1. Enhance energy efficiency and productivity;
2. Bring clean, reliable and affordable energy technologies to the marketplace; and
3. Make a difference in the everyday lives of Americans by enhancing their energy choices and their quality of life.

The California Energy Commission (CEC) is the state's primary energy policy and planning agency. Created by the legislature in 1974, the commission has the following major responsibilities:

1. Forecasting future energy needs and keeping historical energy data;
2. Licensing thermal power plants 50 megawatts or larger;
3. Promoting energy efficiency by setting the State’s appliance and building efficiency standards and working with local government to enforce those standards;
4. Supporting public interest energy research that advances energy science and technology through research, development and demonstration programs;

5. Supporting renewable energy by providing market support to existing, new and emerging renewable technologies;
6. Providing incentives for small wind and fuel cell electricity systems;
7. Providing incentives for solar electricity systems in new home construction;
8. Implementing the State's Alternative and Renewable Fuel and Vehicle Technology Program; and
9. Planning for and directing the State's response to energy emergencies.

The CEC published the 2009 Integrated Energy Policy Report (IEPR) in December 2009. The IEPR was prepared in response to Senate Bill (SB) 1389, Chapter 568, Statutes of 2002, which requires that the CEC prepare a biennial integrated energy policy report. This report contains an integrated assessment of major energy trends and issues facing the state's electricity, natural gas and transportation fuel sectors and provides policy recommendations to: conserve resources; protect the environment; ensure reliable, secure and diverse energy supplies; enhance the state's economy; and protect public health and safety. The IEPR fulfills the requirement of SB 1389. Metro has several similar policies to the CEC's as discussed below.

SCAG is required by state and federal mandates to prepare a regional transportation plan every four years. The 2008 RTP is a long-range regional transportation plan that provides a blueprint to help achieve a coordinated and balanced regional transportation system. The SCAG 2008 RTP describes energy production and consumption throughout the SCAB and provides VMT by county. SCAB is a sub region of the SCAQMD, the agency principally responsible for comprehensive air pollution control in the State. SCAB includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties, including the Salton Sea Air Basin, the South Central Coast Air Basin, the Mojave Air Basin, and the Southern California Air Basin. VMT is an indicator of the extent to which vehicles are used, providing a valuable factor in calculating the amount of energy consumed by transportation.

Metro also has an Energy and Sustainability Policy to control energy consumption and embrace energy efficiency, energy conservation, and sustainability to avoid unnecessary expenditure; help in protecting the environment; improve cost effectiveness, productivity, and working conditions; and prolong the useful life of fossil fuels by using resources more efficiently.

4.7.3 Evaluation Methodology

Energy consumption involves energy used by the operation of vehicles (automobile, truck, bus, or train) within the project alignments. Energy consumption estimates give consideration to annual VMT for automobiles, trucks, buses, and rail vehicles; and the variation of fuel consumption rates by vehicle type. A general evaluation of energy usage by mode was performed based on readily available data sources.

4.7.4 Energy Assessment

For the build alternatives, electricity for the trains would be provided via service connections within the study area. These connections would be provided by both overhead and underground lines. The

overhead lines both transmit and distribute electricity, while underground lines are used entirely for distribution of electricity. For the BRT alternatives, buses would be fueled at Metro or OCTA maintenance and fueling facilities, likely using compressed natural gas (CNG) or other alternative fuels.
BRT, LRT, and Street Car alternatives are expected to reduce energy consumption by reducing dependency on automobile use. Table 4.11 shows a comparison of energy uses by various modes.

Table 4.11 – Transportation Energy Intensity

Transport Mode	Energy Use (BTU/mile)
Passenger Vehicles (Cars)	5,517
Personal Trucks	6,788
Motorcycles	2,224
Buses (Transit/Intercity/School)	39,408
Transit Rail (Light and Heavy)	62,833

Source: Oak Ridge National Laboratory, 2009

Low Speed Maglev technology typically has lower operation and maintenance costs than the LRT, BRT, or Street Car, but has very high energy consumption. The maglev technology proposed for the PEROW/WSAB Corridor project is low-speed; however given that maglev is a new technology, energy consumption information is not widely known.

Generally, implementation of public transit projects such as the proposed alternatives would help to remove excess vehicles from roadways and freeways, easing the increase in VMT, and the usage of energy. In addition, lower VMT would also result in a reduction of vehicles emissions. As such, the proposed alternatives would likely have beneficial effects with regard to the region's energy resources.
As the set of alternatives is reduced and becomes more refined, a more detailed analysis would be provided through future study efforts.

4.8 Noise and Vibration

As part of the AA study, a noise and vibration screening assessment was conducted to compare the potential for impact from different transit modes and alternative alignments. The noise and vibration assessment was prepared in accordance with NEPA and the guidelines set forth by both the FTA's *Transit Noise and Vibration Impact Assessment*[1] and the Federal Railroad Administration's (FRA) *High-Speed Ground Transportation Noise and Vibration Impact Assessment*[2]. The results of the noise and vibration screening assessment are described in the following sections.

[1] *Transit Noise and Vibration Impact Assessment*, FTA-VA-90-1003-06, U.S. Department of Transportation, Federal Transit Administration, Office of Planning and Environment, Washington, DC, May 2006.

[2] *High-Speed Ground Transportation Noise and Vibration Impact Assessment*, U.S. Department of Transportation, Federal Railroad Administration, Office of Railroad Development, Washington, DC, October 2005.

4.8.1 Affected Environment

The Corridor includes a mixture of land use types interspersed between interstate highways ranging from single- and multi-family homes to parks and playgrounds (such as Paramount, Floral Vista, and Artesia Parks) to retail businesses and light industrial and manufacturing. As a result, the current ambient noise environment in the project area is generally dominated by traffic along the interstate highways (such as the I-105, I-605 and I-710) and major arterial streets that intersect the PEROW/WSAB Corridor. Estimated day-night noise levels along the Corridor are expected to range from 55 A-weighted decibel (dBA) within remote residential neighborhoods away from major highways and arterials to 65 dBA along highway corridors such as the I-105.

These noise levels are generally representative of urban land uses and reflect the dominance of vehicle traffic noise within the study area. These noise levels were estimated using the FTA General Assessment guidelines based on the population densities of Los Angeles and Orange Counties as well as proximity to major transportation corridors such as highways, arterials, and railroad corridors.

Similarly, existing vibration along the Corridor is mainly due to vehicular traffic on major arterials as well as local roads. Unlike noise, vibration is event based and highly dependent on the surface or rail conditions and the distance between the source and the receiver. Estimated single-event vibration levels from buses and trucks along the project corridor are expected to range from 57 Vibration decibels (VdB) at receptors approximately 100 feet from local roadways to over 70 VdB at land-uses immediately adjacent to an active roadway. These vibration levels were estimated using the FTA General Assessment guidelines based on average travel speeds from rubber-tired vehicles as well as proximity to arterials and local roadways.

4.8.2 Applicable Laws and Regulations

FTA Noise- and Vibration-Screening Distances

The Federal Noise Control Act of 1972 (Public Law 92-574) requires that all federal agencies administer their programs in a manner that promotes an environment free from noises that could jeopardize public health or welfare. Therefore, the noise- and vibration-screening assessment was prepared in accordance with NEPA and the guidelines in FTA's *Transit Noise and Vibration Impact Assessment* (FTA 2006). These guidelines form the basis for comparing different transit modes and alignments during the preliminary phase of transit projects.

As shown in Table 4.12, the FTA land use categories reflect different sensitivities to transit noise and for different time periods [e.g., the peak-hour Leq(h) for institutional receptors and the 24-hour Ldn for residential receptors]. However, as part of the preliminary screening assessment, the primary focus is on residential properties that are exposed to transit noise 24 hours per day particularly during the nighttime when people are sleeping. For the screening assessment, other institutional land uses were also included to reflect their sensitivity to transit noise such as schools, parks, libraries, and churches. Hospitals and hotels were also included in the screening assessment.

Table 4.12 – FTA Land-Use Categories and Noise Metrics

Noise Metric	Land-Use Category	Description
Leq(h)	1	Tracts of land set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions, and historic landmarks.
Ldn	2	Buildings used for sleeping such as residences, hospitals, hotels, and other areas where nighttime sensitivity to noise is of utmost importance.
Leq(h)	3	Institutional land uses with primarily daytime and evening uses including schools, libraries, churches, museums, cemeteries, historic sites, and parks, and certain recreational facilities used for study or meditation.

Source: FTA, 2006.

As shown in Table 4.13, noise-screening distances were developed for each of the five different transit modes. The noise-screening distances reflect the cumulative noise effects from the project over a 24 hour period including nighttime operations between 10:00 PM and 7:00 AM. The noise-screening distances range from 25 feet for in street-running BRT service to 550 feet for LRT service. The LRT-screening distance of 550 feet, for example, reflects five-minute headways during the peak periods and three-car consists for a total of 474 vehicle trips per day.

Table 4.13 – Project Noise- and Vibration-Screening Distances (feet)[1]

Transit Mode	Type Description	Document Source	Noise[2] "obstructed"	Vibration[3] "frequent"
BRT-HOV	Busway	FTA	55	50
BRT-Street	BRT, exclusive road	FTA	25	50
Street Car	Low- / Intermediate-Capacity Transit	FTA	150	100
LRT	Light Rail Transit	FTA	550	150
Low Speed Maglev	Maglev on concrete	FRA	40	7

Notes:
1 All screening distances are intended to be applied from the proposed corridor centerline.
2 The FTA noise screening distances were adjusted to reflect the proposed operating schedule for each transit mode. Additionally, due to the high building density along the project corridor, the FTA "obstructed" screening distances were utilized (as opposed to the "unobstructed" distances) to account for building shielding.
3 The FTA vibration screening distances reflect "frequent" transit service with more than 70 events per day expected.
Source: AECOM, October 2011.

The FTA criteria for evaluating ground-borne vibration impacts from transit vehicle passbys at nearby sensitive receptors are applied to the same land use categories as for noise, as shown in Table 4.12. Since the FTA vibration criteria are evaluated for single events rather than cumulative exposure, the vibration screening distances reflect single-event transit vehicle passbys.

The FTA's experience with community response to ground-borne vibration indicates that, when only a few trains pass by per day, it takes higher vibration levels to evoke the same community response that occurs from more frequent trains. As a result, the vibration-screening distances reflect the FTA "frequent" event criteria rather than the less-stringent "occasional" or "infrequent" vibration events criteria. The "frequent" events category is defined as more than 70 trains per day; the occasional events category is defined as between 30 and 70 trains per day; and the infrequent events category is defined as fewer than 30 trains per day. To be conservative, the FTA "frequent" events screening distances were used to evaluate the potential for ground-borne vibration impacts along the proposed transit corridors.

As a result, the vibration-screening distances range from only seven feet for Low Speed Maglev vehicles to 150 feet for LRT service. The LRT screening distance of 150 feet, for example, reflects the heaviest vehicle of the group operating on steel rails. The rubber-tired BRT vehicles (with their damped suspension) and the "floating-on-air" maglev vehicles are expected to create minimal vibration effects along the Corridor.

FRA Noise- and Vibration-Screening Distances

For the maglev vehicles, the noise and vibration screening assessment was prepared in accordance with the guidelines in the FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment* (FRA 2005). The FRA utilizes the same noise criteria as the FTA. Additionally, with only minor differences, the FRA vibration criteria are also essentially the same as the FTA criteria. As a result, the noise screening distance was developed for the maglev transit option based on the default FRA distance for high speed maglev on concrete. As shown in Table 4.13, the noise-screening distance for low-speed maglev vehicles is only 40 feet, which reflects both the slower speed compared to the typical high speed options and the lack of contact between the train and the track.

Similarly, the vibration-screening distance for the low-speed maglev trains is only seven feet, which also reflects the maglev vehicles' ability to float on air rather than ride on steel rails. All screening distances are intended to be applied from the proposed Corridor centerline.

4.8.3 Evaluation Methodology

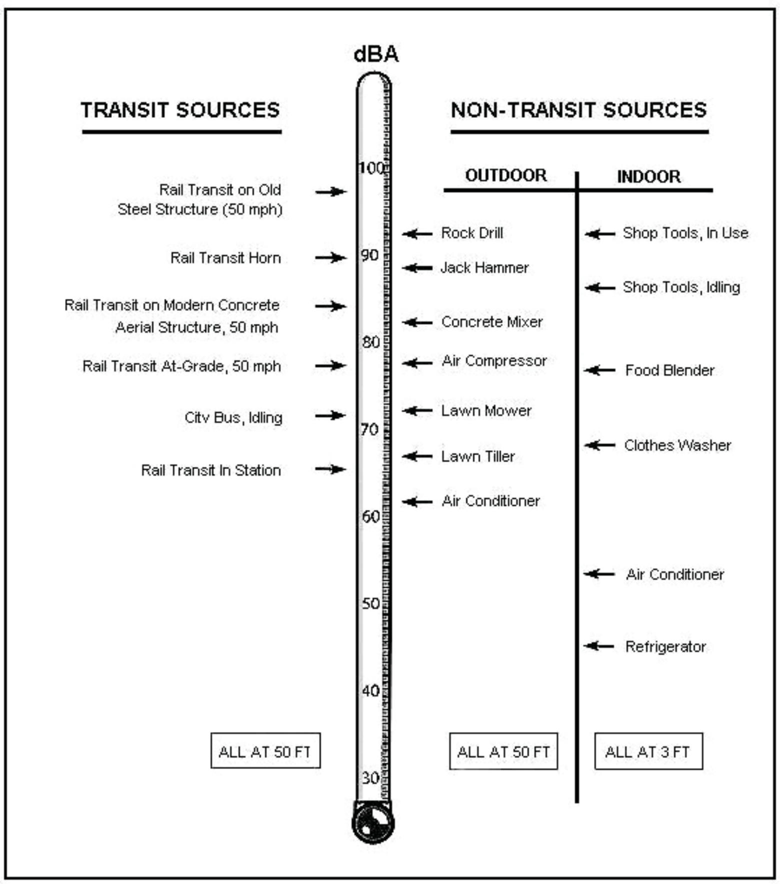
Noise

Noise is "unwanted sound" and, by this definition, the perception of noise is a subjective process. Several factors affect the actual level and quality of sound (or noise) as perceived by the human ear and can generally be described in terms of loudness, pitch (or frequency), and time variation. The loudness, or magnitude, of noise determines its intensity and is measured in decibels (dB) that can range from below 40 dB (the rustling of leaves) to over 100 dB (a rock concert). Pitch describes the character and frequency content of noise, such as the very low "rumbling" noise of stereo subwoofers or the very high-pitched noise of a piercing whistle. Finally, the time variation of noise sources can be characterized as continuous, such as with a building ventilation fan; intermittent, such as for trains passing by; or impulsive, such as pile-driving activities during construction.

Various sound levels are used to quantify noise from transit sources, including a sound's loudness, duration, and tonal character. For example, the A-weighted decibel (dBA) is commonly used to describe the overall noise level because it more closely matches the human ear's response to audible frequencies. Because the A-weighted decibel scale is logarithmic, a 10 dBA increase in a noise level is generally perceived as a doubling of loudness, while a 3 dBA increase in a noise level is just barely perceptible to the human ear. Typical A-weighted sound levels from transit and other common sources are shown in Figure 4.6.

Several A-weighted noise descriptors are used to determine impacts from transit related sources including the L_{max}, which represents the maximum noise level that occurs during an event such as a bus or train passby; the L_{eq}, which represents a level of constant noise with the same acoustical energy as the fluctuating noise levels observed during a given interval, such as one hour; and the L_{dn}, or the 24-hour day-night noise level, which includes a 10-decibel penalty for all nighttime activity between 10:00 PM and 7:00 AM.

Figure 4.6 – Typical A-Weighted Noise Levels



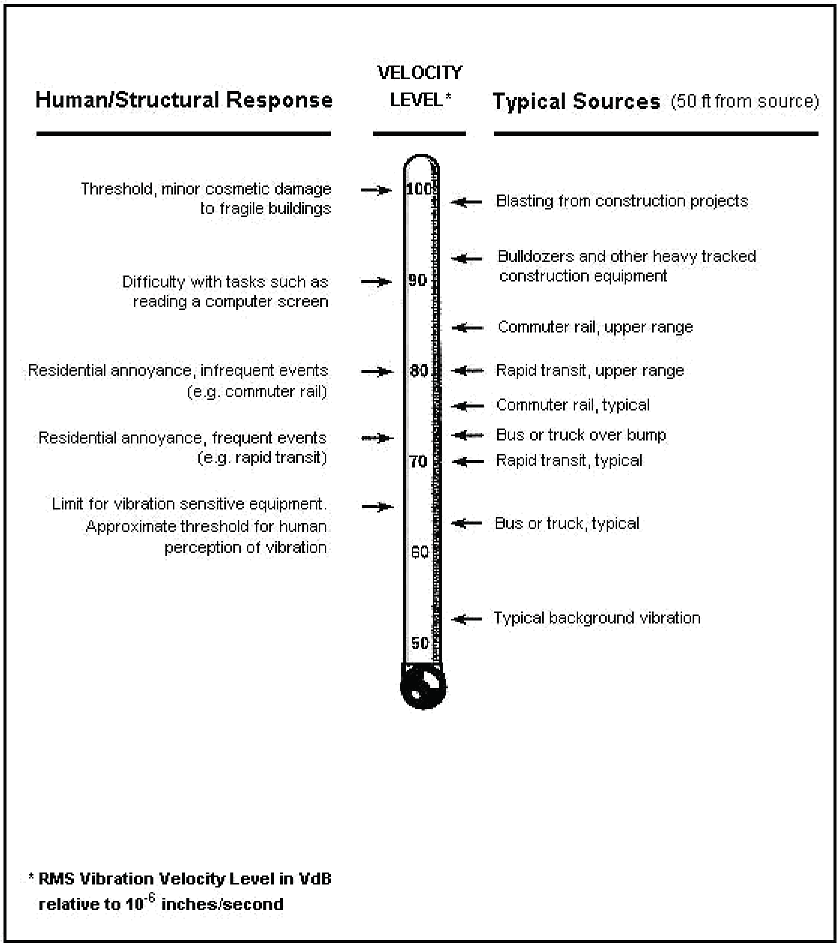
Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, Washington, DC, May 2006.

Vibration

Ground-borne vibration associated with vehicle movements is usually the result of uneven interactions between wheels and the road or rail surfaces. Examples of such interactions (and subsequent vibrations) include train wheels over a jointed rail, an untrue rail car wheel with “flats,” and a motor vehicle wheel hitting a pothole, a manhole cover, or any other uneven surface. Unlike noise, which travels in air, transit vibration typically travels just below the surface of the ground. Depending on the geological properties of the surrounding terrain and the type of building structure exposed to transit vibration, vibration propagation can be more or less efficient. Buildings with a solid foundation set in bedrock are “coupled” more efficiently to the surrounding ground and experience relatively higher vibration levels than buildings located in sandier soil. On the other hand, heavier buildings (such as masonry structures) are less susceptible to ground-borne vibration than wood-frame buildings because they absorb more of the vibration.

Vibration induced by vehicles passing by can generally be discussed in terms of displacement, velocity, or acceleration. However, human responses and responses by monitoring instruments and other objects are most accurately described with velocity. Therefore, the vibration velocity level is used to assess vibration impacts from transit projects. To describe the human response to vibration, the average vibration amplitude (called the root mean square, or RMS, amplitude) is used to assess impacts. The RMS velocity level is expressed in inches per second or vibration decibels (VdB). All VdB vibration levels are referenced to 1 micro-inch per second. Typical ground-borne vibration levels from transit and other common sources are shown in Figure 4.7.

Figure 4.7 – Typical Ground-Borne Vibration Levels



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, Washington, DC, May 2006.

Operating Assumptions

The FTA/FRA screening distances were applied to the project corridor for different transit modes (including BRT, Street Car, LRT and Low Speed Maglev) and different alternative alignments. The transit modes and alternative alignments included in this screening assessment are summarized below.

Transit Modes

- BRT
- Street Car
- LRT
- Low Speed Maglev

Alignments

- BRT HOV Lane-Running
- BRT Street-Running
- East Bank Alignment (except BRT)

- West Bank Alignment 1 (except BRT)
- West Bank Alignment 2 (except BRT)
- West Bank Alignment 3 (except BRT)

The following modeling assumptions were applied to the noise- and vibration-screening assessment:

- Total daily operations for all rail transit modes (Street Car, LRT and Low Speed Maglev) were determined based on five-minute headways during all peak periods of the day between 6:00 and 9:00 AM and 3:00 and 7:00 PM. A detailed breakout of headway time for the rail modes by period of the day was presented in Section 3.0.
- Total daily operations for the BRT service were also determined based on five-minute headways during all peak and off-peak periods of the day between 6:00 and 9:00 AM and 3:00 and 7:00 PM. A detailed breakout of headway time for the BRT service by period of the day was presented in Section 3.0
- All headway times are based on the *2011 Metro Transit Service Policy*.
- Maximum travel speeds of 35 miles per hour (mph) were used for all segments of the proposed BRT alternatives, while a maximum speed of 50 mph was used for the guideway alternatives.
- The screening distances summarized in Table 4.11 reflect the type of transit mode, the number of operations, and the travel speed. Other noise sources such as passenger stations, grade crossing bells or warning horns were not incorporated into the screening distances. These factors would be applied during any future study phase when these other factors are better defined.
- In accordance with the FTA/FRA methodologies, the noise screening distances generally reflect where the project noise reaches 50 dBA for the descriptor shown.
- Similarly, the vibration-screening distances generally reflect "normal" vibration propagation and where the project vibration reaches the threshold of impact of 72 VdB including a 5-decibel factor of safety.

4.8.4 Noise and Vibration Assessment

In accordance with the FTA and FRA guidelines, screening distances were applied along the Corridor to determine the location of any noise- or vibration sensitive receptors. The FTA screening distances were applied to the BRT, Street Car and LRT vehicle types, while the FRA screening distances were applied to the Low Speed Maglev vehicle. The default FTA/FRA noise screening distances were adjusted to reflect the project's operating characteristics including headway times, consist size and travel speeds. These minor adjustments were applied to the noise distances only to reflect the cumulative nature of the 24-hour day-night noise levels. Vibration impacts are based on single events so no adjustments were applied to the FTA/FRA vibration screening distances. The project screening distances are summarized in Table 4.13.

No Build Alternative

The study area is characterized by densely built-out urban communities that include major highways and arterials. Irrespective of other projects in the Transportation Improvement Program (TIP), ambient noise and vibration under the No Build Alternative should be similar as under existing conditions without the PEROW/WSAB Corridor. Therefore, since no significant noise and vibration impacts are expected under the No Build Alternative.

TSM Alternative

Currently, there are numerous transit lines in the study area, both in Los Angeles and Orange counties. The TSM Alternative would not substantially change conditions with respect to land uses, visual quality, parklands and community facilities, or other environmental areas. For example, heavily trafficked streets in some parts of Orange County currently operate 200 or more buses daily. The addition of the TSM into current traffic flow would not significantly change or add to noise and vibration issues.

Build Alternatives

Noise

As shown in Table 4.14, the FTA/FRA noise screening distances applied along the project alignments indicate the potential for impact at several noise sensitive land uses. Under the BRT alternatives, for example, the number of noise sensitive land uses identified within the screening distances ranges from 1,558 properties along the HOV Lane-Running alignment to 2,405 properties along the in Street-Running alignment.

Table 4.14 – Number of Noise-Sensitive Land Uses Identified within the FTA/FRA Screening Distances

Alignment	BRT	Street Car	LRT	Low Speed Maglev
BRT-HOV	1,558	--	--	--
BRT-Street	2,405	--	--	--
East Bank	--	8,509	27,384	1,542
West Bank 1	--	8,410	26,971	1,519
West Bank 2	--	8,857	28,141	1,585
West Bank 3	--	8,772	27,882	1,570

Source: AECOM, October 2011.

- All of the guideway alternatives have the East Bank and West Bank 1 in common. For the Street Car service, the number of noise sensitive land uses identified within the screening distances ranges from 8,410 properties along the West Bank Alignment 1 to 8,857 properties along the West Bank Alignment 2.

- For the heavier LRT vehicles, the number of noise sensitive land uses identified within the screening distances ranges from 26,971 properties along the West Bank Alignment 1 to 28,141 properties along the West Bank Alignment 2.

- For the Low Speed Maglev vehicles, the number of noise sensitive land uses identified within the screening distances ranges from 1,519 properties along the West Bank Alignment 1 to 1,585 properties along the West Bank Alignment 2.

Vibration

As shown in Table 4.15, the FTA/FRA vibration-screening distances applied along the project alternatives indicate the potential for impact at several vibration sensitive land uses.

- For the BRT service, for example, the number of vibration sensitive land uses identified within the screening distances ranges from 2,793 properties along the HOV Lane-Running alignment to 3,574 properties along the Street-Running alignment.

Table 4.15 – Number of Vibration-Sensitive Land-Uses Identified within the FTA/FRA Screening Distances

Alignment Alternative	BRT Alternative	Street Car Alternative	LRT Alternative	Low Speed Maglev
HOV Lane-Running	2,793	--	--	--
Street-Running	3,574	--	--	--
East Bank	--	5,625	8,509	293
West Bank 1	--	5,629	8,410	290
West Bank 2	--	5,898	8,857	305
West Bank 3	--	5,848	8,772	302

Source: AECOM, October 2011.

- Similarly for the Street Car service, the number of vibration sensitive land uses identified within the screening distances ranges from 5,625 properties along the East Bank Alignment to 5,898 properties along the West Bank Alignment 2.

- For the heavier LRT vehicles, the number of vibration sensitive land uses identified within the screening distances ranges from 8,410 properties along the West Bank Alignment 1 to 8,857 properties along the West Bank Alignment 2.

- For the Low Speed Maglev vehicles, the number of vibration sensitive land uses identified within the screening distances ranges from 290 properties along the West Bank Alignment 1 to 305 properties along the West Bank Alignment 2.

Summary

Based on the results of the noise and vibration screening assessment, the following findings summarize the approach along the PEROW/WSAB AA study:

- A screening assessment was conducted to assess the potential for noise and vibration impacts from each of the different transit modes and proposed alternative alignments.
- The default FTA and FRA screening distances were adjusted to reflect the estimated project transit modes and operating schedules.
- The FTA screening distances were applied to all BRT, Street Car and LRT transit modes, while the FRA screening distances were applied to the Low Speed Maglev vehicles only.
- This assessment was conducted using both the FTA and the FRA screening methodologies for noise and vibration sensitive receptors including residences, parks, schools, hospitals, and churches.
- The number of noise and vibration sensitive properties identified within the FTA and FRA screening distances are summarized in Table 4.16.

Table 4.16 – Summary of Noise- and Vibration-Sensitive Land Uses Identified within the FTA/FRA Screening Distances

Alternative	Metric	BRT	Street Car	LRT	Low Speed Maglev	Rank[1] (Alternatives)
BRT HOV Lane-Running	Noise	1,558	--	--	--	1
	Vibration	2,793	--	--	--	
BRT Street-Running	Noise	2,405	--	--	--	2
	Vibration	3,574	--	--	--	
East Bank	Noise	--	8,509	27,384	1,542	2
	Vibration	--	5,625	8,509	293	
West Bank 1	Noise	--	8,410	26,971	1,519	1
	Vibration	--	5,629	8,410	290	
West Bank 2	Noise	--	8,857	28,141	1,585	4
	Vibration	--	5,898	8,857	305	
West Bank 3	Noise	--	8,772	27,882	1,570	3
	Vibration	--	5,848	8,772	302	
Rank of Impacts	Noise Vibration	2	3	4	1	

1. The BRT alternatives are ranked separately from the rail alternatives.
Source: AECOM, October 2011.

- The properties identified within the noise- and vibration-screening distances are not impacts, but rather areas of concern that should be evaluated in more detail during the next phase of the project once the preferred alternative has been selected.

- As shown in Table 4.16, a ranking or comparison of the four transit modes as well as the six alignment alternatives is rated from the lowest number of affected properties (1) to the highest (4).

Noise and Vibration Potential Impacts

Noise is generally defined as unwanted sound, to the degree to which noise can impact the human environment range from levels that interfere with speech and sleep (annoyance and nuisance) to levels that cause adverse health effects (hearing loss and psychological effects). Factors that influence individual response include the intensity, frequency and pattern of noise, the amount of background noise represent before the intruding noise, and the nature of work or human activity that is exposed to the noise source. Vibration impacts at high levels may cause physical personal injury or damage to buildings. However, ground-borne vibration levels rarely affect human health.

The land uses in the PEROW/WSAB Corridor differ greatly from the northern to the southern end. For example, in the Northern Connection Area, land uses are densely developed and contain manufacturing and industrial uses as well as developed urban commercial areas. A transit system and any noise/vibration associated with implementation of a transit system would not pose significant disturbance due to the non-sensitive land uses in the surrounding areas. In the PEROW/WSAB Area, where land uses adjacent to the corridor are of a more suburban environment i.e. residential, institutional, and/or open space, potential noise and vibration resulting from a new transit system could be an impact to people.

4.9 Parks and Recreation Resources

This section describes parklands and recreational facilities in the study area and along the potential ROW of each of the alternatives, and identifies the potential effects of the alternatives. An evaluation of the benefits and consequences of the alternatives on parkland and recreational facilities is presented.

4.9.1 Affected Environment

Potential impacts to parkland and recreational facilities include both constructive use and direct effects. Constructive use effects include noise and vibration; impediment or alteration of access; changes in visual setting; and the introduction of conflicts with facility patrons, pedestrians, and bicyclists. Direct effects include acquiring parkland or recreational areas as right of way for an alternative and complying with regulatory requirements, as presented below.

4.9.2 Applicable Laws and Regulations

The following regulatory provisions apply to projects having potential impacts on parkland and recreational facilities.

The Department of Transportation Act of 1966 stipulates in Section 4(f) that federal funds cannot be used for any “program or project (other than any project for a park road or parkway under Section 204 of Title 23) requiring the use of any publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance (as determined by the federal, state, or local officials having jurisdiction over the park, area, refuge, or site).” Exceptions may be made if “(1) there is no feasible and prudent alternative to using that land, and (2) the program or project includes all possible planning to minimize harm to the park, recreational area, wildlife and waterfowl refuge, or historic site resulting from the use. “

In addition, Section 6009(a) of the SAFETEA-LU amended Section 4(f) at Section 138 of Title 23 and Section 303 of Title 49 to address projects that have only de minimis (no adverse effect) impacts on lands protected by Section 4(f).

Section 6(f) of the Land and Water Conservation Act of 1965 prohibits the conversion of property acquired or developed with Act grants to a non-recreational purpose without the approval of the U.S. Department of the Interior’s National Park Service.

Future environmental analysis would consider the potential effects of Section 4(f) involvement and associated mitigation measures in dealing with publicly owned parks within the study area. Potential Section 4(f) implication of parkland acquisition will be further investigated as part of future study efforts.

The California Public Park Preservation Act of 1971 (California Public Resources Code §5400 et seq.) requires a public agency that acquires public parkland for non-park uses to either provide compensation sufficient enough to acquire substantially equivalent replacement parkland or provide replacement parkland of comparable qualities.

4.9.3 Evaluation Methodology

The parkland and recreational facilities analysis was completed at a preliminary level as site-specific details have not been developed. Each alternative is evaluated in this section based on the number of parkland and recreational facilities within 0.5 miles of the alignment and the type and degree of impacts resulting from each alternative. Consideration is also given to beneficial impacts, including increased connectivity between parkland and recreational areas and the public.

4.9.4 Parklands and Recreation Assessment

Parkland and recreational facilities were identified along the alignments of each of the proposed alternatives as illustrated Figure 4.7, Figure 4.8, and listed in Table 4.17. A preliminary evaluation of the potential benefits and impacts on resources was developed. Resource impacts may occur during construction and operation of a transit project. Possible impacts fall into two categories:

- Constructive use effects include noise and vibration impacts, impediment or alteration of access, changes in the visual setting, and the introduction of conflicts with resource patrons; and
- Direct use effects include acquisition of parkland or recreational areas as ROW for an alternative, requiring compliance with applicable federal, state, and local regulatory laws.

On the federal level, Section 4(f) of the Department of Transportation Act of 1966 prohibits the direct use of parklands and recreational areas for federally funded transportation projects unless no other prudent alternative exists. At the state level, the California Public Park Preservation Act of 1971 requires a public agency that acquires public parkland for non-park uses to either provide compensation sufficient enough to acquire substantially equivalent replacement parkland, or provide replacement parkland of comparable qualities.

A preliminary parkland and recreational resource impact analysis was prepared. While most of the alternative alignments operate through highly-developed, urbanized areas with no parkland or recreational resources, there are a significant number of resources within the Corridor that are summarized below.

Parkland Setting Adjacent to the Alternatives

Parkland and recreational facilities adjacent to or near each of the alternative alignments are presented in Table 4.17 and illustrated in Figures 4.8 and 4.9. It should be noted that three Section 6(f) parks were identified immediately adjacent to the proposed build alternatives:

- Paramount Park in Paramount;
- Cerritos Regional County Park in Cerritos; and
- Flower Street Park in Santa Ana.

Table 4.17 – Parklands and Recreational Facilities

Alternative	Parkland/Recreational Facility	Location	City
Northern Connection Area			
WB3	6th and Gladys Park	6th & Gladys Street	Los Angeles
WB1, WB2, EB	Aliso Pico Recreation Center	370 South Clarence Street	Los Angeles
BRT	Aliso Triangle Park	1313-1321 Pleasant Avenue	Los Angeles
BRT	Boyle Heights Sports Center	901-999 South Mathews Street	Los Angeles
WB1, WB2, WB3, EB	Camp Little Bear Park and Lodge	6712 Orchard Avenue	Bell
WB1, WB2, WB3, EB	Circle Park	10129 Garfield Avenue	South Gate
WB3	City Hall Park	200 North Main Street	Los Angeles
BRT	Colombia Memorial Space Centre	12400 Columbia Way	Downey
WB1, WB2, WB3, EB	Corona Park/Freedom Park	3801 East 61st Street	Huntington Park
BRT	Crawford Park	7000 Dinwiddie Street	Downey
WB1, WB2, WB3, EB	Ernest Debs Park	3709 Gage Avenue	Bell
BRT	Golden Park	8840 Golden Street	Downey
BRT	Hollenbeck Park	415 South Louis Street	Los Angeles
WB1, WB2, WB3, EB	Hollydale Community Park	12221 Industrial Avenue	South Gate
WB1, WB2, WB3, EB	Hollydale Park	11501-11599 Rio Hondo Drive	South Gate
WB1, WB2, WB3, EB	Huntington Park and	3401 East Florence Avenue	Huntington

Alternative	Parkland/Recreational Facility	Location	City
	Community Center/ Salt Lake Park		Park
WB1, WB2, EB	LA Plaza Park	615 Echandia Street	Los Angeles
BRT	Lani Vest Pocket Park	1st Street & Chicago Street	Los Angeles
WB1, WB2, WB3, EB	Los Amigos Golf Course	7295 Quill Drive	Downey
EB	Lou Costello Jr. Youth Center/Hostetter Park	3101-3199 East Olympic Boulevard	Los Angeles
WB1, WB2, WB3, EB	Lugo Park Community Center	4234 Elizabeth Street	Cudahy
WB1, WB2, WB3, EB	Paramount Park	14382-14488 Paramount Boulevard	Paramount
WB1, WB2, EB, BRT	Pecan Park	1600-1698 East 1st Street	Los Angeles
BRT	Prospect Park	Enchandia & Judson Street	Los Angeles
WB1, WB2, WB3, EB, BRT	South Gate Park/Swim Stadium/3 Par Golf Course/Triangle Park	9615 Pinehurst Avenue	South Gate
BRT	Stanford Avenue Park	2714 Iowa Avenue	South Gate
BRT	State Street Recreation Center	700-798 North State Street	Los Angeles
PEROW/WSAB Area			
PEROW/WSAB	Acadia Park	5645-5699 Newman Street	Cypress
PEROW/WSAB	Arnold Cypress Park	8611 Watson Street	Cypress
PEROW/WSAB	Artesia Park	11925-11999 South Street	Artesia
PEROW/WSAB	Baroldi/Sycamore Park	6616 Cerritos Avenue	Cypress
PEROW/WSAB	Buena Park	4471 Lincoln Avenue	Cypress
PEROW/WSAB	Cerritos Regional County Park & Sports Complex	19800 Bloomfield Avenue	Cerritos
PEROW/WSAB	Community Center Park/Village Green Park	12732 Main Street	Garden Grove
PEROW/WSAB	Cypress Senior Center	9031 Grindlay Street	Cypress
PEROW/WSAB	Denni Street Park/ El Rancho Verde Park	7743-7787 Barbi Lane	La Palma
PEROW/WSAB	Caruthers Park/Cerritos Iron-Wood Nine Golf Course	10500-10546 Flora Vista Street	Bellflower
PEROW/WSAB	Gutosky Park	9201 Ferris Lane	Garden Grove
PEROW/WSAB	Hansen Park	1330 South Knott	Anaheim
PEROW/WSAB	Hare School Park	12012 Magnolia Street	Garden Grove
PEROW/WSAB	Jacob Park	19801-19899 Norwalk Boulevard	Cerritos
PEROW/WSAB	John Beat Park	6660 Mt Shasta Circle	Buena Park
PEROW/WSAB	Larwin Park	6150 Ball Road	Buena Park
PEROW/WSAB	Magnolia Park	11402 Magnolia Street	Garden Grove
PEROW/WSAB	Oak Knoll Park/Cypress Community Center	5700 Orange Avenue	Cypress
PEROW/WSAB	Palms Park	20492-20698 Norwalk Boulevard	Lakewood
PEROW/WSAB	Pat Nixon Park & Senior	12340-12398 South Street	Cerritos

Alternative	Parkland/Recreational Facility	Location	City
	Center		
PEROW/WSAB	Pinewood Park	9675 Juanita Street	Cypress
PEROW/WSAB	Progress Park	15500-15544 Downey Avenue	Paramount
PEROW/WSAB	Rosewood Park	17715 Eric Avenue	Cerritos
PEROW/WSAB	Simms Park	16607-16699 Clark Avenue	Bellflower
PEROW/WSAB	Stanton Golf Center Walkerhill	10660 Western Avenue	Stanton
PEROW/WSAB	Stanton Park	11111 Cedar Street	Stanton
PEROW/WSAB	Veterans Memorial Park	10970 Cedar Street	Stanton
PEROW/WSAB	Woodbury Park	13800 Rosita Place	Garden Grove
PEROW/WSAB	Zuniga Park	10902 Date Street	Stanton
Southern Connection Area			
Westminster/17th Street Harbor/1st Street	Angels Community Park	914 West Third Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Birch Park	210 North Birch Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Cesar Chavez Campensino/ Willowick Municipality Golf Course/Spurgeon Park	3311 West Fifth Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Riverview Park/Edna Park	2140 West Edna Drive	Santa Ana
Westminster/17th Street Harbor/1st Street	El Salvador Park & Community Center	1825 West Civic Center Drive	Santa Ana
Westminster/17th Street Harbor/1st Street	Flower Street Park	600-608 West 1st Street	Santa Ana
Westminster/17th Street Harbor/1st Street	French Park	901 North French Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Friendship Park	2210 West Myrtle Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Logan Recreational Center/Chepa's Park	1009 North Custer Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Neal Machander Tennis Center	West 1st Street & South Flower Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Saddleback View Park	631 Patricia Lane Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Santa Ana Stadium	602 North Flower	Santa Ana
Westminster/17th Street Harbor/1st Street	Santa Anita Park & Recreation Center	710 North Jackson Street	Santa Ana
Westminster/17th Street Harbor/1st Street	Sasscer Park	502 West Santa Ana Boulevard	Santa Ana

Source: AECOM 2011
[1]Parks and recreational facilities included in table are located within 0.25 mile of the alignment and 0.5 mile of the stations.
WB1 = West Bank Alternative 1; WB2 = West Bank Alternative 2; WB3 = West Bank Alternative 3; EB = East Bank Alternative; BRT = Bus Rapid Transit Northern Alignment Alternative; Westminster Boulevard/17th Street/Main Street Alternative; Harbor Boulevard/1st Street/SARTC Alternative

Figure 4.8 – Los Angeles County Parks and Recreational Facilities

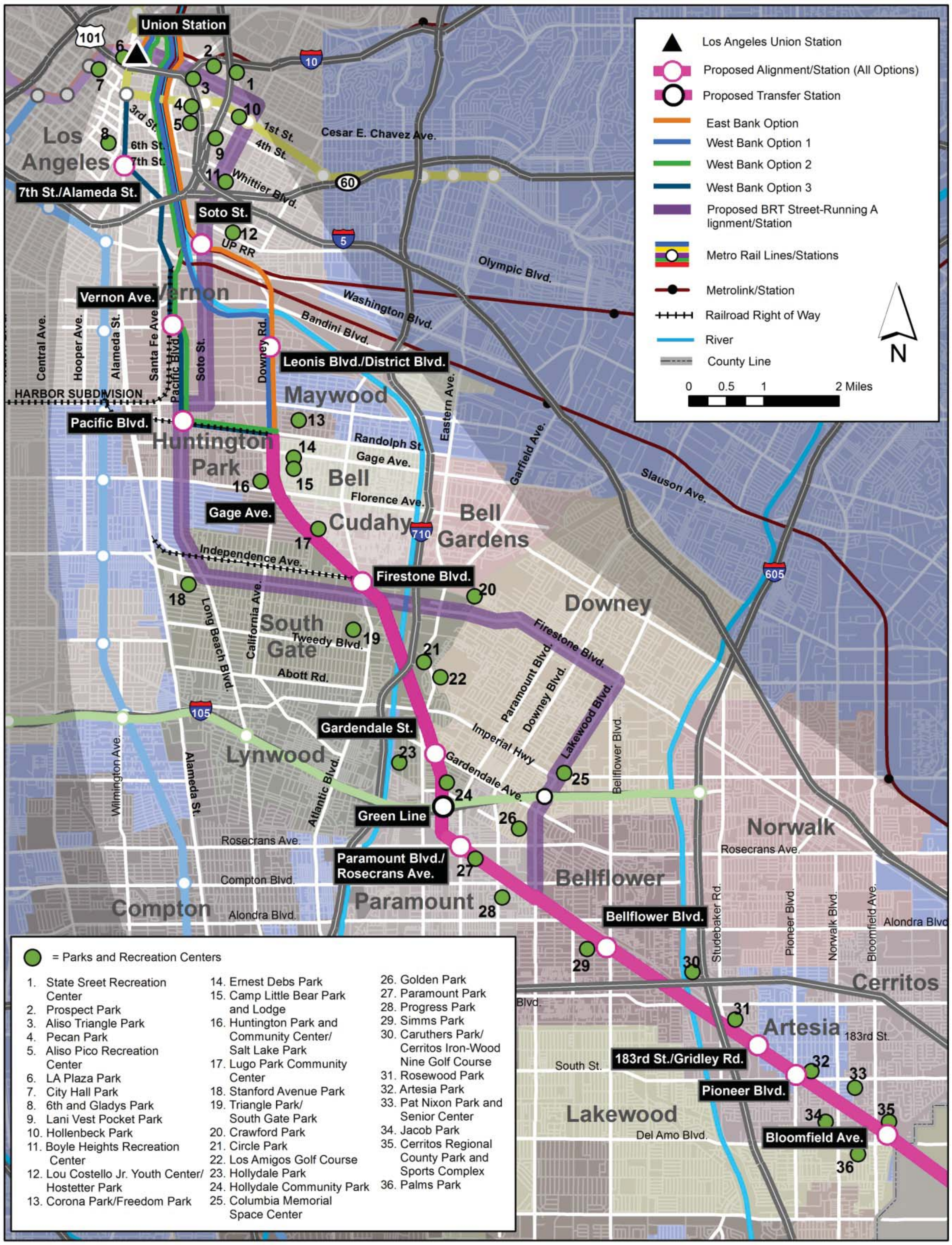
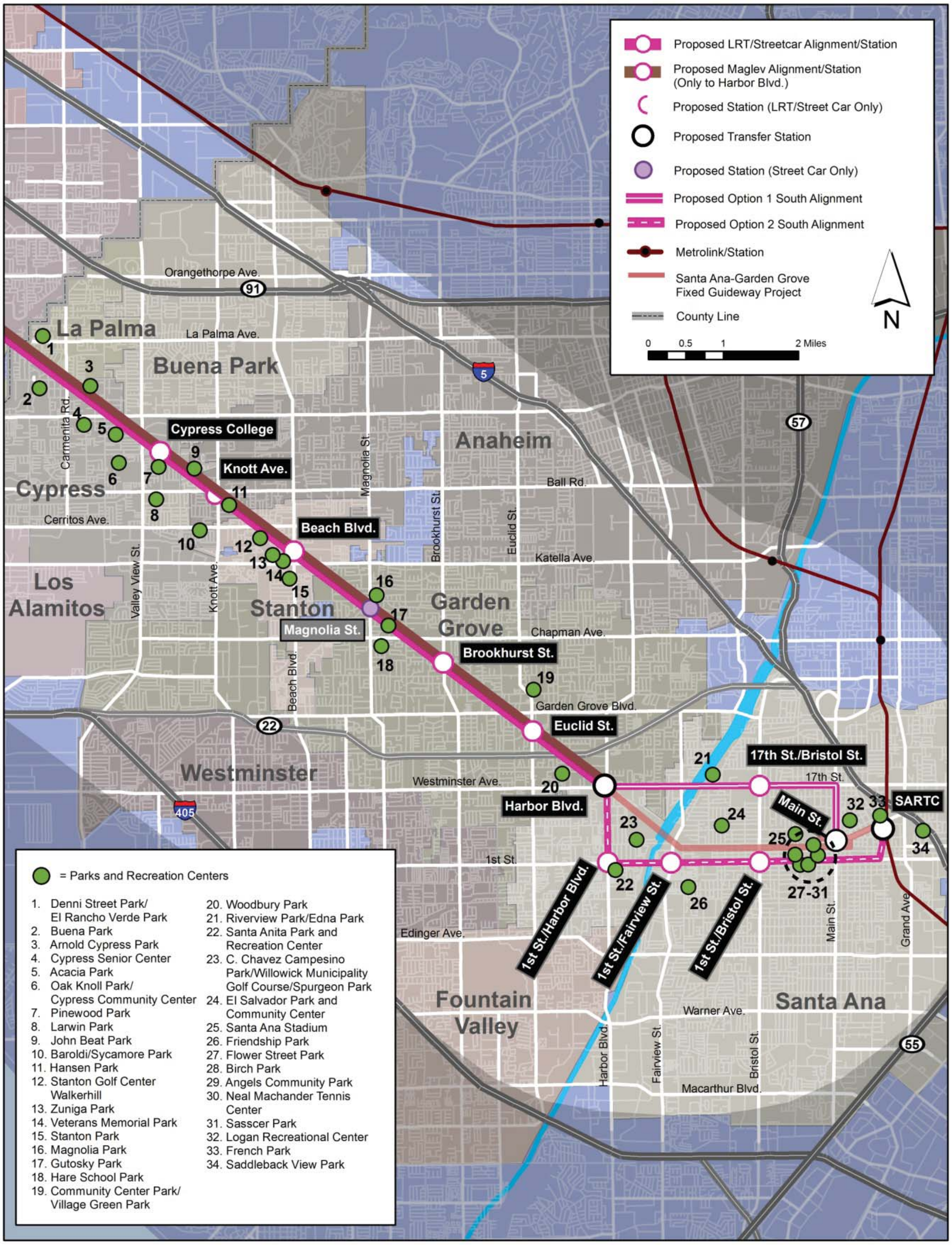


Figure 4.9 – Orange County Parks and Recreational Facilities



Summary

In general, the proposed alternatives have 70 parks and recreational facilities within 0.5 miles of the alignments and several of these are immediately adjacent to the alternatives as shown in Table 4.17 and Figure 4.7 and Figure 4.8. Currently, the PEROW/WSAB Corridor ROW is a vacant land use and not used for parklands or recreation; as such, direct use impacts would be minimal due to the vacant nature of the land. However, the parks and recreational facilities immediately adjacent to the PEROW/WSAB Corridor ROW may have constructive use impacts such as noise and vibration impacts, impediment or alteration of access, changes in the visual setting, and the introduction of conflicts with resource patterns. These impacts would be further identified and analyzed in subsequent environmental phases of the project.

4.10 Safety and Security

This section describes the safety and security issues for passengers, pedestrians, motorists, and the surrounding community. This section will identify any potentially significant safety and security impacts that could occur due to transit improvements related to the project. Of concern is the potential for pedestrian and vehicular conflicts. Another aspect discussed is security impacts resulting from implementation of a transit system.

4.10.1 Affected Environment

Safety relates to 1) protection of people from accidental occurrences that could injure or harm them and 2) protection of property from such accidents. For this study, it includes safety of motorists and pedestrians in locations where they would likely cross the train ROW, enter the stations, or encounter other transit facilities. Related to safety issues are instances of encroachments onto the ROW. While there have been several encroachments approved by both Metro and OCTA for storage, commercial development, parking, and open space, there are also portions of the ROW where residential and commercial properties have been built on the ROW over the years.

Security relates to 1) protection of people from intentional acts that could injure or harm them and 2) protection of property from such deliberate acts. The affected environment is the security on the rail system, both at the stations and in the transit vehicles. Topics discussed include crime prevention, law enforcement, and protection against terrorism.

4.10.2 Applicable Laws and Regulations

NEPA does not include specific guidance or direction with respect to the evaluation of alternatives and their relative effects on public safety and security.

SAFETEA-LU was passed to address issues such as safety, security, reducing traffic congestion, improving efficiency in freight movements, increasing intermodal connectivity, and protecting the environment.

The California Public Utilities Commission (CPUC) has adopted General Order 143-B (GO143B), the Safety Rules and Regulations Governing Light-Rail Transit in California. The order describes all the general requirements for light rail transit, including braking, lighting, operating speeds, ROW standards, and the requirements for maintenance of LRVs.

Appendix G of the CEQA Guidelines provides guidance that can be used to address public safety by including language used to identify projects that would:

- Interfere with an emergency response plan or emergency evacuation plan;
- Affect delivery of community safety services, such as police, fire, or emergency services;
- Substantially increase hazards due to a design feature or incompatible uses; or
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

Public services (i.e. police and fire protection) are generally regulated by local agencies. Therefore, design of these components and operation of the proposed project alternatives would be regulated primarily by the policies and agencies of Los Angeles and Orange counties and those communities the proposed alternatives traverse. Metro also implements policies, plans, and actions specifically directed towards maintaining safety and security in the operation of the transit system.

4.10.3 Evaluation Methodology

Pedestrian and motorist safety along the alternatives are evaluated on a qualitative level based on observations of existing and planned land uses. For the purposes of this study, locations with land uses conducive to high pedestrian and vehicular activity were considered to be at a higher risk for potential safety and security impacts. School aged children near the alignment were also considered at higher risk for safety impacts as well. Although there would be pedestrian and vehicular interaction with the proposed build alternatives throughout the alignment, it is anticipated that the pedestrian and vehicle interaction would increase substantially mostly at the proposed station locations; thus the analysis focuses mainly on the station areas.

4.10.4 Safety and Security Assessment

This section discusses locations where pedestrian and vehicular activity is anticipated to increase and interaction with the trains could occur. While the all portions of the proposed alternatives are susceptible to safety and security issues, the locations highlighted in this section are of particular interest due to high pedestrian activity and nearby activity centers.

Northern Connection Area

The Northern Connection Area land use is predominately industrial and manufacturing with pockets of commercial activities throughout. Much of the residential development is occurring in converted industrial spaces. In addition, the Northern Connection Area experiences a high influx of truck traffic. The proposed stations included in the Northern Connection Area include Union Station, 7th

Street/Alameda Street, Soto Street, Vernon Avenue, Pacific Boulevard, Gage Avenue and Firestone Boulevard. The stations with mixed land uses that would likely contribute to a higher influx of pedestrian, vehicle, and/or light rail interaction would be Union Station, Soto Street, Pacific Boulevard and Gage Avenue station areas.

- **Union Station** is considered the transportation hub of Los Angeles as the central meeting point for various transit agencies in the county and across the western region. The station is adjacent to various culturally significant destinations as well as civic centers.
- **The Soto Street station** area is located on the outskirt of downtown Los Angeles in the community of Boyle Heights, adjacent to heavily trafficked corridors and industrial uses. While the predominate land uses surrounding the station area are industrial and manufacturing, specific plans designate this area for redevelopment opportunities for transit oriented development.
- **The Pacific Boulevard station** area is located in a dynamic area of the City of Huntington Park, surrounded by eclectic mixed use corridor and vibrant pedestrian activity including commercial, entertainment, and retail.
- **The Gage Avenue station** area is located adjacent to the City of Huntington Park's major industrial centers in addition to being surrounded by long established communities and large open spaces/parks.

In addition to the station area land uses conducive to increased pedestrian circulation, there are also several schools located near the alignment that may have school age children using the train or crossing the track to get to school or home. Potential safety impacts may occur if proper safety design measures and educational programs are not implemented. Table 4.18 lists the schools and Figure 4.10 displays the school locations in Los Angeles County. The West Bank Alternative 1, West Bank Alternative 3, and East Bank Alternative have nine schools located within 0.25 miles of the alignment. West Bank Alternative 2 and BRT Alternative Northern Alignment have 16 schools located within 0.25 miles of the alignment.

The activity centers, land uses, and schools surrounding the alignment and station areas will attract pedestrian and vehicular activity to the area. The influx of pedestrian and vehicle traffic due to the new operation of the build alternatives could pose these areas to be at risk for safety and security impacts and should be further studied at the EIR/EIS level.

Table 4.18 – Los Angeles County Schools Near Proposed Alternatives

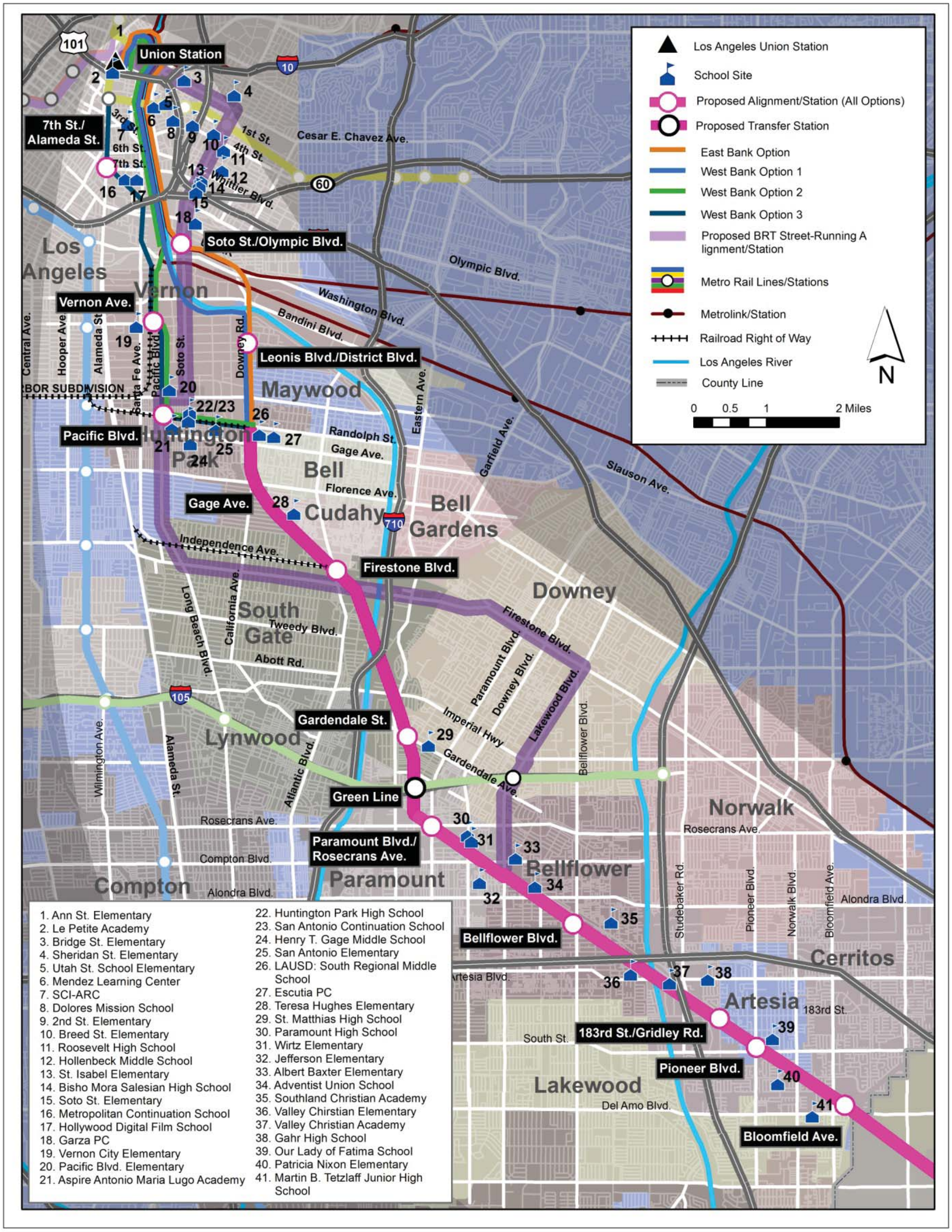
Alternative	School	Location	City	Approximate Distance to Alignment/ Station (feet)
PEROW/WSAB	Our Lady of Fatima School	18626 Clarkdale Avenue	Artesia	400
WB1, WB2, WB3, EB, BRT	Escutia PC	6401 Bear Avenue	Bell	1180
WB1, WB2, WB3, EB, BRT	LAUSD: South Region Middle School #2	6421 Loma Vista Place	Bell	935
PEROW/WSAB	Albert Baxter Elementary	14929 Cerritos Avenue	Bellflower	1190
PEROW/WSAB	Southland Christian Academy	16400 Woodruff Avenue	Bellflower	1000
PEROW/WSAB	Valley Christian Elementary	17408 Grand Avenue	Bellflower	900
PEROW/WSAB	Adventist Union School	15548 Santa Ana Avenue	Bellflower	340
PEROW/WSAB	Gahr High School	11111 Artesia Boulevard	Cerritos	660
PEROW/WSAB	Martin B Tetzlaff Junior High School	12351 East Del Amo Boulevard	Cerritos	650
PEROW/WSAB	Patricia Nixon Elementary School	19600 Jacob Avenue	Cerritos	835
PEROW/WSAB	Valley Christian Academy	18100 Dumont Avenue	Cerritos	Immediately Adjacent
WB1, WB2, WB3, EB, BRT	Teresa Hughes Elementary School	4242 Clara Street	Cudahy	670
WB1, WB2, WB3, EB, BRT	St Matthias Catholic Girls High School	7851 Gardendale Street	Downey	1100
WB2	Aspire Antonio Maria Lugo Academy	2665 Clarendon Avenue	Huntington Park	510
WB2	Henry T. Gage Middle School	2880 East Gage Avenue	Huntington Park	1225
WB2	Huntington Park High School	6020 Miles Avenue	Huntington Park	1225
WB2, WB3	Pacific Boulevard Elementary	2660 East 57th Street	Huntington Park	Immediately Adjacent
WB2	San Antonio Continuation	2861 Randolph Street	Huntington Park	Immediately Adjacent
WB2	San Antonio Elementary School	6222 State Street	Huntington Park	Immediately Adjacent
BRT	2nd Street Elementary School	1942 East Second Street	Los Angeles	350
WB1, WB2, EB, BRT	Ann Street Elementary School	126 Bloom Street	Los Angeles	925
BRT	Bishop Mora Salesian High School	960 South Soto Street	Los Angeles	Immediately Adjacent
BRT	Breed Street Elementary School	2226 East Third Street	Los Angeles	550
BRT	Bridge Street Elementary School	605 North Boyle Avenue	Los Angeles	400
BRT	Dolores Mission School	170 South Gless Street	Los Angeles	330
BRT	Garza PC	2750 East Hostetter Street	Los Angeles	Immediately Adjacent
BRT	Hollenbeck Middle School	2510 East Sixth Street	Los Angeles	Immediately Adjacent
WB1, WB2, WB3, EB	Hollywood Digital Film School	800 South Santa Fe Avenue	Los Angeles	670

Alternative	School	Location	City	Approximate Distance to Alignment/ Station (feet)
WB3	Le Petite Academy	750 North Alameda	Los Angeles	835
WB1,WB2,EB	Mendez Learning Center	1200 Plaza Del Sol	Los Angeles	600
WB3	Metropolitan Continuation High School	727 South Wilson Street	Los Angeles	Immediately Adjacent
BRT	Roosevelt High School	456 South Mathews Street	Los Angeles	430
BRT	Santa Isabel Elementary School	2424 Whittier Boulevard	Los Angeles	Immediately Adjacent
BRT	Sheridan Street Elementary School	416 North Cornwell Street	Los Angeles	430
BRT	Soto Street Elementary School	1020 South Soto Street	Los Angeles	Immediately Adjacent
WB1, WB2, EB	Southern California Institute of Architecture	960 East 3rd Street	Los Angeles	1100
WB1, WB2, EB	Utah St	255 Gabriel Garcia Marquez Street	Los Angeles	1245
WB2, WB3	Vernon City Elementary School	2360 East Vernon Avenue	Los Angeles	880
PEROW/WSAB	Jefferson Elementary School	8600 Jefferson Street	Paramount	1270
PEROW/WSAB	Paramount High School	14429 Downey Avenue	Paramount	Immediately Adjacent
PEROW/WSAB	Wirtz Elementary School	8535 Contreras Street	Paramount	675

Source: AECOM 2011

WB1 = West Bank Alternative 1; WB2 = West Bank Alternative 2; WB3 = West Bank Alternative 3; EB = East Bank Alternative; BRT = Bus Rapid Transit Northern Alignment Alternative; Westminster Boulevard/17th Street/Main Street Alternative; Harbor Boulevard/1st Street/SARTC Alternative

Figure 4.10 – Los Angeles County Schools near Proposed Alignment



PEROW/WSAB Area

The PEROW/WSAB Area is primarily residential development devoted to single-family homes and multi-family apartments and townhouses. In addition to residential development, the PEROW/WSAB Corridor is also occupied by mixed uses including public facilities such as civic centers, schools, hospitals, and educational facilities as well as parks and recreational centers, flood channels, utilities and other uses.

The proposed stations included in the PEROW/WSAB Corridor include Gardendale Street, Paramount Boulevard/Rosecrans Avenue, Lakewood Boulevard, Bellflower Boulevard, 183rd/Gridley, Pioneer Boulevard, Bloomfield Avenue, Cypress College, Knott Avenue, Beach Boulevard, Magnolia Street, Brookhurst Street, Euclid Street, and Harbor Boulevard. All the proposed stations in the PEROW/WSAB Corridor are mixed use and have a high residential presence as well.

However, the stations with mixed land uses and development policies that would likely attract a higher amount of pedestrian, vehicle, and/or light rail interaction would be at Bellflower Boulevard, 183rd Street/Gridley Road, Pioneer Boulevard, Cypress College, Brookhurst Street, and Euclid Street.

- **Bellflower Boulevard Station** area is located in the heart of the City of Bellflower's main street which consists of small scale pedestrian friendly corridor aligned with mixed commercial and gives an "old town" feel. The location is adjacent to the city's civic center and is surrounded by extremely walkable small street which lead to close knit residential neighborhoods.
- **183rdStreet/Gridley Road Station** area is located adjacent to some of the City of Cerritos' major commercial and employment centers, The Auto Square and the Los Cerritos Shopping Center. Both locations are regional powerhouses, attracting people from outside the city while providing considerable employment to the community. Institutional and open spaces are found throughout as well.
- **Pioneer Boulevard Station** area is located at the end of the City of Artesia's main commercial corridors with an integrated mixed use of retail plazas, cultural destinations, restaurants, and adjacent single family residential.
- **Cypress College Station** area is located adjacent to the City of Cypress' college, along one of the city's main commercial corridors, Lincoln Boulevard, lined by various mixed uses and development. Immediately around the station area, there is a mix of mixed use neighborhoods surrounding.
- **Brookhurst Street Station** area is located adjacent to one of the City of Garden Grove's main commercial/mixed use centers, including entertainment and shopping that is walkable from the surrounding neighborhoods.
- **Euclid Street Station** area is located in the "Heart of Garden Grove" amongst the city's main civic center, commercial and retail centers, mixed use corridors while maintaining a balance of a pedestrian friendly environment within a busy destination district. There is an eclectic mix of land uses within the station area including commercial/mixed use adjacent to the station, institutional, open space, and heaving single family residential to the east.

In addition to the station area land uses conducive to increased pedestrian circulation, the PEROW/WSAB Corridor has 28 schools located within 0.25 miles of the alignment. Table 4.19 lists the schools in close proximity to the alignment in Orange County. The locations of the schools are shown in Figure 4.10.

The activity centers, land uses, and schools surrounding the alignment and station areas will attract pedestrian and vehicular activity to the area. The influx of pedestrian and vehicle traffic due to the new operation of the build alternatives could pose these areas to be at risk for safety and security impacts and should be further studied at the EIR/EIS level.

Southern Connection Area

The Southern Connection Area land use is consistent with that of the PEROW/WSAB in regards to residential and mixed land uses that would likely attract a higher amount of pedestrian activity to the area. The proposed stations included in the Southern Connection Area include Harbor Boulevard, 1stStreet/Harbor Boulevard, 1stStreet/Fairview Street, 1st Street/Bristol Street, 17th Street/Bristol Street, Main Street, and SARTC. Of the Southern Connection Area alignments, the Southern Connection North Alternative has 15 schools located within 0.25 miles of the alignment and the Southern Connection South Alternative has 14 schools located within 0.25 miles of the alignment. Schools located near the alignment as part of the Southern Connection Area are also listed in Table 4.19 and the locations of the schools are shown in Figure 4.11.

Table 4.19 – Orange County Schools near Proposed Alternatives

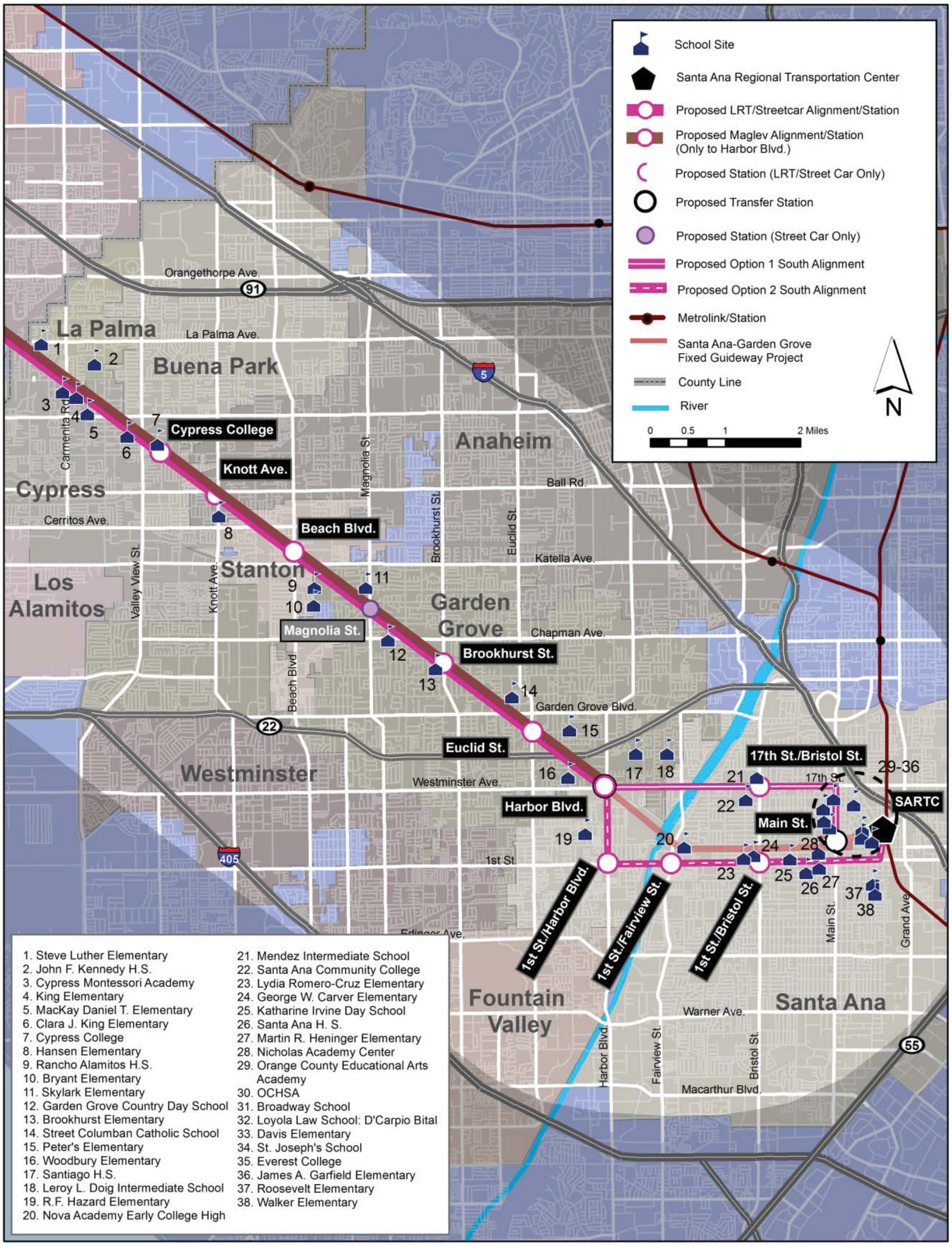
Alternative	School	Location	City	Approximate Distance to Alignment/ Station (feet)
PEROW/WSAB	Hansen Elementary School	1330 South Knott Avenue	Anaheim	Immediately Adjacent
PEROW/WSAB	Clara J. King Elementary School	5851 Newman Street	Cypress	Immediately Adjacent
PEROW/WSAB	King Elementary School	8710 Moody Street	Cypress	Immediately Adjacent
PEROW/WSAB	Cypress College	9200 Valley View Street	Cypress	Immediately Adjacent
PEROW/WSAB	MacKay Daniel T Elementary School	8721 Cypress Street	Cypress	425
PEROW/WSAB	Cypress Montessori Academy	8622 La Salle Street	Cypress	500
PEROW/WSAB	Rancho Alamitos High School	11351 Dale Street	Garden Grove	Immediately Adjacent
PEROW/WSAB	Brookhurst Elementary School	9821 Catherine Avenue	Garden Grove	425
PEROW/WSAB	Street Columban Catholic School	10855 Stanford Avenue	Garden Grove	675
PEROW/WSAB	Skylark Elementary School	11250 MacMurray Street	Garden Grove	755
PEROW/WSAB	Garden Grove Country Day School	9221 Chapman Avenue	Garden Grove	965
PEROW/WSAB	Woodbury Elementary School	11362 Woodbury Road	Garden Grove	980
Westminster	Santiago High School	12342 Trask Avenue	Garden Grove	1160
PEROW/WSAB	Bryant Elementary School	8371 Orangewood Avenue	Garden Grove	1240
PEROW/WSAB	Peter's Elementary School	13162 Newhope Street	Garden Grove	1300
Westminster	Leroy L Doig Intermediate School	12752 Trask Avenue	Garden Grove	1300
PEROW/WSAB	John Fitzgerald Kennedy High School	8281 Walker Street	La Palma	1195
PEROW/WSAB	Steve Luther Elementary School	4631 La Palma Avenue	La Palma	1245
Westminster/17th Street Harbor/1st Street	OCHSA	1010 North Broadway Street	Santa Ana	Immediately Adjacent
Westminster/17th Street	Loyola Law School: D'Carpio Bital	1502 North Main Street	Santa Ana	Immediately Adjacent
Harbor/1st Street	Katharine Irvine Day School	1002 West 2nd Street	Santa Ana	Immediately Adjacent
Harbor/1st Street	Martin R. Heninger Elementary School	417 West Walnut Street	Santa Ana	Immediately Adjacent
Westminster/17th Street	Orange County Educational Arts Academy	825 North Broadway	Santa Ana	435
Harbor/1st Street	Santa Ana High School	520 West Walnut Street	Santa Ana	435
Westminster/17th Street	Santa Ana Community College	1530 West 17th Street	Santa Ana	520
Harbor/1st Street	Lydia Romero-Cruz Elementary School	1512 West Santa Ana	Santa Ana	675

Alternative	School	Location	City	Approximate Distance to Alignment/ Station (feet)
		Boulevard		
Westminster/17th Street Harbor/1st Street	Everest College	600 West Santa Ana Boulevard	Santa Ana	800
Westminster/17th Street	Mendez Intermediate School	2000 North Bristol Street	Santa Ana	800
Westminster/17th Street	El Sol Santa Ana Science and Arts Academy	1010 North Broadway Street	Santa Ana	820
Westminster/17th Street Harbor/1st Street	Nicholas Academy Center	412 West 4th Street	Santa Ana	840
Westminster/17th Street Harbor/1st Street	James A. Garfield Elementary School	850 Brown Street	Santa Ana	850
Harbor/1st Street	George Washington Carver Elementary School	1401 West Santa Ana Boulevard	Santa Ana	945
Westminster/17th Street	Broadway School	321 West Washington Avenue	Santa Ana	975
Westminster/17th Street Harbor/1st Street	St Joseph's School	608 East Civic Center Drive	Santa Ana	1100
Westminster/17th Street	Davis Elementary School	1405 North French Street	Santa Ana	1100
Harbor/1st Street	R. F. Hazard Elementary School	4218 West Hazard Avenue	Santa Ana	1125
Harbor/1st Street	Walker Elementary School	811 East Bishop Street	Santa Ana	1135
Harbor/1st Street	Roosevelt Elementary School	501 Halladay Street	Santa Ana	1175
Westminster/17th Street Harbor/1st Street	Nova Academy Early College High	2609 West 5th Street	Santa Ana	1270

Source: AECOM 2011

WB1 = West Bank Alternative 1; WB2 = West Bank Alternative 2; WB3 = West Bank Alternative 3; EB = East Bank Alternative; BRT = Bus Rapid Transit Northern Alignment Alternative; Westminster Boulevard/17th Street/Main Street Alternative; Harbor Boulevard/1st Street/SARTC Alternative

Figure 4.11 – Orange County Schools near Proposed Alignment



Safety and Security Potential Impacts

Existing conditions in the PEROW/WSAB Corridor are assessed above in order to establish a baseline by which potential impacts may be identified against. For purposes of safety and security, these were identified on a qualitative basis. Potential impacts could affect pedestrians and bicyclists, system passengers and employees, and response times for emergency services (police, fire, and ambulance).

In general, the pedestrian and bicycle circulation system varies across the study area, depending on density, mix of land uses and vehicular circulation patterns. The entire arterial street system network is considered open to pedestrian and bicycle traffic, either on sidewalks or road shoulders. However, in some areas pedestrian and bicycle flow is impeded due to missing, inadequate or unattractive sidewalks and crossings. Other potential areas of concern include the following:

- Traffic queuing
- Approach and corner sight distance
- Visual confusion/sign or signal clutter
- Posted prevailing traffic speed
- Heavy pedestrian volumes
- Presence of adequate lighting
- Emergency access route
- Gate drive around potential
- Delineation and roadway marking
- Pedestrian sight distance
- School access routes
- Special generators

Security impacts could be related to police and fire response, emergency evacuation, and addressing criminal and terrorist activity. Other impacts would be those associated with assault, robbery, petty theft and other similar crimes.

4.11 Environmental Justice and Equity

This section describes the potential effects of the project on environmental justice (EJ) populations. EJ populations are defined those that are minority and/or low-income as defined below. This section will identify the potential benefits of the project alternatives as well as any potential disproportionate negative effects.

4.11.1 Affected Environment

The USDOT Order on Environmental Justice (5610.2) provides clear definitions of the minority populations addressed by Executive Order 12898. These populations are:

- Black – A person having origins in any of the black racial groups of Africa;
- Hispanic – A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race;
- Asian American – A person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent or the Pacific Islands;
- American Indian and Alaskan Native – A person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition; and

- Native Hawaiian or Other Pacific Islander – A person having origins in any of the original peoples of Hawaii, Guam, Samoa or other Pacific Islands.

Low-income populations are defined as any individual or household with income at or below the U.S. Census poverty thresholds, which are derived by the U.S. Census using the U.S. Department of Health and Human Services (HHS) poverty thresholds, as shown in Table 4.20.

Table 4.20 – 2008 U.S. Department of HHS Poverty Guidelines

Household Size	Income Threshold
One-Person	$10,400
Two-Person	$14,000
Three-Person	$17,600
Four-Person	$21,200
Five-Person	$24,800
Six-Person	$28,400
Seven-Person	$32,000
Eight-Person	$35,600
For each additional person, add	$3,600

Source: *Federal Register*, Vol. 73, No. 15, January 23, 2008, pp. 3971–3972

4.11.2 Applicable Laws and Regulations

Environmental Justice is defined by the USEPA Office of Environmental Justice as:

> *The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. (EPA, 1996)*

State law defines environmental justice in California Government Code Section 65040.12, as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations and policies." While there is no requirement under CEQA to address environmental justice, California law requires the Office of Planning and Research to coordinate with federal agencies regarding environmental justice based on Executive Order 12898.

In the Environmental Handbook Volume 4 (1997), Caltrans provides guidance to ensure that environmental justice is promoted and that programs and projects are implemented in a socially equitable fashion. As such, it directs that the environmental analysis should identify ethnic and racial minority and low-income population groups in the affected community. It states, that "the analysis should be integrated in a manner that is 'clear, concise, and comprehensible' within the general format suggested by 40 CFR 1502.10." It also states that a transportation agency should ensure that Title VI and environmental justice concerns are included in any public participation program, including the development of appropriate project avoidance and mitigation options.

SCAG is required to conduct an environmental justice analysis for its RTP, and its environmental justice program includes two main elements: technical analysis and public outreach. Specifically, it is SCAG's role to ensure that when transportation decisions are made, low-income and minority communities have ample opportunity to participate in the decision-making process and that they receive an equitable distribution of benefits and not a disproportionate share of burdens. The environmental justice analysis in the recently released 2012 RTP incorporates performance measures to discuss the overall social and environmental equity in the region. They are:

- RTP Revenue Sources in Terms of Tax Burdens
- Share of Transportation System usage
- RTP/SCS Investments
- Impacts of proposed VMT fees
- Distribution of travel time savings and travel distance reductions
- Jobs-housing Imbalances or Jobs-housing Mismatch
- Accessibility to Employment and Services
- Accessibility to Parks
- Gentrification and displacement
- Environmental Impact Analysis
- Rail-related impacts

Metro seeks to ensure that all segments of the population, including environmental justice groups, enjoy more transit access and benefits. As such, Metro is committed to ensuring that no person is excluded from participation in, or denied the benefits of its service on the basis of race, color or national origin. Metro includes guidelines and planning policies regarding environmental justice issues in its current Long Range Transportation Plan (LRTP). Metro complies with federal environmental justice and Title VI requirements by including environmental justice populations in its community outreach activities and by analyzing the benefits and effects of the projects included in the LRTP on environmental justice populations. The PEROW/WSAB Corridor is included in the LRTP as part of the Recommended Financially Constrained Plan.

Community involvement that has occurred for this project is described in Section 6.0, Public Involvement and Agency Coordination.

4.11.3 Evaluation Methodology

Consideration of equity and environmental justice is required to ensure that both economic and environmental costs and benefits are distributed fairly across communities and population groups located throughout the study area. Alternatives and their alignment segments that deliver more or as many benefits as they do impacts in Corridor communities are rated more highly than those that separate benefits from costs and serve some communities or populations better than they do others. Particular attention is given to the alternatives that better serve minority populations and low-income and transit-dependent households.

Concentrations of minority and low-income groups (i.e., environmental justice areas) within the study area were identified through analysis of US Census Bureau data (and SCAG data, if available) at both the county and the Traffic Analysis Zone (TAZ) level. The TAZ data were compared to the countywide data to determine whether any of the TAZs would qualify as having large concentrations of one or more special populations. A TAZ was categorized as having a large concentration of either minority or low income population if:

- At least 50 percent of the population in the TAZ is minority or low-income; or
- The population of minority or low-income residents of the TAZ is at least 10 percent greater than the average of the minority or low-income population in the county. Ten percent is used in this analysis since environmental justice guidance under NEPA states that, "the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." Typically, 10 percent has been considered to be statistically meaningful in similar studies across the country.

For purposes of this study, Los Angeles County is the larger geographic community or "community of comparison" that functions as the basis for a comparative demographic analysis of the environmental justice community. The demographic characteristics of Los Angeles County are shown in Table 4.21.

Table 4.21: Los Angeles County – Demographic Characteristics

Demographic Characteristics	Value
Total Population	9,818,605
Total Households	3,217,889
Percent Population Low-Income	15.7%
Median Household Income	$55,476
Percent Minority	74%
Percent Limited English Proficiency, Age 5 or older	27%
Percent of Population over 65 years of Age	10.9%
Unemployment Rate	12.5%

Source: AECOM, 2010; US Census Bureau, 2010

4.11.4 Environmental Justice Assessment

Table 4.22 shows demographic data for the population and households in the study area. As shown in Table 4.22, approximately 81 percent of the Corridor's population in the study area belonged to a minority group in 2008. The minority group with the largest representation in the study area was Hispanic or Latino (60 percent). The second largest minority group was Asian (12 percent) and the third largest minority group was Black or African American (6 percent).

Table 4.22 – Environmental Justice Populations in the Corridor Study Area

Population	2008 Population	Percent of Population
Total Population	2,777,441	--
White	532,647	19%
Hispanic or Latino	1,670,969	60%
Black or African American	165,014	6%
American Indian	9,793	0%
Asian	344,405	12%
Other	54,613	2%
Total Minority	2,244,794	81%
Households	**2008**	**Percent of Households**
Total Households	717,510	--
Zero-Car Households	68,658	10%
Median HH Income	$41,514	--
HHs with income $25k or less	206,885	29%
HHs with income $25k to $50k	215,175	30%
HHs with Income $50k to $100k	214,109	30%
HHs Income > $100k	81,341	11%

Source: Metro Model, 2006.

Approximately 29 percent of the households in the study area had an income of $25,000 or less a year and 10 percent were without a car or transit-dependent. Figure 4.12 and Figure 4.13 shows the distribution of minorities, low income households, and zero-car households. In addition, while the LA County unemployment average is 12%, several of the cities in the Northern Connection Area have unemployment rates ranging as high as 20%, such as Lynwood at 18.6% and Paramount at 20 % in October 2011.

The number and percentage of low-income households is higher in the Northern Connection Area than in the PEROW/WSAB Area. In the areas with the highest number of low-income households, the percentage ranges from 180 to 200 percent higher than the county average. With the forecast loss of jobs in the Northern Connection Area, the high number and percentage of low-income households in the Los Angeles County portion of the study area is anticipated to continue and increase. Transit-dependent households are defined as households without access to an automobile. Transit-dependence has a strong inverse correlation with household income. The subregions with the highest percentage of transit-dependent households are all located in the Northern Connection Area, and the subregions with the highest number of transit-dependent households are Central Los Angeles West and Downtown Los Angeles. In the Southern Connection Area the two alignments, Westminster Boulevard/17th Street/Main Street Alternative and Harbor Boulevard/1st Street/SARTC Alternative are different from each other as well. Generally, there are differences in the income along both routes, where the Westminster alignment has higher income households than along the Harbor route, and an in depth analysis for households along both alternatives may be completed in subsequent environmental phases.

As presented above, a general discussion of the environmental justice communities along the corridor provides an overview location, and in future environmental phases, detailed analysis will include impacts to minority owned businesses, impacts to parks and other open spaces adjacent to EJ communities and impacts to places of work.

Implementing improved transit service could create both beneficial and adverse impacts on all populations in the study area, including environmental justice populations. Possible adverse effects to all populations would be related to quality of life, which could include noise and vibration impacts, traffic, air quality, barrier effects, aesthetics, and safety, particularly near station areas. Construction impacts could also include impacts on minority businesses. Overall, at this stage in the project development, disproportionate adverse effects to environmental justice populations are not anticipated since all populations in the study area may be affected. All populations, including environmental justice populations, would benefit from improved mobility options and greater accessibility that would be provided by new transit service.
Information pertaining to potential visual and aesthetic effects is discussed in Section 4.3 Visual and Aesthetics, and a preliminary noise and vibration impact assessment is included in Section 4.8 Noise and Vibration. Safety and security is discussed in Section 4.10 Safety and Security. A summary of the performance of the alternatives in terms of environmental justice is provided below.

Safety and Security

The activity centers and land use surrounding the proposed station areas would attract pedestrian and vehicular activity to the area. In addition, with the addition of a station, more pedestrian and park-and-ride trips are likely to be drawn to the area as well. The influx of pedestrian and vehicle traffic combined with the new operation of the build alternatives could result in safety and security impacts related to transit operation and may be studied through a possible future environmental review document. These potential safety and security effects would affect all populations in the study area and would not likely result in disproportionate adverse effects to environmental justice populations.

Parks and Recreation

In general, the proposed alternatives have 70 parks and recreational facilities within 0.5 miles of the alignments and several of these are immediately adjacent to the alignment of the alternatives. Currently, the PEROW/WSAB Corridor ROW is an abandoned land use and is not used for parklands or recreation; as such, direct use impacts would be minimal due to the vacant nature of the land. However, the parks and recreational facilities immediately adjacent to the PEROW/WSAB Corridor may have constructive use impacts such as noise and vibration impacts, impediment or alteration of access, changes in the visual setting, and the introduction of conflicts with resource patrons. These potential effects would affect all populations in the study area and would not likely result in disproportionate adverse effects to environmental justice populations.

Figure 4.12 – Los Angeles County Environmental Justice Populations

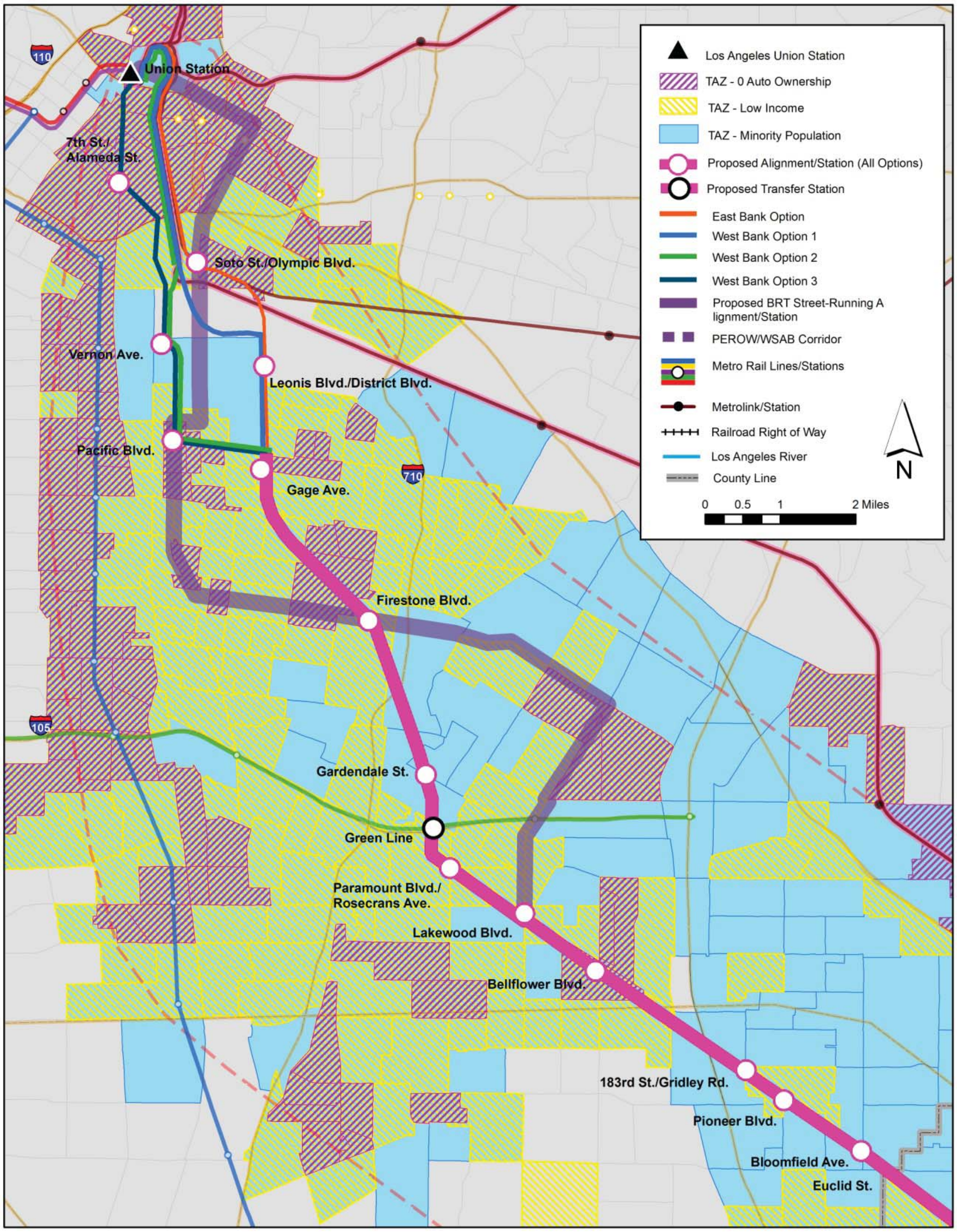
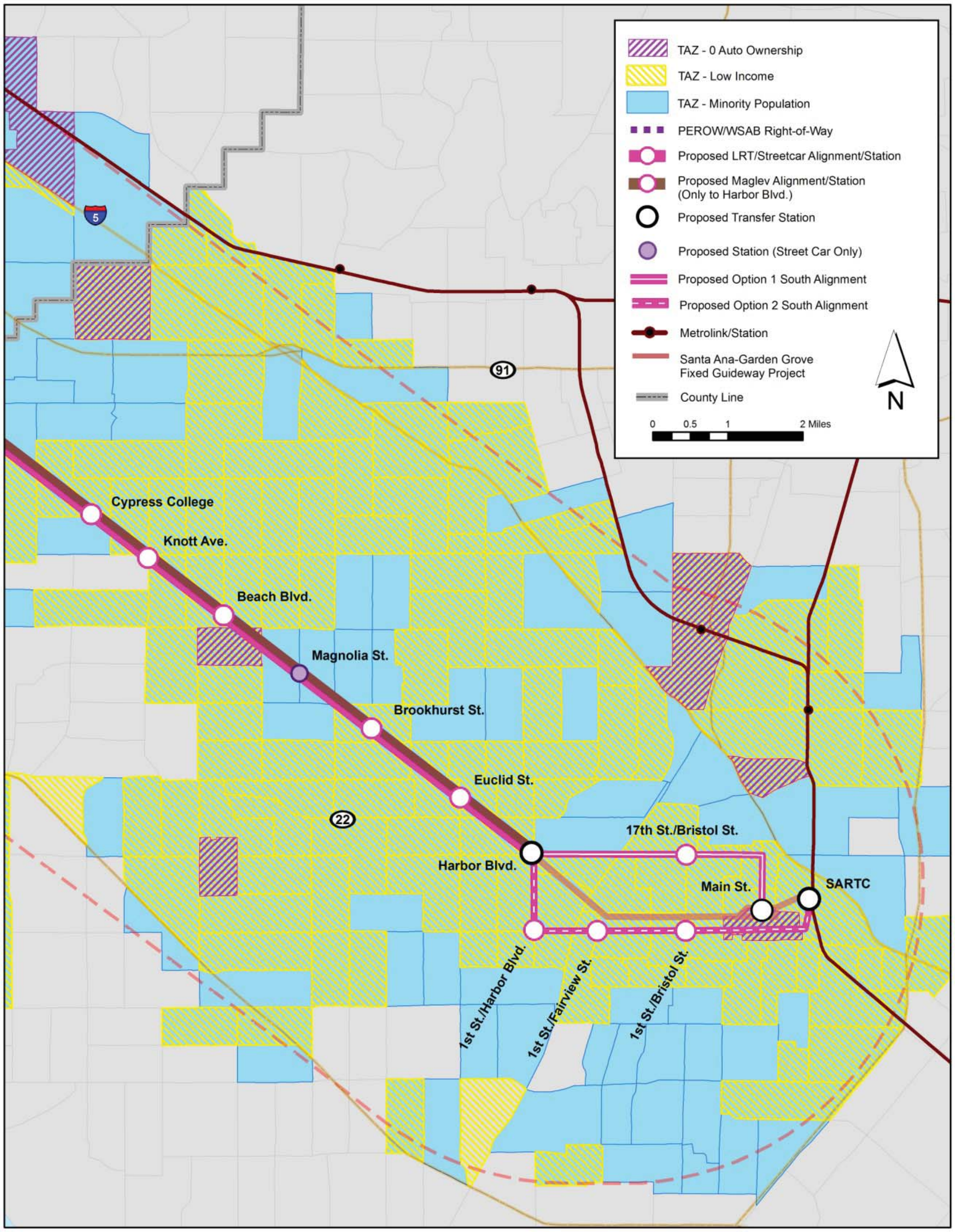


Figure 4.13 – Orange County Environmental Justice Populations



Noise and Vibration

The proposed alternatives have the potential for impact at several noise and vibration sensitive land uses. Under the BRT alternatives, the number of noise sensitive land uses identified within the screening distances ranges from 1,558 properties along the HOV Lane-Running alignment to 2,405 properties along the in Street-Running alignment. The number of vibration sensitive land uses identified within the screening distances ranges from 2,793 properties along the HOV Lane-Running alignment to 3,574 properties along the in Street-Running alignment.

Similarly for the Street Car service, the number of noise sensitive land uses identified within the screening distances ranges from 8,410 properties along the West Bank Alignment 1 to 8,857 properties along the West Bank Alignment 2. The number of vibration sensitive land uses identified within the screening distances ranges from 5,625 properties along the East Bank Alignment to 5,898 properties along the West Bank Alignment 2.

For the heavier LRT vehicles, the number of noise sensitive land uses identified within the screening distances ranges from 26,971 properties along the West Bank Alignment 1 to 28,141 properties along the West Bank Alignment 2. The number of vibration sensitive land uses identified within the screening distances ranges from 8,410 properties along the West Bank Alignment 1 to 8,857 properties along the West Bank Alignment 2.

For the Low Speed maglev vehicles, the number of noise sensitive land uses identified within the screening distances ranges from 1,519 properties along the West Bank Alignment 1 to 1,585 properties along the West Bank Alignment 2. The number of vibration sensitive land uses identified within the screening distances ranges from 290 properties along the West Bank Alignment 1 to 305 properties along the West Bank Alignment 2.

More detailed analysis during future study efforts will be required to determine if disproportionate adverse effects related to noise and vibration would occur to environmental justice populations.

Summary

As shown in the Figure 4.12 and 4.13 above, all proposed alternatives would serve environmental justice populations and provide mobility and connectivity benefits. However, as described in the Section 3.0, Transportation Analysis , the LRT West Bank Alternative would result in the most riders at 87,150 and greatest user benefit of 27,075 hours.

4.12 Summary of Environmental Impacts and Benefits

An initial environmental analysis of the Final Alternatives was prepared and an initial environmental review was updated to reflect possible impact areas that implementation of the proposed transportation alternatives.

At this preliminary level of analysis, with alignment engineering and station design information at a five percent level of completeness, there are minor differences in the level of environmental impacts between the Final Alternatives as summarized below in Table 4.23. And while there does not appear to be any insurmountable environmental challenges, there are remaining areas of concern requiring further analysis during any subsequent Draft EIS/EIR effort:

Table 4.23 – Summary of Environmental Impacts

Alternative	Environmental and Community Impacts
No Build	This baseline option represents the completion of Corridor transportation improvements which have committed local, regional, state, and federal funding as identified in constrained plans of the adopted Metro and OCTA LRTPs. The No Build Alternative is used for comparison purposes to assess the relative benefits and impacts of constructing a new transit project in the study area versus implementing only currently planned projects.
TSM	The alternative: • Would support land use plans. • Would require minimal property acquisitions other than what would be needed for maintenance facilities. • Would have minimal impacts to visual and aesthetics. • Would result in minimal impacts to noise and vibration. • Could impact air quality and climate change because it produces some mobile source emissions from combustion of natural gas or other alternative fuel type. • Would have little minimal impact on culturally sensitive resources or parkland and recreational facilities. • Would have major traffic impacts due to the increase in the number of busses using the Corridor's highway system.
BRT	The alternative: • Would support land use plans. • Would require minimal acquisition of property for dedicated bus lane space, other than what would be needed for maintenance facilities. • Would have minor impacts to visual and aesthetics, particularly in the HOV-Running alignment. • Could have potentially minor impacts to noise and vibration from

	increased bus service, in addition to major traffic impacts due to the increase in the number of buses. • Could potentially impact air quality and climate change due to the increase in bus emissions from combustion of natural gas and other fuel. • Would have minimal impacts to cultural or parklands resources.
Street Car	The alternative: • Would support land use plans and provide economic development opportunities on a community-oriented rail system. • Would require minor property acquisitions for rail ROW, specifically required for rail turning radius' and maintenance facilities. • Could have impacts to noise and vibration. • Lower travel speeds and more frequent stops could increase congestion and other traffic impacts, primarily at intersections. • Would have visual and aesthetic impacts, particularly when at-grade adjacent to residential or commercial corridors, in addition to overhead catenary system, etc. • Would have minimal impact on culturally sensitive resources or parkland and recreational facilities. • Would not impact air quality because it is electrified and does not result in mobile source emissions however potential impacts to climate change, due to off-site electricity generation for transit power exist. This could, in turn, attribute to local climate change benefits.
LRT	The alternative: • Would support land use plans and be a catalyst for public/private economic revitalization and development opportunities. • Would require minor property acquisitions for rail ROW, specifically required for rail turning radius' and maintenance facilities. • Would have minimal impact on culturally sensitive resources or parkland and recreational facilities. • Would have visual and aesthetic impacts, particularly when at-grade adjacent to residential or commercial corridors, in addition to overhead catenary system, etc. • Would have noise and vibration impacts, particularly adjacent to residential neighborhoods, or sensitive land uses such as schools, hospitals, churches, etc. • Would not impact air quality because it is electrified and does not result in mobile source emissions. However, it could adversely impact climate change, because it requires off-site electricity generation for transit power. This could, in turn, attribute to local climate change benefits. • Would have traffic impacts, particularly in at-grade sections and

	intersections.
Low Speed Maglev	The alternative: • Although grade-separated, this alternative would support economic development opportunities and could encourage dynamic uses of the PEROW/WSAB Corridor at grade. • Would require significant property acquisitions for system turning radius, column structures, and maintenance facility. • May have some impacts to culturally significant resources, specifically in older, established neighborhoods. • Would have significant impacts to visual and aesthetic resources due to the scale of the alternative and being completely grade-separated. These impacts would be significant adjacent to single family residential communities in addition to blocking important views. Additional visual and noise impacts include those to parklands and recreational resources. • Would have noise and vibration impacts, particularly adjacent to residential neighborhoods, or sensitive land uses. • Would not impact air quality because it is electrified however; it could adversely impact climate change because it requires off-site electricity generation for transit power. The maglev technology proposed for the PEROW/WSAB Corridor project is low-speed; given that maglev is a new technology, energy consumption information is not widely known. • Would have some traffic impacts due to the structural column placement along the ROW to support the grade-separated system, particularly at intersections.

5.0 COST ANALYSIS

This chapter answers the questions of what it will cost to build and operate and maintain the proposed transit system alternatives in the PEROW/WSAB Corridor. Conceptual level cost estimates have been identified based on engineering and system design plans developed at a five percent level of information for the Final Alternatives presented in Chapters 2.0 and 3.0.

5.1 Capital Cost Analytical Overview

Capital costs are the expenses associated with the design and construction of the proposed transit system alternatives, with the system costs falling into one of two areas:

1. **Construction Costs** – This category includes the costs that go into building the transit system, such as roadway, track, and guideway elements; stations and parking structures; maintenance and storage facilities; site work (demolition and utility work); and vehicle control and power system equipment.
2. **Total Project Costs** – The second category includes the non-system costs, such as land acquisition; provision of engineering, project, and construction management services; permits; surveying and testing; insurance; and finance charges.

Conceptual order-of-magnitude capital costs were developed by estimating the quantities on a per mile basis for the individual line items required to build and operate each alternative, and then by applying standardized unit costs. The unit costs used in preparing the capital cost estimates were derived from similar Metro and other transit projects with recent construction bid information, and/or detailed preliminary engineering-related cost estimates. The capital costs were identified by multiplying the unit costs by the quantities, such as length of the roadway or track. The resulting capital costs were compiled in Standardized Cost Categories developed by the FTA for comparing project costs on a national basis.

When developing a capital cost estimate at this conceptual level of design, future costs arising from unforeseen project circumstances need to be accounted for. Contingencies provide a way to address evolving project costs due to issues such as unknown site conditions and city requirements. Based on recent Metro projects, an allocated contingency of 30 percent was applied to each cost category, with a five percent contingency applied to the vehicles, and an unallocated contingency of 10 percent applied to the overall project cost. An additional contingency factor was identified and applied to the Low Speed Maglev Alternatives reflecting unknown costs as this technology is not yet in revenue service in the U.S. While a majority of this option's grade-separated construction elements would be similar to other above-grade U.S. transit systems, the future costs of migrating the Japanese maglev guideway, and integrated operating and power systems, along with the system-specific vehicles are unknown. An additional allocated contingency of 20 percent was applied to these unique system elements to reflect unforeseen costs, especially those related to meeting U.S. transit requirements.

5.2 Capital Costs

Order-of-magnitude capital cost estimates were developed for the TSM Alternative and the four build options based on the previously discussed methodology. The No Build Alternative was not included in this effort, as all No Build costs are considered to be within the financial capability of Metro and OCTA as reflected in their adopted LRTPs. The transit service projects included in the TSM Alternative were identified with Metro, OCTA, and Long Beach Transit staff, and project costs were based on cost projections developed by each agency or identified in cooperation with the transit agencies. The conceptual estimated costs were reviewed with Metro and OCTA staff and compared to historical pricing data received from Metro and the Exposition Authority and the costs were increased by 27.8 percent reflecting the analytical results.

5.2.1 Vehicle Requirements

Alternative-specific vehicle requirements were identified based on each option's run time, or the time it would take to travel from one end of the alignment to the other. Run times vary based on factors such as the alignment length and configuration, and the number of stations proposed for each option. Service frequency and fleet requirements were based on approved Metro and OCTA bus service plans, and Metro's adopted rail operational policies.

The vehicle assumptions for the BRT Alternatives were as follows; The decision on whether to use 60-foot articulated buses, similar to those used on the Metro Orange Line, was deferred to the future when more detailed operating plans may be developed if a BRT Alternative moves forward.

- **HOV Lane-Running Option** – 45-foot NABI vehicles similar to those used for Metro Silver Line service, and
- **Street-Running Option** – 40-foot NABI vehicles similar to those used for Metro Rapid service.

The vehicle assumptions for the Guideway Alternatives were:

- **Street Car** – The Siemens S70 Street Car low-floor vehicle reflecting the anticipated Orange County Street Car system decision;
- **LRT Option** – Breda 2550 LRV vehicles similar to those currently used by Metro; and
- **Low Speed Maglev Option** – Nippon Sharyo HSST-100L vehicles similar to those utilized by the Linimo system in Nagoya, Japan.

Table 5.1 – Fleet Requirements for TSM and BRT Alternatives

Alternative	Peak Vehicles	Maintenance Spares[1]	Total Fleet Size
TSM Alternative	98	20	118
BRT Alternative: HOV Lane-Running	32	6	38
BRT Alternative: Street-Running	16	3	19

[1] Maintenance spares are vehicles available to be put into service in case of operational problems.

As presented in Table 5.1, bus requirements for the TSM and BRT alternatives were developed based on the number of peak revenue vehicles required by the identified service headway frequency and resulting run times presented in Chapter 3.0. Maintenance spares, required in case of operational problems, were defined as equal to 20 percent of the peak revenue vehicles based on Metro's adopted *2011 Transit Policy*. The resulting number of vehicles required by the BRT alternatives varies from a total of 19 daily vehicles for the Street-Running Alternative to 38 for the HOV Lane-Running Option. The fleet difference reflects the more frequent service headway proposed for the HOV Lane-Running Alternative – five minutes compared to ten minutes. The Street-Running Alternative was proposed to have less frequent service due to the significant number of buses already operating in the Northern and Southern Connection areas of the Corridor.

The vehicle requirements for the guideway modal and alignment alternatives presented in Table 5.2 were calculated based on the proposed service headway frequency and resulting run times discussed in Chapter 3.0. The total fleet size reflects Metro rail operational requirements for maintenance spares and "ready cars". Maintenance vehicles are calculated as 20 percent of the total peak revenue vehicles. Ready cars are three-car gap trains ready to pull into service in case of a late train or other operational problems, and are typically available at each end and sometimes in the center of the alignment.

Table 5.2 – Fleet Requirements for Guideway Alternatives

Modal/Alignment Alternative	Peak Revenue Vehicles	Ready Cars[1]	Total Revenue Vehicles	Maintenance Spares[2]	Total Fleet Size
Street Car					
‣ East Bank 1	84	9	93	19	112
‣ West Bank 1	81	9	90	18	108
‣ West Bank 2	84	9	93	19	112
‣ West Bank 3	81	9	90	18	108
Light Rail Transit					
‣ East Bank 1	75	9	84	17	101
‣ West Bank 1	72	9	81	16	97
‣ West Bank 2	78	9	87	17	104
‣ West Bank 3	72	9	81	16	97
Low Speed Maglev					
‣ East Bank 1	51	9	60	12	72
‣ West Bank 1	51	9	60	12	72
‣ West Bank 2	54	9	63	12	75
‣ West Bank 3	51	9	60	12	72

[1] Ready Cars are vehicles available at each end and in the center of the alignment in case of operational problems.
[2] Maintenance spares equal 20 percent of peak revenue vehicles based on the Metro *2011 Transit Policy*.

The resulting fleet requirements for the three guideway alternatives vary from 72 to 112 vehicles. While all of the guideway options are proposed to operate with the same service frequency, the alignment lengths, number of stations, vehicle operational speeds, and resulting run times vary. The Low Speed Maglev Alternative requires the lowest number of vehicles due to the fastest average operational speed and the shortest alignment length of the modal options, with its proposed terminus at the future Harbor Boulevard Street Car Station. The Street Car Alternative has the largest fleet requirement reflecting the longest run times among the alternatives due to having the lowest maximum and average speeds along with more stations than the other two guideway alternatives. The resulting average operational speeds are 31.0 mph for Street Car service and 35.3 mph for LRT service. The slower Street Car average speed results in longer run times than the LRT alternatives – approximately seven minutes longer for the end-to-end trip from Union Station to the SARTC.

Among the alignment alternatives, the East Bank and West Bank 2 options require more vehicles due to longer alignments, more stations, and resulting longer run times required in the Northern Connection Area. While the West Bank 3 alignment alternative has the highest number of stations in this section, serving more cities and longest alignment length, more than 25 percent of this option's alignment operates in a grade-separated configuration compared to eight percent for the other alignment options. For the Low Speed Maglev Alternative, the West Bank 2 alignment option requires slightly more vehicles due to the longest run time among the Low Speed Maglev alignment options.

5.2.2 Storage and Maintenance Facilities

All of the proposed alternatives will require:

- **Overnight vehicle storage** – Vehicle storage is typically provided at either one end, or both ends (depending on the length of the alignment), to provide overnight storage to reduce "deadhead" or non-revenue service, time required to put the vehicles into position for morning service. Overnight storage space may incorporate daily cleaning and light maintenance capabilities; and
- **Storage/Heavy Maintenance Yard** – A majority of the service fleet is typically stored overnight in a larger location incorporating facilities for vehicle washing and heavy maintenance and repair.

The capital cost estimates presented below in Table 5.3 include a placeholder cost of $184 million for construction of a storage and heavy maintenance facility to support system operations for each of the alternatives except the TSM option, which would accommodate the proposed vehicle increase in existing facilities. This cost represents the purchase of 25 acres to house approximately 80 vehicles along with construction of a related maintenance and repair facility.

Storage and maintenance of the bus fleets required for the BRT Alternatives was assumed to require a new facility to accommodate busses that may be different than the existing fleet. Some overnight storage for early morning peak period services was assumed to be accommodated at the northern end of the alignment at a Metro-owned site adjacent to Union Station, at the southern end at the SARTC along with other transit facilities proposed as part of this transit center's master plan, and along the

PEROW/WSAB ROW, where BRT operations would require only 30 to 60 feet (approximately at stations) of the available 75 to 195 feet ROW width.

Storage and maintenance of the guideway vehicle fleets required for the Street Car, LRT, and Low Speed Maglev alternatives was assumed to require a new facility, either to accommodate the new Street Car and Low Speed Maglev technologies, or due to constrained storage available at existing Metro LRT facilities. Some overnight storage for morning peak period services was assumed to be accommodated at the southern end of the alignment at the SARTC within the future Santa Ana Street Car storage and maintenance site. At the northern end of the Corridor, there is no storage capability at Union Station or at nearby existing LRT facilities, and a new site would have to be identified.

A maintenance and storage site possibility exists just to the south of Union Station where Metro owns property along the Harbor Subdivision known as the Malabar Street Yard in Vernon. This linear 4.9-acre site is owned in part with the BNSF, which currently uses a majority of the property (4.3 acres) for freight rail storage. Site improvements would be required to make this site viable for the proposed guideway vehicles. Co-use of the site by freight and passenger rail vehicles would require construction of new track, operational control system, and fencing. This site would only be viable for the West Bank alignment alternatives; the East Bank vehicles may be stored at the Mission Junction property or other sites being evaluated by Metro for Eastside LRT vehicle storage. Future guideway storage facility sites in Orange County are limited due to the built-out residential and commercial nature of this portion of the Corridor; industrial sites east of the SARTC appear to offer the only possible opportunities. If the future transit system were implemented in Minimum Operable Segments (MOSs), the first construction phase was assumed to be along the PEROW/WSAB Corridor ROW, currently owned by Metro and OCTA, with the existing ROW providing ample room for pavement, tail tracks, or guideway structure to accommodate overnight vehicle storage.

Possible maintenance yard site options were identified in the northern portion of the Corridor along or adjacent to the guideway alignment options, including the PEROW/WSAB ROW, the Harbor Subdivision ROW, and the San Pedro Subdivision ROW. Several sites of publicly- and/or privately-owned land were identified ranging in size from 18 to 32 acres, which could accommodate 57 to 102 vehicles. Possible sites were identified primarily in this area due to the number of larger sites that are either vacant or appear to be underutilized. The final decision on where to locate the project's support facilities, and how to allocate the cost, would be based on further policy and cost analysis work performed during possible future engineering and environmental assessment efforts, and within the larger framework of transit agency or private-operator system decisions.

5.2.3 Capital Costs

Capital cost estimates were identified and presented in a variety of ways to help elected officials, stakeholders, and the public to understand the differences among the alternatives: by segment, with and without vehicle costs; per mile; per county; and per possible MOS. In addition, cost estimates were prepared for building totally grade-separated systems, similar to the Low Speed Maglev Option, for the Street Car and LRT alternatives.

Capital Costs by Corridor Study Area

Table 5.3 presents order of magnitude project capital cost estimates for the modal and alignment alternatives divided into each of the three Corridor areas. This information allows for consideration of the varied alignment sections and their costs, and provides a basis for the consideration of possible MOSs in the identification of a preferred transit strategy or phasing of strategies that is discussed below.

Table 5.3 – Order of Magnitude Capital Costs (FY 2010 dollars)

Modal/Alignment Alternative	Northern Connection Area Cost (Millions)	PEROW/ WSAB Area Cost (Millions)	Southern Connection Area Cost (Millions)	Total Project Capital Cost (Millions)	Incremental Increase over TSM[1] (Millions)
TSM Alternatives					
Core Service Project	NA	NA	NA	$9.9	--
Corridor System	NA	NA	NA	$249.0	--
BRT Alternatives					
Street-Running	$275.9	$583.3	$216.0	$1,075.2	$826.2
HOV Lane-Running	$282.3	$583.3	$216.0	$1,081.6	$832.6
Street Car Alternatives					
East Bank 1	$1,397.6	$873.0	$304.2	$2,574.7	$2,325.7
West Bank 1	$1,433.9	$873.0	$304.2	$2,611.0	$2,362.0
West Bank 2	$1,407.2	$873.0	$304.2	$2,584.3	$2,335.3
West Bank 3	$1,741.0	$873.0	$304.2	$2,918.1	$2,669.1
LRT Alternatives					
East Bank 1	$1,552.4	$1,039.1	$377.6	$2,969.2	$2,720.2
West Bank 1	$1,493.1	$1,039.1	$377.6	$2,909.9	$2,660.9
West Bank 2	$1,481.6	$1,039.1	$377.6	$2,898.3	$2,649.3
West Bank 3	$1,799.3	$1,039.1	$377.6	$3,216.5	$2,967.5
Low Speed Maglev Alternatives					
East Bank 1	$2,847.8	$3,772.9	NA	$6,620.7	$6,371.7
West Bank 1	$2,841.4	$3,772.9	NA	$6,614.3	$6,365.3
West Bank 2	$3,404.4	$3,772.9	NA	$7,177.4	$6,928.4
West Bank 3	$3,703.8	$3,772.9	NA	$7,476.7	$7,227.7

[1] Compared to the TSM Corridor System Alternative.

The capital cost for all of the build alternatives includes the cost for the TSM Alternative as required by the FTA for AA studies. It should be noted that two TSM costs were identified: 1) the TSM Corridor System option representing all of the proposed bus services, including the two bus lines serving the same alignment as the build alternatives (the Union Station-Los Cerritos Center and the Katella Avenue BRT lines); and 2) the TSM Core Service Project representing only the two bus lines replicating the service provided by the build alternatives. The TSM cost included in the build alternative capital cost estimates is for the TSM cost without the two lines ($239.2 million), rather than the TSM Corridor System cost of $249.0 million.

While all of the modal alternatives have the single alignment in the PEROW/WSAB Area in common, there are four different alignment options in the Northern Connection Area, and two alignments for the Street Car and LRT alternatives in the Southern Connection Area. The construction costs vary due to different alignment lengths and number of stations reflecting the cities and destinations being served, and the engineering requirements to fit the proposed transit system within the built-out Corridor. The length and number of stations for the four alignments in Northern Connection Area vary, while there is only one alignment in the PEROW/WSAB Area for all of the modal alternatives, and the Harbor Boulevard/1st Street/SARTC alignment in the Southern Connection Area was used for the Street Car and LRT options. There are no Southern Connection Area costs for the Low Speed Maglev alternatives due to the proposed terminus at the future Santa Ana-Garden Grove Fixed Guideway Harbor Station.

As may be expected, the at-grade alternatives have the lowest total project capital costs, with the TSM and BRT alternatives identified as costing the least. The TSM Alternatives were estimated to cost $9.9 million for the Core Service Project and $249.0 million for the TSM Corridor System. The BRT options were projected to cost $1.1 billion for both the Street-Running and the HOV Lane-Running Options. The Street-Running Alternative was estimated to cost slightly less due to fewer vehicles being required to provide the proposed limited stop bus service. The cost of the Street-Running Alternatives includes implementation of signal priority system improvements to support operations beyond the PEROW/WSAB ROW in both the Northern and Southern Connection areas, while the HOV Lane-Running Alternative would only require signal priority improvements in the Southern Connection Area as it would use freeway HOV and Harbor Transitway lanes in the Northern Connection Area. It should be noted that buses typically have a 10 to 15 year lifecycle, and that the initial capital investment in the bus fleet would have to be repeated in the future, and is not included in the identified capital costs for the BRT Alternatives.

The Low Speed Maglev alternatives, designed as entirely grade-separated, would have the highest estimated capital costs – ranging from approximately $6.6 to $7.2 billion for an approximately 30-mile system running from Union Station to Harbor Boulevard. The capital costs for the Street Car and LRT alternatives would range from $2.6 to $2.9 billion and $2.9 to $3.2 billion respectively, for an approximately 35-mile system operating from Union Station to the SARTC.

For both the Street Car and LRT alternatives, the West Bank 3 would have the highest cost primarily due to 27 percent of the Northern Connection Area alignment being grade-separated compared to the other alternatives, along with having the highest number of stations. Costing approximately $300 million more among the Street Car options and $250 to $320 million more for the LRT alternatives than the other alignment options, the West Bank 3 Alternative provides the highest average speed and fastest travel time. This alignment option also was the highest among the Low Speed Maglev Alternatives, costing $300 to $860 million more than the other options, primarily due to a higher number of stations.

The Northern Connection Area capital costs were the highest among the three Corridor sections primarily due to the cost methodology that placed the cost for all of the vehicle requirements and the maintenance yard in this first system section, adding $184 million to this area's capital costs, while the TSM Alternative costs were included in the PEROW/WSAB Area costs. Table 5.4 presents a capital cost breakdown presenting the system component costs and how they contribute to the overall project cost.

Table 5.4 – Capital Cost Breakdown (FY 2010 dollars)

Modal/Alignment Alternative	TSM Cost (Millions)	Main. Yard Cost (Millions)	Vehicle Cost (Millions)	Construction Cost (Millions)	Total Project Cost (Millions)
BRT Alternatives					
‣ Street-Running	$239.2	$184.0	$9.0	$643.0	$1,075.2
‣ HOV Lane-Running	$239.2	$184.0	$18.0	$640.4	$1,081.6
Street Car Alternatives					
‣ East Bank 1	$239.2	$184.0	$411.6	$1,739.9	$2,574.7
‣ West Bank 1	$239.2	$184.0	$396.9	$1,790.9	$2,611.0
‣ West Bank 2	$239.2	$184.0	$411.6	$1,749.5	$2,584.3
‣ West Bank 3	$239.2	$184.0	$396.9	$2,098.0	$2,918.1
LRT Alternatives					
‣ East Bank 1	$239.2	$184.0	$371.1	$2,174.9	$2,969.2
‣ West Bank 1	$239.2	$184.0	$356.5	$2,130.2	$2,909.9
‣ West Bank 2	$239.2	$184.0	$382.2	$2,092.9	$2,898.3
‣ West Bank 3	$239.2	$184.0	$356.5	$2,436.8	$3,216.5
Low Speed Maglev Alternatives					
‣ East Bank 1	$239.2	$184.0	$540.0	$5,657.5	$6,620.7
‣ West Bank 1	$239.2	$184.0	$540.0	$5,651.1	$6,614.3
‣ West Bank 2	$239.2	$184.0	$562.5	$6,191.7	$7,177.4
‣ West Bank 3	$239.2	$184.0	$540.0	$6,513.5	$7,476.7

Capital Cost Per Mile

An evaluation of the conceptual capital costs on a per mile basis is presented in Table 5.5. Implementation of the BRT Alternatives would cost the least at approximately $34.0 million per mile, while the entirely grade-separated Low Speed Maglev Alternatives would have the highest cost at $222.9 to $256.0 million per mile for the East Bank and West Bank 3 alignment options respectively.

Table 5.5 – Estimated Capital Cost Per Mile (FY 2010 dollars)

Modal/Alignment Alternative	Alignment Length (Miles)	Total Project Cost (Millions)	Total Project Cost Per Mile (Millions)
BRT Alternatives			
‣ Street-Running	38.2	$1,075.2	$34.5
‣ HOV Lane-Running	39.0	$1,081.6	$34.0
Street Car Alternatives			
‣ East Bank	35.2	$2,574.7	$73.1
‣ West Bank 1	35.2	$2,611.0	$74.2
‣ West Bank 2	35.6	$2,584.3	$72.6
‣ West Bank 3	34.5	$2,918.1	$84.6
LRT Alternatives			
‣ East Bank	35.2	$3,213.0	$84.4
‣ West Bank 1	35.2	$3,153.7	$82.7
‣ West Bank 2	35.6	$3,142.2	$81.4
‣ West Bank 3	34.5	$3,459.9	$93.2
Low Speed Maglev Alternatives			
‣ East Bank	29.7	$6,620.7	$222.9
‣ West Bank 1	29.6	$6,614.3	$223.5
‣ West Bank 2	29.9	$7,177.4	$240.0
‣ West Bank 3	29.2	$7,476.7	$256.1

The Street Car Alternative ranges from $72.6 to $84.6 million per mile for the West Bank 2 and West Bank 3 alignment, while the LRT Alternative ranges from $81.4 to $93.2 million per mile for the West Bank 2 and 3 respectively. While Street Car systems typically have a lower capital cost due to a range of factors including lighter vehicles requiring less structure and less expensive power systems due to fewer Operating Control System (OCS) poles and traction power substations, two of the LRT options are less expensive than the most costly Street Car option. The West Bank 3 Alternative would have the highest cost per mile, while having the shortest alignment, it has more stations, a higher percentage of grade-separation, and the most complex system needs as it weaves through multiple freeways and bridges in Vernon and downtown Los Angeles.

Capital Cost Per County

The conceptual capital costs per county were identified, as presented in Table 5.6, to allow for a comparison to available funding and to support consideration of MOSs, as the decision may be made to implement the proposed system in segments.

Table 5.6 – Estimated Capital Cost Per County (FY 2010 dollars)

Modal/Alignment Alternative	Los Angeles County Cost (Millions)	Los Angeles County Portion (Percent)	Orange County Project Cost (Billions)	Orange County Portion (Percent)	Total Project Capital Cost (Millions)
TSM					
Core Service Project	$5.2	53%	$4.7	47%	$9.9
Corridor System	$26.9	11%	$222.1	89%	$249.0
BRT Alternatives					
Street-Running	$466.8	43%	$608.4	57%	$1,075.2
HOV Lane-Running	$473.2	44%	$608.4	56%	$1,081.6
Street Car Alternatives					
East Bank 1	$1,757.3	68%	$817.4	32%	$2,574.7
West Bank 1	$1,793.6	69%	$817.4	31%	$2,611.0
West Bank 2	$1,766.9	68%	$817.4	32%	$2,584.3
West Bank 3	$2,100.7	72%	$817.4	28%	$2,918.1
LRT Alternatives					
East Bank 1	$1,984.3	67%	$984.9	33%	$2,969.2
West Bank 1	$1,925.0	66%	$984.9	34%	$2,909.9
West Bank 2	$1,913.4	66%	$984.9	33%	$2,898.3
West Bank 3	$2,231.6	69%	$984.9	31%	$3,216.5
Low Speed Maglev Alternatives					
East Bank 1	$4,662.2	70%	$1,958.5	30%	$6,620.7
West Bank 1	$4,655.8	70%	$1,958.5	30%	$6,614.3
West Bank 2	$5,218.9	73%	$1,958.5	27%	$7,177.4
West Bank 3	$5,518.2	74%	$1,958.5	26%	$7,476.7

While approximately 60 percent of the project length would be located in Los Angeles County compared to Orange County, the actual percentage of capital costs varies per alternative. The TSM Alternative is more costly for Orange County based on the more extensive range of enhanced and new bus services and the provision of arterial system improvements at 21 intersections along six major streets identified for this section of the Corridor. For the BRT Alternatives, a majority of the project capital cost is related to reuse of the PEROW/WSAB ROW with provision of a paved ROW, stations, and signal system at roadway crossings. The Orange County portion is higher due to more of the PEROW/WSAB ROW – approximately 12 of the 20 total miles – being located in this county.

The percentage of capital costs for the guideway alternatives would be higher for Los Angeles County (66 to 74 percent) reflecting the alignments traveling through the challenging combination of former railroad ROWs and city street systems coupled with freeway and river crossings in the Northern Connection Area to connect with Union Station. For the Low Speed Maglev Alternatives, 70 to 74 percent of the alignment cost would occur in Los Angeles County reflecting a longer alignment length compared to the Orange County portion of the system as this alternative does not continue through the City of Santa Ana to the SARTC.

Possible MOS Costs

With a transit project of this length and complexity, it would most likely be constructed in MOSs, or system segments that could stand alone as operable systems providing needed connections between key locations. The definition of MOSs would also be county-based reflecting public agency system priorities and funding constraints. Four proposed MOSs, with the first two segments located in Los Angeles County reflecting the Measure R funding commitment to this project, have been defined and an order of magnitude of cost identified below in Table 5.7:

- **MOS 1** – In Los Angeles County, the first segment would run from the Metro Green Line Lakewood Boulevard Station along the Metro-owned WSAB ROW to the Bloomfield Avenue Station which would serve as an interim terminus at the county line. This section is similar to the Los Angeles County portion of the PEROW/WSAB Area cost, but is 0.56 of a mile shorter as the MOS alignment turns up Lakewood Boulevard to connect with the existing Metro Green Line Lakewood Boulevard Station.
- **MOS 2** – The second segment would operate north from the end of the PEROW/WSAB ROW in Paramount from a new Metro Green Line station along the Ports-owned ROW, various active and inactive railroad ROWs, and city streets to a northern terminus at Union Station. The cost for this section is the Northern Connection Area cost for each of the alternatives.
- **MOS 3** – The first segment in Orange County would continue south from the county line along the OCTA-owned PEROW to an interim terminus at the future Santa Ana-Garden Grove Fixed Guideway Harbor Boulevard Station. This section's cost is the Orange County portion of the PEROW/WSAB Area capital cost as identified previously.
- **MOS 4** – The final segment of the system would be constructed south through the City of Santa Ana along the Harbor Boulevard/1st Street/SARTC alignment, and the cost is the Southern Connection Area capital cost.

Table 5.7 – Capital Cost for Possible Minimum Operable Segments (FY 2010 dollars)

Modal/Alignment Alternative	MOS 1 Metro Green Line to County Line (Millions)	MOS 2 Metro Green Line to Union Station (Millions)	MOS 3 County Line to Harbor Boulevard (Millions)	MOS 4 Harbor Boulevard to SARTC (Millions)
BRT Alternatives				
‣ Street-Running	$183.3	$275.9	$392. 3	$216.0
‣ HOV Lane-Running	$183.3	$282.3	$392. 3	$216.0
Street Car Alternatives				
‣ East Bank	$345.3	$1,397.6	$513.3	$304.2
‣ West Bank 3	$345.3	$1,741.0	$513.3	$304.2
LRT Alternatives				
‣ East Bank	$414.6	$1,552.4	$607.2	$377.6
‣ West Bank 3	$414.6	$1,799.7	$607.2	$377.6
Low Speed Maglev Alternatives				
‣ East Bank	$1,741.9	$2,847.8	$1,958.5	NA
‣ West Bank 3	$1,741.9	$3,703.8	$1,958.5	NA

Street Car and LRT Capital Costs with Grade-Separated System

The Street Car and LRT alternative capital costs presented above were based on a proposed combination of at-grade and grade-separated operations. Grade-separated operations are considered to be primarily above-grade and not in a subway configuration. During Initial Screening, subway construction was removed from further consideration due to the PEROW/WSAB ROW's high water table which ranges from approximately two to 20 feet below the surface, resulting in higher construction costs, as well as the costly need to address the possibly contaminated ground water from years of railroad operations. The West Bank 3 Alternative does include a subway segment as the proposed alignment transitions from the Metro-owned Harbor Subdivision to travel through the densely-developed Central City East and Little Tokyo areas of downtown Los Angeles to Union Station.

Conceptual vertical alignment decisions were made based on engineering best practices and Metro's nationally-recognized *Grade Crossing Policy for Light Rail Transit*, which was used for the entire corridor to provide a consistent cost methodology. Table 5.8 presents a summary of the percentage of each alignment segment that was designed at-grade or grade-separated at this point in the system planning process. As previously stated, the West Bank 3 alignment alternative is the only option designed with a percentage of grade-separated operations in the City of Vernon and Central City East area of Los Angeles.

Table 5.8 – Street Car and LRT Alignments: Definition of Vertical Configuration

Alignment Alternative	Northern Connection Area (Percent)		PEROW/ WSAB Area (Percent)		Southern Connection Area (Percent)		Total (Percent)	
	At-Grade	Aerial/ Subway	At-Grade	Aerial	At-Grade	Aerial	At-Grade	Aerial/ Subway
East Bank 1	76%	24%	92%	8%	92%	8%	87%	13%
West Bank 1	78%	22%	92%	8%	92%	8%	87%	13%
West Bank 2	85%	15%	92%	8%	92%	8%	90%	10%
West Bank 3	73%	27%	92%	8%	92%	8%	86%	14%

If the decision were made to construct the Street Car and LRT options in an entirely grade-separated configuration, similar to the Low Speed Maglev alternatives, the resulting increase in estimated capital costs for each Corridor area is presented in Table 5.9. The increase in cost to grade-separate the Street Car and LRT alternatives is approximately two times (1.8) the cost estimates presented in Table 5.3.

Table 5.9 – Estimated Capital Cost For 100% Grade-Separated Systems (FY 2010 dollars)

Alignment Alternative	Alignment Section	Street Car Cost (Millions)	Street Car Cost Per Mile (Millions)	LRT Cost (Millions)	LRT Cost Per Mile (Millions)
East Bank	Northern Connection Area	$2,473.0		$2,542.0	
	PEROW/WSAB Area	2,580.7		2,850.8	
	Southern Connection Area	722.1		843.1	
35.2 Miles	**Total**	**$5,775.8**	**$164.1**	**$6,235.9**	**$177.2**
West Bank 1	Northern Connection Area	$2,447.8		$2,526.5	
	PEROW/WSAB Area	2,580.7		2,850.8	
	Southern Connection Area	722.1		843.1	
35.2 Miles	**Total**	**$5,750.6**	**$163.4**	**$6,220.4**	**$176.7**
West Bank 2	Northern Connection Area	$2,534.8		$2,644.1	
	PEROW/WSAB Area	2,580.7		2,850.8	
	Southern Connection Area	722.1		843.1	
35.6 Miles	**Total**	**$5,837.5**	**$164.0**	**$6,338.0**	**$178.0**
West Bank 3	Northern Connection Area	$2,535.0		$2,685.7	
	PEROW/WSAB Area	2,580.7		2,850.8	
	Southern Connection Area	722.1		843.1	
34.5 Miles	**Total**	**$5,837.8**	**$169.2**	**$6,379.6**	**$184.9**

5.3 Operating and Maintenance Costs

Operating and maintenance (O&M) costs are those related to the day-to-day operations of the proposed transit service including labor, vehicle maintenance, and overall transit system maintenance. O&M costs were projected based on the level of service and unit costs for each alternative as described in detail in *Appendix E: PEROW/WSAB Corridor AA Operating and Cost Estimate & Financial Analysis Report.*

Project level of service was estimated based on operating plans prepared for each alternative incorporating information including vehicle revenue miles, vehicle revenue hours, and peak vehicles. The O&M unit cost estimates were based on existing bus and rail service unit costs from Metro and OCTA, as well as from other peer transit operators after adjustment to reflect the operating conditions (i.e., labor costs) in Los Angeles and Orange counties. For each alternative, four sets of O&M unit costs were estimated, as it was not known who the operator would be for two of the proposed transit services. While there is extensive BRT and LRT experience in the Corridor, there is no local operating information available for Street Car and Low Speed Maglev. In addition, the four sets of O&M unit costs reflect the conceptual level of planning and provide a common level of comparison among alternatives. The first two sets of O&M unit costs reflect operation by either Metro or OCTA and are based on the labor costs for these two agencies. The second set of numbers represented the costs reflecting the low and high costs of peer agencies for each mode (e.g., the Vancouver TransLink and Miami Metromover systems for Low Speed Maglev). For the O&M information presented below, the costs are based on assuming all Metro operations. To derive unit costs, the total expenses assigned to each supply variable were divided by the annual service quantities; and the unit cost for each supply variable was multiplied by the projected annual units of service to identify the annual O&M costs presented in Table 5.10.

Table 5.10 – Estimated Annual O&M Costs (FY 2011 dollars)

Alternative	Total Annual O&M Cost (Millions)	Incremental Cost over TSM (Millions)
TSM Alternative		
‣ Corridor System	$56.9	--
BRT Alternatives		
‣ Street-Running	$41.6	($15.3)
‣ HOV Lane-Running	$53.1	($3.8)
Street Car Alternatives		
‣ East Bank 1	$217.9	$161.0
‣ West Bank 1	$216.8	$159.9
‣ West Bank 2	$219.4	$162.5
‣ West Bank 3	$217.5	$160.6

Table 5.10 – Estimated Annual O&M Costs (FY 2011 dollars)

Alternative	Total Annual O&M Cost (Millions)	Incremental Cost over TSM (Millions)
LRT Alternatives		
East Bank 1	$216.0	$159.1
West Bank 1	$210.0	$153.1
West Bank 2	$214.1	$157.2
West Bank 3	$204.0	$147.1
Low Speed Maglev Alternatives		
East Bank 1	$152.3	$95.4
West Bank 1	$155.1	$98.2
West Bank 2	$153.2	$96.3
West Bank 3	$151.9	$95.0

During any subsequent engineering and environmental review efforts, system components and requirements would become more detailed and updated operator-specific O&M cost assessments would be prepared.

5.4 Financial Feasibility Analysis

This section begins with a discussion of the sources and uses of available funds, which addresses both capital and operating revenues and expenses. A second discussion presents funding requirements, including the revenue required to fund the gap between projected sources and uses of funds for project capital and O&M costs. The concluding section presents an overview of the cash flow analysis for selected project alternatives. More detailed information presented in the *Appendix E: PEROW/WSAB Corridor AA Operating and Cost Estimate and Financial Analysis Report.*

5.4.1 Sources and Uses of Funds Analysis

This section presents an overview of the funding required to construct and operate the alternatives studied in the PEROW/WSAB Corridor AA. All references to fiscal year in this analysis refer to the Metro and OCTA fiscal year, which begins on July 1 and ends on June 30.

Capital Uses of Funds

The construction period of the recommended project resulting from this study is assumed to be between FY 2015 and FY 2026, with the exception of the TSM Alternative which is assumed to be completed within five years from FY 2022 to FY 2026. For AA evaluation purposes, the implementation schedule was assumed to be as follows reflecting Measure R funding availability in Los Angeles County:

- **MOS 1** consisting of the segment along the portion of the PEROW/WSAB ROW owned by Metro from the Metro Green Line to the county Line.
  - PE/DEIS/DEIR initiated in 2013 and completed in 2015.
  - Construction initiated in Winter 2015, and assuming six years of construction based on the Exposition Phase 1 Project, completed in early 2021.
  - Initiate operations in early-2021
- **MOS 2** consisting of the segment north from the Metro Green Line to Union Station.
  - Construction initiated in mid-2021 and completed in early 2027.
  - Initiate operations in early 2027.

Capital cost estimates were first developed in FY 2010 dollars and then escalated to FY 2011 dollars. The resulting capital costs were escalated at 3.33 percent based on the R.S. Means Construction Cost Index for San Jose, California, prepared in June 2010. This projection was prepared for the Santa Clara Valley Transportation Authority by Moody's Economy, and was the most detailed and recent projection available. It should be noted that this inflation rate differs from the 3.0 percent inflation rate used in the preparation of Metro's *2009 Long Range Transportation Plan (LRTP)*. The 3.33 percent rate was used instead of the LRTP rate since it is a more recent estimate. The inflation forecast is summarized in the financial analysis section of the *Appendix* E: *PEROW/WSAB Corridor AA Operating and Cost Estimate & Financial Analysis Report*. The financial analysis also projected the costs to rehabilitate, replace, and maintain capital assets in a state of good repair. Rehabilitation and replacement costs typically are incurred beginning 12 years after the initial construction costs, and are based on the useful life of capital assets as identified by FTA.

Capital Sources of Funds

The following Los Angeles County and federal funding sources were assumed to be available to support construction of the PEROW/WSAB Corridor project. Federal New Starts funding was assumed not to be available given other funding priorities by Metro and OCTA.

Measure R

Measure R is a sales tax initiative approved by Los Angeles County voters in 2008. A half-cent sales tax effective July 1, 2010, ending in 2039, is to be used for public transportation purposes. Approximately $240 million from Measure R bond proceeds is allocated to West Santa Ana Branch (WSAB) portion of the PEROW/WSAB Corridor project from FY 2020 to FY 2025 in Metro's *2009 LRTP*.

Prop A 35% Bond

Proposition A is a half-cent sales tax, passed by Los Angeles County voters in 1980, to be used to improve public transit with 35% of the revenue dedicated to rail development and operations. $124.4 million from Prop A 35% bond proceeds are allocated to the WSAB portion from FY 2025 to FY 2028 in the Metro *2009 LRTP*.

Prop C 25%

Proposition C is a half-cent sales tax, passed by Los Angeles County voters in 1990, to be used for public transit purposes with 25% of the revenues dedicated to transit-related highway funds. $500,000 from the Prop C 25% program is allocated to WSAB portion of the PEROW/WSAB Corridor project in FY 2011 and FY 2012 in the Metro *2009 LRTP*.

Local Agency Contribution

Metro's *2009 LRTP* also identified a total of $19.5 million funding as local agency contribution available to the WSAB portion of the PEROW/WSAB Corridor project in FY 2022 and FY 2025.

Section 5309 Fixed Guideway Modernization Grants

These are discretionary federal funds derived by formula as specified in The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and published in the *Federal Register*. The formula is a function of transit vehicle-revenue miles and route-miles, and funds are available seven years after each segment of a new fixed guideway transit project enters revenue service.

Operating Sources of Funds

The following discussion summarizes funding sources that were assumed to be available to support operations of the PEROW/WSAB Corridor project.

Passenger Revenues

Passenger revenues were based on a projection of the average fare paid per rider and the projected riders for each alternative. The average fare paid per rider was sized to cover the unmet requirements of the operating fund. Ridership projections were based on the average weekday travel demand forecast prepared for each alternative; an annualization factor of 319.5 average weekdays per year was applied, based on recent Metro and OCTA experience. Growth in ridership from the opening year to the design year takes into consideration the following factors:

- **Demographic growth –** Ridership was projected to increase between the opening year and the design year based on projected population growth in the PEROW/WSAB study area.
- **Fare increases** – The average fare per rider was projected to grow with inflation adjusted every other year. The impacts of these fare increases on projected ridership were taken into account by assuming a fare elasticity of -0.3 percent; that is, for each real fare increase (net of CPI inflation) one percent ridership would be expected to fall by 0.3 percent. In years that fares do not change, ridership increases marginally because fares are declining in real terms.

Advertising Revenues

Advertising revenues were projected based on recent Metro and OCTA revenue per rider and projected ridership based on Metro and OCTA information derived from the *2009 National Transportation Database Report*. The ridership projection was based on the travel demand forecast for each alternative. Advertising revenue per rider was projected to grow by the projected rate of California San Jose CPI identified by Moody's Economy.com in June 2010.

Section 5307 Urbanized Area Formula

These discretionary funds were derived by a formula specified in SAFETEA-LU and published annually in the *Federal Register*. The apportionment of these funds is based primarily on service level and ridership variables. The annual allocation of funds to Urbanized Areas is based on the level of service operated in the previous two years. SAFETEA-LU limits the application of these funds to capital expenditures for areas with a population greater than 200,000, but preventative maintenance expenses in the operating budget may be considered as "capital." One percent of these funds must be applied to "enhancements" which include the new initiative capital projects. Incentive tier funding in this grant program were not assumed to be available to the PEROW/WSAB Corridor project, but would be available to the existing bus operators in the urbanized area. The estimated funding applied in the financial analysis was based on level of service projection of each alternative.

5.4.2 Additional Capital and Operating Funding Requirements

The financial analysis identified that the projected capital revenue sources described above would not be sufficient to cover the estimated PEROW/WSAB Corridor project capital costs. Funding requirements on a cash basis were identified by subtracting the capital expenditures from the projected funding revenues in year-of-expenditure dollars. The resulting unmet capital funding requirements are presented below in Table 5.11, and the larger numbers than the original cost reflect financing funding requirements. TSM capital expenditures were assumed to be shared by the Los Angeles County and the Orange County, therefore no unmet funding requirement of TSM was projected.

Table 5.11 – Capital Funding Requirements: FY2011 to FY2040 (Year-of-Expenditure)

Alternative	Funding Shortfall (Millions)
BRT Alternatives	
‣ Street-Running	$1,120
‣ HOV Lane-Running	$1,135
Street Car Alternatives	
‣ East Bank	$2,855
‣ West Bank 3	$3,285
LRT Alternatives	
‣ East Bank	$3,015
‣ West Bank 3	$3,470
Low Speed Maglev Alternatives	
‣ East Bank	$8.210
‣ West Bank 3	$9,325

At this point in the planning process, the unmet capital funding requirements were assumed to be addressed through the assumption of a future incremental sales tax in Los Angeles and Orange Counties.

Additional sales tax was assumed in the cash flow analysis to close the gap in capital funding identified in Table 5.11. The additional sales tax revenues were sized proportionally to the capital costs breakdown between the two counties for each alternative. The sales tax base amount in each county was provided by SCAG in October 2011.

An overview of the resulting conceptual cash flow analysis is presented in Table 5.12. Bridge financing was applied to address the working capital needs during peak years of construction. The short-term debt was assumed to be retired after five years, and the interest and debt management expenses repaid by sales tax revenue streams. The interest rate applied in this analysis was based on a June 2010 projection of tax-exempt commercial paper interest rates developed by Moody's Economy.com, which is summarized in *Appendix E: Operating and Cost Estimate & Financial Analysis Report.* The bonds were assumed to incorporate the costs of the first year's debt service payment, the debt issuance expense (equal to 0.6 percent of the gross amount of debt issued). The coverage ratio of the short-term debt was maintained above 2.0 during the entire analysis period. The average fare paid per rider was adjusted to size the passenger revenue to close the operating funding gap except for the TSM component. The Metro high O&M unit cost was applied in calculating the O&M costs of the PEROW/WSAB Corridor alternatives.

Table 5.12 – Summary of Cash Flow Analysis

Alternative	Average Fare Per Unlinked Trip	Incremental Sales Tax			
		Tax Rate		Implementation Period	
		Los Angeles	Orange	Los Angeles	Orange
BRT Alternatives					
‣ Street-Running	$2.42	0.0006%	0.032%	2015	2029
‣ HOV Lane-Running	$2.64	0.0006%	0.032%	2015	2029
Street Car Alternative					
‣ West Bank 3	$9.60	0.038%	0.036%	2015	2040
LRT Alternative					
‣ West Bank 3	$8.23	0.033%	0.041%	2015	2040
Low Speed Maglev Alternative					
‣ West Bank 3	$7.12	0.101%	0.110%	2015	2040

The cash flow analysis derived the incremental sales tax rate in each county necessary to generate sufficient sales tax revenues to close the estimated capital funding gap of each alternative and maintain sufficiently high debt service coverage. The incremental sales tax was assumed to be implemented in 2015 and continue through 2029 for the BRT alternative and through the end of the 30-year analysis period for the Street Car, LRT, and Low Speed Maglev alternatives. It should be noted that for the Street Car, LRT, and Low Speed Maglev alternatives, further refinement of the cash flow analyses could include lowering the incremental tax rate in the last 5 to 10 years of the 30-year analysis period, thereby avoiding large 2040 year-end cash balances.

Other Financing Sources

A *PEROW/WSAB Corridor AA Value Capture Memo* was prepared to evaluate the derivation of transit project financing from enhanced land value attributable to the transit investment. Three areas of value capture solutions were assessed: joint development, special assessments, and tax increment financing. A Corridor-level transit improvement undertaken by Metro or OCTA could benefit from local value capture, as long as a mechanism existed to accommodate the transfer of funds from individual municipalities to the entity funding the project. Under California's uniquely flexible Joint Powers process, such an entity could easily be created. The following summarizes the findings:

- **Joint development** – There is virtually no surplus Metro or OCTA-owned land along the PEROW/WSAB Corridor alignment, but the joint development concept may also be applied to land which is owned now, or might be assembled in the future, by the cities or their former redevelopment agencies. Each city would have the option of tying the redevelopment of parcels in their ownership to the transit investment, by dedicating the sale or ground lease proceeds of the transactions in question to the project. For the LRT or Low Speed Maglev Alternatives, it is also conceivable that developers of adjacent properties could be induced to participate in station construction as demonstrated elsewhere.
- **Special Assessments –** The creation of betterment assessment districts is available to Metro or OCTA and to each municipality. Enacted in 1996, Proposition 218 requires that any new assessment district be approved in a weighted-vote election among affected property owners.[1] The willingness of any of the affected jurisdictions to pursue a betterment assessment district and see it through to electoral approval is speculative.
- **Tax Increment Financing** – California's version of TIF was reflected in its community redevelopment law first enacted in 1945. It allowed any city or county to create a redevelopment agency, which oversaw one or more redevelopment project areas. The creation of such areas requires a "finding of blight", which triggered the availability of the law's broad redevelopment powers. Among these is the capture, for a maximum of 50 years, of the tax increment derived from all taxable parcels within the project areas. In response to budget challenges, the California State Legislature passed a law in the summer of the 2011 that abolished redevelopment agencies. The law was appealed and on December 28, 2011 the California Supreme Court ruled in favor of the state law and more than 400 redevelopment agencies ceased to exist as of February 11, 2012. Redevelopment advocates are expected to return to the Legislature to ask lawmakers to restore the ability of local governments to reestablish redevelopment project areas.

Many cities in the PEROW/WSAB Corridor had redevelopment project areas that included lands within a half-mile of the proposed stations with the potential for transit-oriented development (TOD). The TOD

[1] Legislative Analyst's Office; http://www.lao.ca.gov/1996/120196_prop_218/understanding_prop218_1296.html.

potential is greatest at those stations in recognizable downtown and community areas, such as downtown Los Angeles and Pacific Boulevard in Huntington Park, and where mixed-use development is already present or anticipated in local planning and zoning. The introduction of a high-capacity transit service with direct connections to and from Corridor activity centers and destinations could be expected to induce a more intensified, transit-oriented development pattern over time. While not contributing to the construction of the project, future TOD development will support the success of the transit system alternatives by attracting higher levels of system ridership.

6.0 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

Public and agency outreach input has been integral in shaping the PEROW/WSAB Corridor AA study process and guiding the direction of the project. Stakeholder comments were received and documented over the course of the 24-month study at meetings and work sessions with a wide range of elected officials, stakeholders, advisory committee members, and the community. This section summarizes the involvement approaches, activities, and outcomes of the AA outreach effort.

6.1 Public Involvement and Agency Coordination Efforts

Prior to project initiation, a Public Participation Plan was developed describing the community outreach and public engagement activities to be conducted to support the PEROW/WSAB Corridor AA study. The goals of this Public Participation Plan were to:

1. Invite communities and stakeholders to shape and share responsibility for their future;
2. Present a well-designed approach that clearly explained both the opportunities and constraints of the decisions – from financial, social, technical, and political perspectives;
3. Hold inclusive public forums/workshops for communities to develop and critique the "multiple ways" to reach their desired future.

Development of the Public Participation Plan was guided by the following strategies:

- Incorporate a range of outreach tools that encouraged people to contribute in establishing a vision to guide transportation planning and project(s) in the Corridor.
- Provide opportunities for two-way dialogues, during which study team members engaged in thoughtful conversations with community members and stakeholders.
- Develop public and media information that inspired project understanding, support, and enthusiasm both for participating in the study and the resulting project.

The Public Participation Plan was divided into three phases to correlate with the key milestones of the AA study process. In order to enhance public understanding of the process, the milestones were renamed with distinct phases as indicated below:

- **Project Initiation and Conceptual Alternatives Screening** – Phase 1: Envisioning Our Future;
- **Initial Alternatives Screening** – Phase 2: Exploring the Possibilities; and
- **Final Alternatives Screening and Selection of the Recommended Mobility Improvements** – Phase 3: Realizing Our Vision.

Numerous participation strategies were utilized in throughout the study to maximize community, stakeholder, and agency input:

- **Interagency Coordination Group** – Stakeholder and agency participation was coordinated through a group comprised of SCAG, Metro, OCTA, Gateway Cities COG, and the Orangeline Development Authority.

- **Elected Official Briefings** – One-on-one meetings were held to solicit elected official input on the transportation and other challenges facing their city, ideas for alternatives to be studied, and guidance on how to best involve their communities in the AA study. This effort included presentations to city councils to provide an overview of the study efforts and results and encourage participation in the community meetings.
- **Project Advisory Committees** – Two policy committees were formed to guide the planning process both from an elected official perspective and a city and other affected agency viewpoint.
- **Stakeholder and Community Groups** – Meetings were held with stakeholders, business leaders, and community groups to hear their concerns and project input, and to encourage their participation in the study process and upcoming community meetings.
- **Community Meetings** – A series of public meetings was held three times at locations throughout the Corridor to present information about the AA study process, and to hear community input on project-related issues and challenges, and possible transportation alternatives.

A *PEROW/WSAB Corridor AA Public Participation Meeting Matrix* was prepared and updated frequently to document meeting dates, the organization or group, and the type and purpose of the meeting. The matrix is included as Appendix G to this report. Input was summarized and recorded through memorandums, community meeting summary reports, comment cards, and emails and letters documented in *Appendix G: PEROW/WSAB Corridor AA Log of Public Comments*.

The following participation tools were used during the AA study process:

- **Project Fact Sheet** – A tri-lingual fact sheet (English, Spanish, and Vietnamese) was developed to present a project overview, including a map of the study area, the purpose of the AA study, a project schedule, and key milestones for public involvement to set the framework for community discussion. These were distributed at all briefings, meetings, and work sessions.
- **Project Overview Handout** – An overview of the AA study process, including a discussion of the six AA study steps, anticipated study and outreach efforts, and project schedule, was developed and updated throughout the study process to develop a public understanding of the study process and to encourage public participation by identifying how to provide it.
- **Websites** – A project website (www.pacificelectriccorridor.com), with current project information, including all reports, other study information, and a calendar of upcoming events, was designed for ease of public access. AA study "business" cards with the website information were distributed at all briefings, meetings, and work sessions. In addition, a project page was created on the SCAG website (www.scag.ca.gov/perow).
- **Facebook** – Project study information was posted and updated on SCAG's Facebook page throughout the AA study process.
- **Project Information Line and Email** – The SCAG Project Manager's phone number and email address were provided to receive and respond to project comments and inquiries. Comments were recorded in the *Log of Public Comments*.

- **Database** – A project database was developed of Corridor individuals and organizations affected by and interested in any future transit project. The database also included interested parties and/or affected individuals and organizations outside of the study area. This database was utilized to communicate meeting dates and study updates.
- **Electronic newsletters** – Newsletters presenting project study information were posted on the project website and SCAG's Facebook page at key decision points throughout the study process.
- **Meeting Notices** – Trilingual information about upcoming community meetings was posted on the project websites, most city websites, and distributed door-to-door within a 0.25 mile of the Corridor by Walking Man for the first two series of community meetings. City websites, newspaper ads, and emails to the project database were used for the final community meetings.
- **Survey Forms** – Phase-specific project survey forms were developed and used at each of the community meetings to record public comments and alternative preferences.

6.1.1 Conceptual Screening Efforts

During this first AA study phase, the purpose of the public involvement efforts was to communicate information about the AA study, solicit input on key Corridor transportation and related community issues, identify possible transportation solutions, seek input on the project goals and evaluation criteria, and establish outreach strategies. The following discussion provides an overview of the public outreach efforts conducted during this phase: elected official briefings, stakeholder interviews, project advisory committee meetings, stakeholder and community group presentations, and community meetings that are summarized at the end of this section.

Outreach efforts in this phase resulted in the identification of a set of nine Conceptual Alternatives representing a wide range of possible technologies. The proposed alternatives were evaluated on a meets-does not meet level of technical and policy assessment, along with additional stakeholder input, to define eight Initial Alternatives to be studied further in the next study phase.

Elected Official Briefings and Stakeholder Interviews

During project initiation, interviews were conducted with elected officials or their representatives from each of the study area cities, including Anaheim, Artesia, Bell, Bellflower, Buena Park, Cerritos, Cudahy, Cypress, Downey, Garden Grove, Huntington Park, Lakewood, La Palma, Los Angeles, Lynwood, Maywood, Paramount, Santa Ana, South Gate, Stanton, and Vernon, and the counties of Los Angeles and Orange. The goal was to ensure that elected officials and their staff fully understood the project's objectives, the process and schedule, opportunities for community involvement, and conversely to ensure that their priorities, values and needs, and concerns were understood and reflected in the project efforts.

Interviews were also conducted with stakeholders identified by elected officials as people who they felt would offer valuable insight into transportation, land use, and economic issues facing their communities. Interviews were conducted in-person, or by telephone, and were used to explore critical issues and questions, and to evoke strategic thinking to assist in the development of the project purpose and need, goals and evaluation criteria, and possible transportation alternatives.

Project Advisory Committees

During Project Initiation, two Project Advisory Committees were established to guide planning efforts:

- **Steering Committee (SC)** – The purpose of this committee was to represent their communities, advise the project team, and guide study decision-making. Membership consisted of elected officials from the communities located throughout the Corridor Study Area, along with representatives from the Los Angeles and Orange County Supervisors, Gateway Cities Council of Governments (COG), Orange County COG, and Caltrans, and was chaired by a Metro and OCTA Board member and/or elected official.
- **Technical Advisory Committee (TAC)** – This committee's role was to represent their city's needs and concerns, advise the project team on the technical requirements of the project, and serve as a sounding board throughout the study process. The TAC was composed of staff members from the transportation, public works, and/or planning departments of the Corridor cities and counties, and included staff representatives from Metro, OCTA, the Gateway and Orange County COGs, and other affected agencies, including the FTA, U. S. Army Corps of Engineers, Caltrans Districts 7 and 12, California Public Utilities Commission, UP Railroad, Southern California Regional Rail Authority (Metrolink), Orangeline Development Authority, and Long Beach Transit.

The approximately 30-member Steering Committee was identified through letters sent to each city mayor or agency head requesting them to serve or to appoint a representative. The approximately 40 TAC members were identified through letters and emails sent to each city manager or public works/agency director asking them to serve or to designate a representative. Committee meetings were held in various locations in Los Angeles and Orange counties to encourage participation.

During the Conceptual Screening phase, the committees met two times and members provided advice on framing the study process and goals, defined the Conceptual Set of Alternatives, and, based on technical assessment and community input, approved an Initial Set of Alternatives. The TAC meetings were conducted on May 25, 2010; and July 13, 2010, and the Steering Committee meetings on May 26 and July 21, 2010. Both sets of advisory committee meetings had similar purposes:

- May 2010 – The meeting included a project overview, and a group discussion of Corridor transportation issues and possible solutions, strategies for engaging their communities, and input on the presentation and informational materials for the upcoming community meetings; and
- July 2010 – The meeting included an overview of the project initiation efforts and community comments received, and a discussion of Project Goals, and related screening criteria. Screening results of the nine Conceptual Alternatives was presented resulting in the identification of the eight Initial Alternatives to be evaluated in more detail in the next AA study phase.

Stakeholder and Community Groups

More than 150 community-based organizations, civic organizations, and Chambers of Commerce were identified in each city through on-line research and in interviews with elected officials and city staff during project initiation. Before each series of community meetings, these organizations were contacted by telephone and email to make them aware of the study and encourage participation. City managers and public information officers were also contacted and asked to provide information about the study and promote attendance at the upcoming community meetings through their information channels, including public access cable TV, city newsletters, city websites, and meeting notices at city hall public counters. Staff for city planning and transportation commissions were also contacted to provide meeting information to the commissioners.

Community Meetings

During the first phase, a series of six interactive community meetings were held from Tuesday, June 15 through Wednesday, June 23, 2010. The community meetings were designed to accommodate two-way communication where the public was first educated about the AA study, its goals and objectives, and the process; and then encouraged to provide their views about community needs and transportation concerns, possible alternative solutions, and criteria for evaluating the alternatives. The meetings were publicized by a variety of methods to maximize awareness and participation from the community:

- Approximately 37,000 flyers were hung on the doors of businesses and residents located within a 0.25-mile radius of the Corridor and the northern railroad corridors connecting to Downtown Los Angeles and Union Station. Flyers were bilingual (English and Spanish), and tri-lingual in Garden Grove (English, Spanish, and Vietnamese).
- An invitation was emailed to 410 stakeholders and other interested parties.
- A press release was distributed to local newspapers, local transit blogs, and other media outlets.
- Public service announcements were aired on Vietnamese-language radio.
- Meeting notices were posted on many city websites and presentations were made at local city council and other government agency meetings throughout the Corridor.
- Phone calls were made and invitations emailed to business groups, community-based organizations, environmental justice and bicycle groups, as well as city commissioners.

Approximately 185 participants attended the meetings held in accessible locations in the following PEROW/WSAB Corridor cities:

- Garden Grove, Tuesday, June 15, 2010, 6:30-8:30 PM;
- Huntington Park, Wednesday, June 16, 2010, 6:30-8:30 PM;
- Cypress, Thursday, June 17, 2010, 6:30-8:30 PM;
- Cerritos, Saturday, June 19, 2010, 1:00-3:00 PM;
- Paramount, Tuesday, June 22, 2010, 6:30-8:30 PM; and
- Stanton, Wednesday, June 23, 2010, 6:30-8:30 PM.

The meeting format included an open house set up with 13 presentation boards providing information on the AA study process, the Corridor, and potential transit opportunities. Participants had an opportunity to view the boards and ask questions of project team members. Spanish-speaking staff was available at all meetings with Vietnamese capabilities at the Garden Grove meeting. Following the open house, attendees were welcomed to the meeting and the project team gave a presentation providing an overview of the project purpose, process, outcomes, timeline, and opportunities for public involvement. Information providing an overview of the Corridor context and potential transit opportunities from previous studies and stakeholder interviews was included. At the conclusion of the presentation, participants divided into small discussion groups. Each group had a facilitator who started the discussion and recorded comments on a flip chart as the group addressed the following questions:

- What do you think are the transportation issues and challenges in your community?
- What transportation solutions make sense to you?
- Where do you want to go? What work, shopping, education, entertainment, recreational, and other destinations would you like easier travel to?
- How should the proposed transportation solutions be evaluated? What should we consider when making Corridor transportation decisions?

A volunteer from each of the discussion groups reported back to the meeting-at-large to allow for all participants to hear key ideas from each discussion group. At the conclusion of the meeting, the project team members identified how the public could submit additional comments and stay informed as the project progressed. Participants were encouraged to submit comment cards addressing the questions and to identify a preferred method of communication. The questions on the comment cards were similar to the group discussion questions, but participants were encouraged to share any comments, concerns, or ideas related to the Corridor and AA study. Input received from the group discussions and comment cards is summarized below and was documented in the *PEROW/WSAB Corridor AA Community Meetings Series #1 – Summary Report*.

Summary

Public involvement efforts conducted during the Project Initiation and Conceptual Alternatives Screening phase are summarized in Table 6.1 and documented in *Appendix G: Public Comments*.

Table 6.1 – Summary of Conceptual Screening Phase Outreach Efforts

Meeting Type	Number of Meetings	Number of Attendees	Type/Number of Comments Received
Elected Official/Stakeholder Interviews	50	57	Verbal comments
Technical Advisory Committee	2	53	Verbal comments
Steering Committee	2	61	Verbal comments
Stakeholder/Community Groups	10	40	Verbal comments
Community Meetings	6	185	Verbal comments Written comments (86)
Total	70	396	

6.1.2 Initial Alternatives Screening Efforts

During the second AA study phase, the Initial Alternatives were assessed based on a comparative initial evaluation of technical and environmental benefits and impacts. The purpose of this phase's public involvement efforts was to communicate the resulting technical information and seek stakeholder and community input to identify the most viable transit solutions to be included in the Final Set of Alternatives to be studied and evaluated further based on more detailed engineering and related technical and environmental information.

Elected Official and Stakeholder Briefings

Between October 18 and November 23, project presentations or announcements were made at 18 study area city council meetings to provide information on the study and encourage participation at the upcoming community meetings. Presentations were made at seven city council meetings: Artesia, Bellflower, Buena Park, Cerritos, Huntington Park, Paramount, and South Gate. Announcements were provided during the public comment period at eleven city council meetings: Anaheim, Cudahy, Cypress, Downey, Garden Grove, Lakewood, Lynwood, Maywood, Santa Ana, Stanton, and Vernon. In addition, approximately 20 elected official and stakeholder briefings were held from November 3, 2010 through November 23, 2010 to present the Initial Screening technical results and seek input on the Final Set of Alternatives.

Project Advisory Committees

During this screening phase, the two project advisory committees met multiple times between October 2010 and April 2011 to review the Initial Screening results and guide the identification of the Final Set of Alternatives. The Technical Advisory Committee met five times during the Initial Screening phase:

- October 2010 – The meeting focused on an overview of the Initial Screening technical results and providing input on how to present the information at the upcoming community meetings.
- January 2011 – This working session included a discussion of the Purpose and Need Report, the project goals and evaluation criteria, Initial Screening approach, and input received from the community meetings.
- February 2011 – This second working session focused in detail on the initial screening efforts, including a detailed definition of the Initial Alternatives, analytical methodology, and the draft Initial Screening Report.
- March 2011 – The meeting included a more detailed presentation of the Initial Screening results and the Final Screening phase efforts, along with an initial discussion of recommendations for the Final Set of Alternatives.
- April 2011 – At this meeting, TAC members developed a Final Set of Alternatives to be recommended to the Steering Committee.

In addition, four station area planning work sessions were held with TAC members on September 9, 16, 21, and 29, 2010 to identify station locations and city-specific planning goals and plan.

The Steering Committee met three times during the Initial Screening phase:

- November 2010 – At this meeting, the committee members received a presentation on and discussed the study Purpose and Need Statement and the Initial Screening Results, and provided input on the presentation of the Initial Screening Results at the upcoming community meetings.
- February 2011 – The meeting focused on discussing study framework information, including an overview of the AA planned process, the anticipated Locally Preferred Alternative (LPA) actions and schedule, a more detailed definition of the Initial Set of Alternatives, the Initial Screening approach, an overview of the Initial Screening technical results, and input received from the community meetings held in November and December 2010.
- April 2011 – At this meeting, the committee received a presentation on and approved the Final Set of Alternatives recommended by the TAC.

Stakeholder and Community Groups

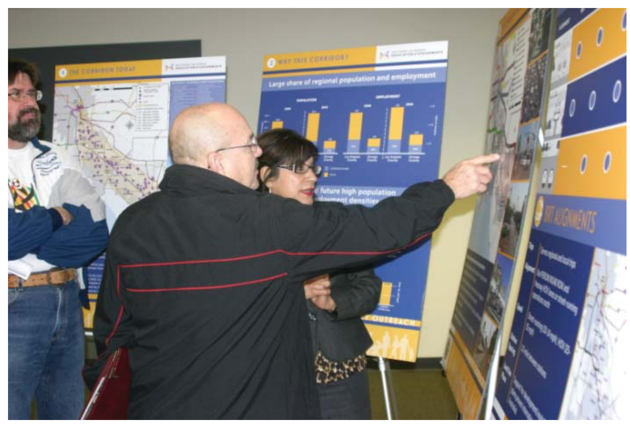
From November 16 through December 11, 2010, more than 150 city commissions, civic organizations, chambers of commerce and community-based organizations were contacted by email and telephone to invite their participation in the upcoming community meetings. Special efforts were made to target "hard to reach" populations, i.e. Spanish-speaking and Vietnamese-speaking communities. Six presentations were made; two in Spanish – to Kingdom Causes in Bellflower on October 28, 2010, and to the Women's Club in Huntington Park on November 9, 2010. Other groups that received presentations were: the Bellflower Kiwanis Club on November 12, 2010, and Cypress College Associated Student Body on December 1, 2010.

Community Meetings

During the second phase, a series of six interactive community meetings were held from Tuesday, November 16 through Saturday, December 11, 2010. The community meetings were designed to accommodate two-way communication where the public was first provided with an overview of the AA study process, Draft Purpose and Need Statement, and results of the Initial Screening technical efforts; and then encouraged to provide their views about which alternatives should be included in the Final Set of Alternatives for further study. The meetings were publicized by a variety of methods to maximize awareness and participation from the community:

- A first project E-Newsletter was prepared sharing information on the AA study process, study area description and mobility challenges, what was heard at the first community meetings, a description of the Initial Set of Alternatives, and information on the upcoming meetings.
- Approximately 38,000 flyers were hung on the doors of businesses and residents located within a four block radius of the Corridor and the northern railroad corridors connecting to Downtown Los Angeles and Union Station. Flyers were bilingual (English and Spanish), and tri-lingual in Garden Grove (English, Spanish, and Vietnamese).
- Presentations were given at seven city council meetings and announcements were made during the public comment period at 11 city council meetings.

- Meeting information was provided to the public information officers of 19 cities to notify elected and appointed officials and to distribute to the public; and meeting notices were posted on many city websites.
- Approximately 5,000 flyers were provided to cities to be made available in public areas, such as city halls and libraries.
- Steering Committee and TAC members were requested to notify their cities and interested stakeholders.
- An invitation was emailed to 500 stakeholders and other interested parties who requested notification.
- Phone calls were made and invitations were sent to community-based organizations, business groups, civic organizations, and environmental justice groups located in all 21 study area cities.
- A press release was distributed to local and community newspapers, including the *Orange County Register*, the *Long Beach Press Telegram*, *Paramount Journal*, *Los Angeles Wave* (Lynwood), *Downey Patriot*, *Downey Connect*, *Buena Park Independent*, *Garden Grove Journal*; local transit blogs; and other media outlets.



Approximately 170 participants attended the community meetings held in the same six cities as those in the first series of community meetings in Los Angeles and Orange counties:

- Paramount, Tuesday, November 16, 2010, 6:30-8:30 PM;
- Cerritos Tuesday, November 23, 2010, 6:30-8:30 PM;
- Huntington Park, Wednesday, December 1, 2010, 6:30-8:30 PM;
- Garden Grove, Thursday, December 2, 2010, 6:30-8:30 PM;
- Cypress College, Tuesday, December 7, 2010, 6:30-8:30 PM; and
- Stanton, Saturday, December 11, 2010, 6:30-8:30 PM.

The format of the meetings was similar to the community meetings conducted during Project Initiation and started with an informal open house where participants could view boards presenting an overview of the project-to-date. Information presented included an overview of the AA planning process, Corridor facts leading to the definition of the Purpose and Need Statement and Mobility Statement, the eight Initial Set of Alternatives being evaluated, and potential alignments. Participants had an opportunity to view the boards, ask questions of the project team members, and take a bi-lingual (English and Spanish) handout summarizing the project information presented on the boards. Spanish-speaking staff was available at all meetings with Vietnamese capabilities at the Garden Grove meeting.

Following the open house, attendees were welcomed to the meeting and the project team gave a project overview, after which participants split into discussion groups. Each discussion group discussed the proposed alternative modes of transportation, the pros and cons of each, and their preferences for their community. A volunteer from each of the discussion groups reported back to the meeting-at-large to share key ideas from each discussion group. In addition, participants were provided with comment cards requesting that they identify the three alternatives they felt were the most viable and should be studied further, along with any project-related comments. Input received from the group discussions and comment cards is summarized below and was documented in the *PEROW/WSAB Corridor AA Community Meetings Series #2 – Summary Report*.

Communicating the Final Set of Alternatives

With approval of the Final Set of Alternatives by the Steering Committee on April 19, 2011, a variety of efforts were made to provide the community and stakeholders with information on the No Build, Transportation Systems Management, and four build alternatives to be studied in the last phase of the AA study. Two community open houses were held, one each in Los Angeles and Orange counties on the following dates:

- South Gate, Monday, June 27, 2011, 5:30-7:30 PM; and
- Garden Grove, Tuesday, June 28, 2011, 5:30-7:30 PM.

The informal community open houses were designed to provide the community and stakeholders with an overview of the Final Set of Alternatives as presented on presentation boards. Information presented included an update of the AA planning process, the Corridor facts leading to the definition of the Purpose and Need Statement and Mobility Statement, detailed information on the six Final Alternatives being evaluated, along with their potential alignments. Participants had an opportunity to view the boards, ask questions of the project team members, and take a bi-lingual (English and Spanish) handout summarizing the project information presented on the boards. Spanish-speaking staff was available at all meetings with Vietnamese capabilities at the Garden Grove meeting. Participants were asked to complete a bi-lingual comment card asking the following questions:

- What are your thoughts about the Final Set of Alternatives?
- What should we consider when making the decision on the final recommended alternative?
- Do you have comments on any other issue related to the study?

The open houses were publicized by a variety of methods to maximize awareness and participation from the community:

- A second project E-Newsletter was prepared introducing the Final Set of Alternatives and inviting participation in the upcoming open houses and emailed to: all persons and organizations on the project database; TAC and Steering Committee members; federal, state, county, and city elected officials; and community organizations, city commissions, and chambers.
- A meeting notice was printed in local and community newspapers, including the *Orange County Register*, *Long Beach Press Telegram* serving the Gateway Cities, *La Opinion*, and *Viet-Herald*.
- Steering Committee and TAC members were requested to notify their cities and interested stakeholders.
- Phone calls were made and emailed invitations were sent to community-based organizations, business groups, civic organizations, and environmental justice groups in all 21 study area cities.
- Presentations were made to community-based organizations, business groups, civic organizations, and other groups, including the Bellflower Kiwanis Club on November 12, 2010, Cypress College Associated Student Body on December 1, 2010, South Gate Chamber of Commerce on May 24, 2011, and South Gate Planning Commission on May 25, 2011.

Environmental Justice

Public outreach for EJ communities was an important part of outreach efforts due to the high population of EJ communities along the PEROW/WSAB Corridor. Initial outreach efforts began in the conceptual screening phase with 10 meetings and presentations to EJ communities. This was followed by 52 meetings and presentations conducted in the initial screening phase.

Summary

The public involvement efforts conducted during the Initial Alternatives Screening phase are summarized in Table 6.2 and documented in *Appendix G: Public Comments*.

Table 6.2 – Summary of Initial Screening Phase Outreach Efforts

Meeting Type	Number of Meetings	Number of Attendees	Type/Number of Comments Received
City Council Presentations	18	NA	Verbal comments
Technical Advisory Committee Meetings	5	128	Verbal comments
Steering Committee Meetings	3	87	Verbal comments
Stakeholder/Community Groups	168	NA	Verbal comments
Community Meetings	6	169	Verbal comments Written comments (86)
Community Open Houses	2	80	Verbal comments Written comments (17)
Total	202	464*	

*Total number of attendees excluding City Council Presentations and Stakeholder/Community Groups

6.1.3 Final Alternatives Screening Efforts

During the final AA study phase, the Final Set of Alternatives were evaluated in detail based on including conceptual level engineering and station area working sessions with the Corridor cities. The purpose of this phase's public involvement efforts was to communicate the resulting technical information and seek stakeholder and community input to identify the Final Recommendations for future study.

Elected Official and Stakeholder Briefings

During this phase, approximately 12 elected official and stakeholder briefings were held from July 2011 through June 2012 to present the Final Screening technical results and seek input on the Final Recommendations.

Project Advisory Committees

During this final screening phase, the two project advisory committees met multiple times after the Steering Committee's approval of the Final Set of Alternatives on April 19, 2011. Between July 2011 and June 2012, advisory committee activities focused on refinement of the Final Set of Alternatives, discussion and review of the Final Screening technical results, and development of the Final Recommendations. The Technical Advisory Committee met five times during the Final Screening phase:

- July 2011 – This TAC meeting focused on hearing the results of the city work sessions held during June 2011 to refine station and alignment decisions. The project team presented an overview of the technical efforts that were to be initiated, along with the comparative evaluation methodology to be followed. After this meeting, and TAC agreement on the refined definition of the Final Set of Alternatives, the project team efforts were going to focus on preparing the engineering, cost, ridership, environmental, and other technical analytical efforts.
- March 2012 – This meeting focused on providing committee members with an update on the project schedule and an overview of the Final Screening results from the technical analytical efforts, including a summary comparison of the alternatives. An update on the definition of the Final Set of Alternatives based on work sessions with individual cities was also provided.
- April 2012 – The working session focused on a detailed discussion of the technical analytical results and the methodologies used in the technical evaluation of the alternatives.
- May 2012 – At this meeting, TAC members were asked to provide their input on the community meeting format and presentation materials. An initial discussion was held on what the Final Recommendations should include.
- June 2012 – In the final TAC meeting, a presentation of the project team recommendations was made to start the discussion of the Final Recommendations. The TAC developed and approved Final Recommendations including technology, alignment, and phasing recommendations, to be forwarded to the Steering Committee for discussion and approval.

The Steering Committee met twice during the Final Screening phase:

- April 2012 – At this meeting, the committee members received a presentation on the technical study process and the results. Information presented included refined definitions of the alternatives, conceptual capital and operating cost, daily ridership estimates, cost-effectiveness, and environmental benefits and impacts. An overview of the upcoming schedule through the Steering Committee's approval of the Final Recommendations at the upcoming June 2012 was presented and discussed. Committee members were also informed about the community meetings to be held during May at six locations in Los Angeles and Orange counties.
- June 2012 – At this final meeting, Steering Committee members received a brief presentation of the Final Recommendations developed by the TAC, and then discussed the proposed recommendations for further study. Minor revisions were made to the recommendations and the Steering Committee voted on June 20, 2012 to approve Final Recommendations to be forwarded to SCAG's Transportation Committee and Regional Council for action.

Community Meetings

During the second phase, a series of six interactive community meetings were held from Tuesday, May 15 through Thursday, May 24, 2012. The community meetings were designed to accommodate two-way communication where the public was first provided with an overview of the technical findings of the AA study process; and then encouraged to provide their views about which alternatives should be included in the Final Recommendations for further study. The meetings were publicized by a variety of methods to maximize awareness and participation from the community:

- Steering Committee and TAC members were requested to notify their cities and interested stakeholders.
- An invitation was emailed to 500 stakeholders and other interested parties who requested notification about future meetings.
- A press release was distributed to local and community newspapers, including the *Orange County Register* and the *Long Beach Press Telegram*, *La Opinion*, and *Nguoi Viet Daily News*.

Approximately 149 participants attended the community meetings held in the following six Corridor cities located in both Los Angeles and Orange counties:

- Santa Ana, Tuesday, May 15, 2012, 5:30-7:30 PM;
- Garden Grove, Wednesday, May 16, 2012, 5:30-7:30 PM;
- Buena Park, Saturday, May 19, 2012, 5:30-7:30 PM;
- Little Tokyo (Downtown Los Angeles), Tuesday, May 22, 2012, 5:30-7:30 PM;
- Bellflower, Wednesday, May 23, 2012, 5:30-7:30 PM; and
- South Gate, Thursday, May 24, 2012, 5:30-7:30 PM.

The community meetings provided an opportunity for the project team to share the results of the technical and environmental analytical results of the Final Set of Alternatives. The meetings were designed to allow residents from throughout the region, people who own property adjacent to the Corridor, business and civic leaders, transit advocates, and other interested members of the public to share issues, ideas, and perspectives about the Final Set of Alternatives and provide input to the development of the Final Recommendations. The format of the meetings was similar to the June 2011 community meetings with an informal open house, with a formal presentation mid-way through.

An open house was set up in each meeting room and included presentation boards containing information about the PEROW/WSAB Corridor, the Alternatives Analysis (AA) study process, the Final Set of Alternatives being analyzed, the alignment alternatives, a comparison of cost, ridership, and environmental impacts, and a project schedule of the next steps. Attendees had the opportunity to review the information on the presentation boards and ask questions of members of the project team, and refer to a bi-lingual (English and Spanish) handout summarizing the project information presented on the large boards. Spanish-speaking staff was available at all meetings, with Vietnamese capabilities provided at the Garden Grove meeting. Participants were asked to complete a comment card, provided in English, Spanish, and Vietnamese, asking the following questions:

- Please rate each of the six final alternatives (from strongly oppose to strongly support) and explain why you provided that rating.
- What factors are most important to you when evaluating the alternatives?
- Which transit alternatives are you most likely to use?

After allowing meeting attendees time to review the presentation boards and ask questions, the project team then gave a presentation on the results of the AA study process. The presentation provided a detailed overview of the Final Set of Alternatives and focused on the characteristics that distinguished each transit option. A comparison of the estimated cost, ridership, and environmental impacts was also presented. At the conclusion of the presentation, the project team shared the next steps in the process and identified ways for the public to submit their comments. The meeting then returned to an open house format. Public input received from the comment cards was documented in the *PEROW/WSAB Corridor AA Community Meetings Series #4 – Summary Report*.

Summary

The public involvement efforts conducted during the Final Alternatives Screening phase are summarized in Table 6.3 and documented in *Appendix G: Public Comments*.

Table 6.3 – Summary of Final Screening Phase Outreach Efforts

Meeting Type	Number of Meetings	Number of Attendees	Type/Number of Comments Received
Technical Advisory Committee Meetings	5	125	Verbal comments
Steering Committee Meetings	2	80	Verbal comments
Community Meetings	6	149	Verbal comments Written comments
Total	12	354	

6.2 Summary of Public and Agency Comments

Public comments were received at elected official, advisory committee, community and stakeholder groups, and community meetings. Comments were documented through written meeting summaries and community meeting reports, public comment sheets, letters, and emails.

6.2.1 Themes Identified During Conceptual Alternatives Screening

During Elected Official briefings and Stakeholder interviews, the following dominant issues and concerns were identified:

- ***Traffic disruption*** – The diagonal right-of-way (ROW) crosses numerous heavily-traveled streets, and there were concerns about how impacts to traffic capacity and flow can be minimized.
- ***Noise impacts*** – The ROW is adjacent to well-established and quiet residential neighborhoods and concerns were expressed about how the peaceful character, privacy, and quality of life be maintained.
- ***Cost to build, operate, and ride*** – Given the current economic realities being experienced by city governments and transit operator, there were concerns about whether an affordable transportation option could be provided, and the funds available to build and operate it.
- ***Resulting system travel speed*** – Even with implementation of a transit system, travel times between key points may not be reduced and concerns were given that whether Corridor residents and employees would just continue to drive.

At the same time, elected officials and stakeholders saw a future transit system as offering the following opportunities:

- ***Traffic congestion relief*** – Participants felt that providing more transportation will get more people out of their cars, but wanted to understand what ridership could be projected.
- ***Transit-oriented development support*** – Many cities viewed the potential system as a catalyst to support new development and new places to help their cities become a new destination attracting new shoppers, diners, and visitors.

- ***Improved access to jobs and employees*** – With a new transportation option, large employers can attract more employees; residents will be able to travel to employment centers more easily and more affordably.
- ***Improved access to educational and cultural opportunities*** – Residents could use the potential system to expand their educational and cultural experiences, and future employment opportunities.
- ***Improved access to recreational opportunities*** – Residents could have improved access to existing and planned pedestrian and bicycle trails and parks throughout the Corridor via the transit system; and provision of an integrated walking and biking facility would improve alternative modes of access and increase the use of existing recreational facilities.

During this study phase, major project themes were identified at the community meetings, which represent a synthesis of participant input on issues and challenges, solutions and opportunities, important destinations, and evaluation criteria for transit along the Corridor. The input was gathered through the facilitated group discussions and individual comment cards that were turned in at each community meeting. The major themes will be used in the AA study process, along with the technical assessment efforts to evaluate potential alternatives. The key themes are organized in the following areas to correspond with the discussion questions:

- Issues and Challenges;
- Solutions;
- Destinations; and
- Evaluation Criteria.

Issues and Challenges were identified by the meeting participants in response to the question – What do you think are the transportation issues and challenges in your community?

- ***Traffic congestion and parking availability constrain car travel*** – Participants expressed frustration with congestion on freeways and arterial streets, and there were concerns that congestion could get worse in the future because many freeways and roads are already at or near capacity. Many participants anticipated that population growth will likely increase the number of cars on the road, and thought that a limited ability to expand the existing highway system would be a significant issue in the future. People also felt that parking was important and destinations with parking shortages, including possible future transit stations, were problematic.

- ***Current public transit systems do not adequately serve transportation needs*** – One of the strongest recurring concerns identified by participants was the perception that current local public transit is inconvenient, inefficient, and inflexible. Other areas of concern related to current transit were infrequent service, limited hours of operation, slow travel speeds, and frequent transfers with coordination between multiple transit modes and providers making reaching final destinations by transit more difficult.
- ***Transit usage faces challenges*** – Many people felt that the prevailing "car culture" led to a perception, real or not, that public transit is inferior to car travel. Safety, comfort, cleanliness, convenience, cost, and a lack of familiarity with the transit system are all factors that were expressed when describing the challenges of using public transit. Many participants believed that a well designed and properly functioning transit system could address these issues.
- ***Many barriers exist that encourage car usage*** – Community members who seek to travel without a car found mobility challenging, and expressed a need for a supportive walking infrastructure that facilitates safe, comfortable, and convenient travel related to public transit.

In response to the question – what transportation solutions make sense to you? – the following input related to possible transportation solutions was received:

- ***Enthusiasm for providing public transit in the Corridor*** – Participants were excited about the potential for public transit in the Corridor, and were eager to discuss how public transit would function in the study area. There were robust discussions on the benefits and challenges of different transportation modes. Although a preferred mode was not identified, many participants were adverse to Bus Rapid Transit and tended to prefer rail service.
- ***Opportunities for development and neighborhood revitalization along transit service in the Corridor*** – Community members were interested in the possibility that Corridor transit could provide a catalyst for residential and commercial development. In general, participants felt that mixed-use developments near transit stations would be attractive because of the ease of accessing transit and providing connections to jobs, goods, and services. Many believed that the unique characteristics and particular needs of each community should be considered, and stations could help establish distinct community identities.
- ***Widespread support for trails and open space adjacent to a transit system*** – Participants were supportive of creating a linear bicycle and pedestrian trail along the length of the ROW, and providing dedicated open space adjacent to a transit system. Many believed that this pathway system would provide additional connections between stations that would complement the public transit system.
- ***Consideration for opportunities other than transportation solutions***. – Along with other ideas for reuse of the Corridor that were offered at each of the meetings, some participants supported leaving the Corridor as it is.

In response to the questions about desirable destinations, the following input was received on work, shopping, education, entertainment, recreational, and other destinations that the community would like easier travel to:

- ***Connections to existing and future transportation systems are essential*** – Participants strongly communicated the need for Corridor transit to integrate into the existing transportation network. Community members cited improved access to airports, other rail lines, and local bus lines and circulator services. Overall, participants expressed that they wanted an easy to use, seamless system.
- ***Employment centers, educational institutions, medical facilities, and cultural/entertainment venues provide the best opportunity for transit use*** – Major employment centers were mentioned frequently as important destinations, along with the desire to travel to universities and colleges. Hospitals and medical facilities were also frequently mentioned destinations, especially for older adults who may not be able to drive. Providing access to concert and entertainment venues and sports stadiums was also cited frequently, as long as the transit would be able to provide service during the hours those venues operate.
- ***Stations should be located within activity centers*** – Community members felt that stations should be co-located with existing activity centers to provide an enriching environment to support transit use, and that new development could be created to support the potential stations. They supported connecting to Downtown Los Angeles to the north and Downtown Santa Ana to the south as these two existing activity centers have jobs, government facilities, and other active uses.

When asked about how the proposed transportation solutions should be evaluated, and what should be considered when making Corridor transportation decisions, the following guidance was identified as important to participants:

- ***Preserving and enhancing the quality of life*** – Participants expressed significant concern over potential impacts of constructing a transit system, including environmental, safety, economic, and lifestyle impacts. Key concerns were impacts related to noise, vibration, privacy, safety, security, and air quality. Community members believed that some of these impacts could be mitigated, but complete avoidance would be difficult. Additionally, they were concerned about the impact of transit at-grade crossings on safety and traffic, and the fear that acquisition would be necessary and that property values would be negatively impacted.
- ***Balancing the necessity for convenient access to many local destinations with the ability to quickly reach regional destinations*** – Participants were aware that the more stops there are along a transit line, the slower the travel speed would be. However, they felt it was imperative that convenient access to a transit system be provided. Equally important was the need for public transportation to quickly reach key regional destinations for it to be useful.
- ***Creating a sustainable system of choice*** – Participants wanted a public transit system that is financially feasible and minimized financial impacts on taxpayers. They expressed concerns about the costs to build the system, as well as the costs to operate and maintain the system. In addition, participants said the cost to ride was an important factor, especially for older adults and students.

6.2.2 Comments Received During Initial Screening

During this study phase, the discussion focused on the alternatives under consideration, and stakeholders and the community were asked the following questions about the transit alternatives:

- Would this alternative meet your community's transportation needs? Why or why not?
- Would you use this alternative if it were provided? Why or why not?
- Is this alternative a reasonable solution considering the investment required to implement it?

The discussion themes identified during the second series of community meetings are listed below and reflect the feedback, perspectives, experiences, issues, and ideas on the different alternatives identified in the group discussions and submitted through comment cards during the six meetings. The input has been synthesized to reflect identify issues that address issues relevant to the project as a whole and/or related how the Corridor should be used, and/or specific input on each of the different alternatives.

- ***Continued enthusiasm for providing public transit in the Corridor*** – Participants remained excited about the potential for providing transit in the Corridor, and were eager to consider and discuss different transportation solutions. Many attendees felt that the Corridor is a unique asset that provides a special opportunity to provide a critical link between Los Angeles and Orange counties. They saw the need for public transit to meet future local and regional transportation challenges.
- ***Preserving and enhancing quality of life remains a critical issue*** – There were concerns regarding potential impacts to the quality of life from the introduction of transit service in the Corridor. Similar to the first community meetings, concerned attendees identified possible air quality, noise, vibration, visual, privacy, and crime impacts as critical issues. Participants inquired about the potential mitigation measures that could be incorporated into the project design to reduce the impacts.
- ***Awareness of the challenges from potential at-grade crossings along the Corridor*** – Participants understood the diagonal orientation of the Corridor and the large number of street crossings, especially major arterial streets, will present a challenge in providing public transit. Concerns were expressed that at-grade crossings would negatively impact both the transit system and local traffic. Several people expressed concerns about pedestrian and bicycle safety.
- ***Consideration of other opportunities for the Corridor*** – Many participants were supportive of including a linear bicycle and pedestrian trail, either in conjunction with or instead of a transit system. Some community members, particularly those with houses adjacent to the PEROW/WSAB Corridor ROW, supported leaving the Corridor as it is.

- ***Concerns over funding for providing transit in the Corridor*** – Attendees were concerned with whether adequate funding would be available to implement transit in the Corridor. Concerns were expressed that any future funds would be well spent and Corridor transit is well-utilized.

Based on group discussion and comment cards received, the major alternative-specific points were:

- ***Bus Rapid Transit (BRT) is a pragmatic and sensible solution, but it has obstacles to successful implementation.*** Participants felt that BRT was possibly a good solution due to its relatively low cost to build and operate, and perceived shorter construction time that would allow it to be in operation sooner than the other alternatives. Overall, BRT received lackluster support because it was viewed as "second-rate" transit service. Many people expressed doubts that the negative public perception of buses could be overcome, and that the system would not have the ridership necessary to be successful. Participants doubted its efficiency without a dedicated ROW beyond the PEROW/WSAB Corridor ROW.
- ***Although not widely considered a right fit for the Corridor, Street Car service was viewed favorably.*** In general, participants liked the street car vehicle and saw it as providing a smooth ride utilizing an electric system. Its slow travel speed was viewed as possibly having less community and environmental impacts than some of the other alternatives. However, a majority of the community members did not see it as a right fit for this Corridor. The slow travel speed and frequent stops were perceived to meet local transportation needs, but not the regional transportation needs viewed as essential for connecting communities along the Corridor. There were concerns that this alternative would have low ridership because of the mismatch between the Corridor's capacity needs and street car seating characteristics, and many felt it was not worth the investment required to implement it.
- ***Strong support was expressed for Light Rail Transit (LRT) based on its potential for serving the community's transportation needs.*** Of all the transit alternatives, participants indicated the strongest preference for the LRT option. Many considered it to be an efficient system that would provide the right balance between local and regional service for the Corridor. Participants felt the station spacing was appropriate to support community economic and transportation needs. In addition, it was viewed as a familiar technology that has been proven successful locally and that it would be compatible with existing systems.

- ***Diesel Multiple Unit (DMU) was generally viewed unfavorably because of its diesel-based technology.*** Although some participants saw DMU service as a potential solution for the Corridor, it did not receive widespread support. Great concerns were expressed over its use of diesel fuel – even clean diesel fuel. Participants cited air quality impacts and public health concerns as their dominant reasons for not supporting this option. Other attendees felt introduction of a new transit technology was inconsistent with other locally proven systems, and may not be cost-effective.

- ***Conventional high speed rail was seen as a good solution for statewide transportation needs, but would not provide access to local destinations needed along the Corridor.*** Most attendees felt that high speed rail was not a right fit with the Corridor as it was perceived to primarily serve regional trips. People expressed the concern that Corridor communities would be burdened with the impacts without receiving sufficient benefits. Others felt that high speed rail service in the Corridor would be duplicative of the planned California High Speed Rail System (CAHSR) between Union Station and Anaheim. There were also significant concerns about the high cost to build, operate, and ride high speed rail, and that the low ridership projections in the Corridor would not make it a cost-effective solution.
- ***High Speed Maglev had a mixed reception, with many participants expressing that it was an unreasonable solution, but other suggesting a lower speed option that could meet community needs.*** As with conventional high speed rail, participants were not generally supportive of maglev high speed service. Many felt that the Corridor is too short to support high speed travel, and that the costs to build, operate, and ride are too high. Some people supported a modified maglev system option that would operate at a slower speed and have more station stops than high speed service. Those participants felt that it was more of a cutting-edge approach and would provide cleaner and quieter service. Others expressed concern that the technology was unproven in the United States, would be incompatible with existing systems, and would be redundant to and incompatible with the planned CAHSR system.

Comments Received During Open Houses

Based on group discussion and comment cards received, the major points were:

- ***Enthusiasm for providing public transit in the Corridor.*** A majority of participants supported providing for a future transit system in the Corridor.
- ***Light Rail Transit (LRT) was identified as the preferred modal option.*** The BRT and Street Car alternatives were identified as being too slow and not being able to interline with the Los Angeles rail system. While some respondents questioned using an unproven technology, more information was requested on the Low Speed Maglev Option.
- ***The No Build Alternative was preferred by some residents living along the PEROW/WSAB Corridor ROW.*** Residents expressed significant concerns about the impacts resulting from implementing a transit system which would negatively impact their quality of life and property values.
- ***There was strong support for provision of a bicycle and pedestrian trail either in conjunction with or instead of a transit system option.***
- ***The key concerns expressed about implementation of a transit system were related to possible noise and vibration impacts, and the need to build a cost-effective solution.***

6.2.3 Comments Received During Final Screening

The final series of community meetings was intended to provide the public with results of the analysis for each alternative. The discussion themes identified during the fourth series of community meetings are listed below and reflect the feedback, perspectives, experiences, issues, and ideas on the different alternatives through comment cards during the six meetings.

- ***Concerns about transit funding, feasibility, and impacts.*** Some community members that supported the No Build Alternative expressed concerns about the high overall cost of providing transit, as well as the limited sources of funding, and the generally troubled state of government finances. Community members, especially those who live, operate businesses, and own property adjacent to the Corridor also expressed a strong desire for preserving quality of life in areas near the Corridor, and shared specific concerns about potential impacts to air quality, aesthetics and privacy, noise, property values, traffic (especially at intersections), and safety.
- ***Additional transportation options are needed to meet future transportation needs of the growing region.*** Most community members were enthusiastic about providing transit in the Corridor, and they commented that the Corridor was a unique and valuable asset that should be used to provide additional transportation options. Community members who opposed the No Build Alternative often commented that it would be a continuation of the status quo, and that consequences for not proactively taking action to address the region's transportation problems. The No Build Alternative would rely exclusively on freeways for regional transportation and would not provide a solution as congestion worsens as the region grows in the future.

- ***Consider additional uses of the Corridor instead of, or in addition to, transit.*** Overall, community members generally supported the use of the Corridor for recreational purposes in conjunction with transit service. Other comments specifically addressed the use of the Corridor as a transportation route for bicyclists. A few community members commented that the Corridor should be used for only for open space and recreation instead of transportation.
- ***Measures that improve the efficiency of the region's transportation system should be implemented to alleviate congestion.*** Overall, community members supported the TSM Alternative as a way to address the region's transportation challenges in the short term, but not as a comprehensive long-term solution. Many community members opposed the TSM Alternative because it does not provide an alternative to the congested road and highway network. Community members who expressed support for the TSM Alternative often commented that improvements to existing bus service, providing pedestrian and bicycle paths, and other small improvements to the transportation system would be most effective in combination with providing a transit option in the Corridor, and the improvements would likely be insufficient without a transit option. Overall, the low-cost solutions included in the TSM Alternative were supported by many community members.
- ***BRT is practical but is not the best transportation solution of the Corridor.*** In general, community members were not very enthusiastic about the BRT Alternative as a transportation solution in the Corridor. However, some community members thought that its relatively low cost, the speed in which it could be implemented, demonstrated success in the region, adaptability, and that no transfers would be needed between Santa Ana and Los Angeles made it a practical transportation solution. Some community members commented that BRT was better than no transportation solution at all, and that it could serve as an interim transportation solution and a precursor to another solution in the future. Other community members were opposed to BRT because it is an old technology and would not appeal strongly enough to people to choose it over driving. In addition, many community members commented that BRT would not meet the transportation needs of the Corridor because it would have to operate in the already congested street network, leading to unpredictable travel times and contributing to further congestion.
- ***Although adequate, Street Car is not the ideal transportation solution for the Corridor.*** Some community members supported the Streetcar Alternative because it would provide a quality, lower cost transportation alternative that would serve the communities along the Corridor. However, most community members commented that it was not worth the investment compared to other alternatives because it has a similar overall costs and similar noise, safety, traffic, and impacts to adjacent property as other alternatives. The Streetcar Alternative also has a lower projected ridership, slower travel speeds than other alternatives, and it would not be compatible with the existing Metro system.
- ***Light Rail Transit is the best investment of all the transit alternatives and would provide a beneficial transportation solution for the region.*** Community members expressed strong support for the Light Rail Transit Alternative, and many commented that it was the best out of all the alternatives. Supporters commented that it was the best fit for the Corridor because it would

have faster speeds, higher capacity, and higher projected ridership. They also commented that it would not have any transfers from Santa Ana to Los Angeles, and, therefore, is the best alternative to address the region's transportation needs. Light rail transit would also benefit from being compatible with the existing Metro transit system because it would be adaptable and would benefit from using existing facilities. In addition, because light rail transit is already used by Metro, it is known to be reliable, is a proven technology in the region, and is familiar to transit riders.

- ***The cost of providing Low Speed Magnetic Levitation seems prohibitive, but the technology could provide a new solution to meet future transportation needs.*** The Low Speed Maglev Alternative had support from some community members because it would be faster, quieter, and safer, and would cause minor traffic impacts compared to other alternatives. Some community members believe that, in addition to meeting the current transportation needs, the Low Speed Maglev Alternative is the best long- term solution to meet future transportation needs. Other community members commented that it had a significantly higher overall cost that was prohibitive, and that it would cost more to operate and maintain, and to ride. Community members also opposed Low Speed Maglev because it would only provide a marginal benefit compared to other alternatives, is an unproven technology in the United States, and would not be compatible with the existing Metro transportation system. Community members were also concerned that the Low Speed Maglev Alternative would potentially require property acquisition that would displace residents who live adjacent to the Corridor.

7.0 COMPARISON OF ALTERNATIVES AND RECOMMENDATIONS

An AA study has been completed to explore transit opportunities for connecting Los Angeles and Orange counties and serving future travel needs for the PEROW/WSAB Corridor. While focusing on the former Pacific Electric Railway right-of-way (ROW), the study evaluated possible connections from the ROW north to Union Station, and south to the Santa Ana Regional Transportation Center (SARTC). The purpose of the study was to identify and evaluate a wide range of possible transit system alternatives, and to provide the public and decision-makers with technical information on the future Corridor travel needs, and the benefits and impacts of each of the proposed transit alternatives. The study process included three phases of evaluation to screen a wide range of possible alternatives to the most viable alternative(s) that best meets the identified Corridor Purpose and Need and project goals. In this last study phase, the Final Set of Alternatives has been assessed through conceptual-level engineering and station design and related technical and environmental analytical efforts, and discussed through community and agency outreach activities. This section provides an overview of the results.

7.1 Purpose and Need

The PEROW/WSAB Corridor is a densely-developed area comprised of the most active hearts of Los Angeles and Orange counties, including downtown Los Angeles, the Gateway Cities subregion of Los Angeles County, the growing western and central portions of Orange County, and downtown Santa Ana. The Corridor has a diverse combination of residential neighborhoods, community civic centers, shopping districts and centers, educational institutions, and medical facilities. There are concentrations of employment centers ranging from industrial uses in the northern portion of the study area to office centers in downtown Los Angeles, Anaheim, and Santa Ana. In addition downtown Los Angeles and Santa Ana serve as the civic centers for each county. This Corridor has a significant number of regional and national destinations ranging from Staples Center in downtown Los Angeles at one end of the study area to Disneyland and Knott's Berry Farm at the other.

This unique Corridor was recommended for study as current and future congested travel conditions and limited transportation system connectivity will negatively impact the quality of life for residents, and the economic vitality of the Corridor's businesses and destinations making them less attractive to residents and visitors. An AA study was undertaken to look strategically at future mobility in this Corridor given the following trends:

- ***High population and population density*** – Home today to 4.5 million people, the Corridor's population is projected to grow by more than 500,000 new residents to 5.0 million people by 2035, or four times the population of San Diego, California's second largest city. Population density is projected to increase to an average of 12,000 people per square mile, with portions exceeding 14,000 residents per square mile. These trends are commensurate with densities successfully served by Metro and other urban rail systems.
- ***High levels of employment and employment density*** – In 2035, the Corridor will remain a major employment destination with more than 2.3 million forecasted jobs – three times higher than

San Diego's total employment. Future Corridor employment densities are forecasted to be 5,400 jobs per square mile, with areas exceeding that average with 9,000 to 14,000 jobs. In comparison, employment densities served by the Metro rail system range from 2,500 (light rail) to 14,000 (heavy rail) jobs per square mile.

- ***Changing employment patterns*** – While remaining a major employment center, the northern Los Angeles County portion of the Corridor, once the manufacturing heartland of Southern California, will continue to suffer disproportionately from long term economic structural changes resulting in the loss of approximately half a million jobs over the last 20 years. Future projections show a continuation of this trend. Providing residents in this portion of the Corridor with fast, direct transit access to employment opportunities elsewhere in the region will become of increasing importance. Conversely, the Orange County portion of the Corridor was forecasted to experience a large employment growth; accommodating increased peak period travel access will be important to maintaining this county's attractiveness as an employment destination.
- ***Increasing transit-dependent population*** – A Corridor-wide average of 16 percent of all households was identified as currently without access to an automobile. The number of transit-dependent residents is expected to increase reflecting the large number of low-income households, the continued loss of jobs in the northern portion, and an aging population.
- ***Increasing travel demand*** – By 2035, total daily travel originating and remaining in the Corridor are projected to increase by 36 percent with 12.8 million additional daily trips straining the existing transportation network.
- ***Strained highway system*** – Even with implementation of the planned highway improvements, increasing daily travel will adversely impact highway system capacity, and the level of service on the already congested highway network will continue to decline.
- ***Limited travel options*** – Currently, Corridor residents have two travel options – private automobile and bus transit – both of which operate on an increasingly congested highway system. Transit options are limited and include bus, local circulator, and two miles of east-west urban rail available in a portion of this north-south oriented Corridor. As a result, auto travel is the predominant travel mode with 86 percent of work trips made by car.
- ***Limited connections to the regional rail system*** – The Corridor has limited connections to the expanding urban rail system being implemented in the region. Currently, study area residents have only one connection to the Metro urban rail system, and two points of access to the regional Metrolink commuter rail system at either end of the Corridor. This lack of regional transit system linkages will become more detrimental to future Corridor travel and economic development as study area population and employment continue to grow.
- ***Limited transit investment*** – While a significant level of regional and local investments have been identified for the Corridor's freeway and arterial system, only minor transit improvements are planned, with minimal benefits. This lack of transit investment limits mobility and travel choices contributing to the study area's continued dependence on auto travel.

7.2 Evaluation Criteria

Corridor-specific goals and criteria were identified based on: local goals identified in consultation with elected officials, stakeholders, and the public; findings of the Corridor Mobility Problem and Purpose and Need analysis prepared as part of the AA study process; and applicable criteria of possible implementing and funding agencies. As documented in the *PEROW/WSAB Corridor AA Evaluation Methodology Report*, a detailed set of Corridor goals, criteria, and related performance measures were established to guide identification and evaluation of the proposed transit options. The identified criteria are intended to reflect the broad range of benefits and impacts that may be realized by the implementation of each of the proposed transit projects. The resulting criteria and related performance measures are presented in five categories that correspond to FTA New Starts project evaluation categories. While not currently a New Starts project, these evaluation areas are also used by state and regional agencies as well to evaluate possible projects.

1. **Public and Stakeholder Support** – the level of community, stakeholder, and jurisdictional support for the project.
2. **Mobility Improvements** – the level to which the project improves local and regional mobility and accessibility as measured by:
   - Provide another travel option.
   - Connect to the regional transit system.
   - Serve both community and regional trips.
   - Increase access to and from corridor destinations and activity centers.
   - Provide a fast travel speed.
   - Provide related pedestrian and bicycle facilities.
3. **Cost-Effectiveness/Sustainability –** provide a cost-effective solution where project costs are balanced with expected benefits, and the project funding needs fit within available funding resources.
4. **Land Use/Economic Plans** – implement a project that supports local and regional land use and development plans and policies:
   - Provide station location and spacing that supports local economic development and revitalization plans and goals.
5. **Project Feasibility** – assess the following for each alternative:
   - Fit with current local transit system operations or plans.
   - Has state and federally approved vehicles, and is operational in the U.S.
6. **Environmental and Community Impacts** – the extent to which the project provides additional travel capacity, while minimizing environmental and community impacts, and balancing distribution of benefits, impacts, and costs by mode, household income, and race/ethnicity.

The criteria and the performance measures used to evaluate the Final Set of Alternatives are presented in Table 7.1. A comparative analysis of the proposed transit system alternatives is discussed in the following sections.

Table 7.1 – Final Screening Evaluation Criteria

Criteria	Performance Measures
1. Public and Stakeholder Support	• Provide a desirable solution to the community and stakeholders. • Have city/jurisdictional support.
2. Mobility Improvements	• Improve travel speeds and reduce travel times. • Provide connections to the regional rail system. • Increase range of transportation options. • Serve current and future travel growth and patterns. • Serve both community and regional trips. • Make transit a viable alternative as measured by resulting ridership and new riders. • Increase access to and from Corridor activity centers and destinations. • Increase service for transit dependent Corridor residents. • Provide improved cross-county line transit service. • Provide an integrated pedestrian and bicycle system.
3. Cost-Effectiveness/Sustainability	• Balance project costs with expected benefits – resulting construction and operating costs are balanced by strong ridership (cost-effectiveness). • Identify transportation alternatives that are financially sustainable with identified resources.
4. Land Use/Economic Plans	• Provide station spacing that supports local economic development and revitalization plans and job strategies. • Serve areas with transit supportive land use policies.
5. Project Feasibility	• Fit with current local transit system operations or plans. • Has state and federally approved vehicles, and is operational in the U.S.
6. Environmental Benefits and Impacts	• Minimize environmental/community impacts • Improve air quality by reducing tailpipe and Greenhouse Gas emissions • Minimize the number of properties to be acquired. • Assess environmental justice impacts

7.3 Alternatives Considered

During the AA study process, a wide range of modal alternatives, along with possible alignment alternatives, was identified and evaluated. Based on Project Initiation efforts, nine Conceptual Alternatives were identified from previous studies and in consultation with elected officials, stakeholders, and city and agency staff. These options were analyzed and reduced to an Initial Set of Alternatives of six build options for further evaluation, which were evaluated and presented to stakeholders and the community for review and comment. In April 2011, the following six Final

Alternatives were approved by the Project Steering Committee for further study. The options include two baseline alternatives:

1 **No Build** – This alternative represents the completion of Corridor transit, highway, and other transportation projects that have approved local, county, state, and federal funding.

2. **Transportation Systems Management (TSM)** – This option maximizes the use and effectiveness of the existing transportation system through a set of proposed transit, highway, bicycle, and pedestrian projects. The TSM Alternative is presented as: a ***Core Service Project*** representing bus service providing a service alignment similar to the build alternatives – the Union Station-Los Cerritos Center service in Los Angeles County, and the Katella Avenue BRT Service in Orange County; and a ***Corridor System*** option which includes the Corridor-wide TSM transit and arterial system improvement projects identified with Metro and OCTA staff for Los Angeles and Orange counties respectively.

And four “build” or construct and operate a new transit system:

3. **Bus Rapid Transit (BRT)** – This build option represents a high capacity, high speed bus service primarily operating in dedicated lanes similar to the Metro Orange Line in Los Angeles County. Two BRT alternatives were identified: a ***Street-Running*** option providing limited stop service with signal priority improvements; and ***HOV Lane-Running*** express bus service operating in HOV lanes along the I-105 freeway and I-110/Harbor Transitway.

4. ***Street Car*** – This build alternative proposes a community-oriented rail system similar to that being considered by the cities of Santa Ana and Garden Grove in Orange County, and in operation in Portland and other U.S. cities.

5. ***Light Rail Transit (LRT)*** – This option consists of a rail system similar to the Gold and Blue lines operated by Metro in Los Angeles County.

6. ***Low Speed Magnetic Levitation (Maglev)*** – This alternative proposes service similar to that provided by the Linimo System operating in Nagoya, Japan.

The definition of the build alternatives was divided into three alignment sections for analytical purposes and to reflect different coordination requirements and possible phasing decisions. The three guideway alternatives have the following areas in common:

- **Northern Connection Area** – This portion of the study area extends north from the PEROW/WSAB ROW terminus in the City of Paramount to Union Station in downtown Los Angeles. Possible alignments were explored along several active and inactive railroad ROWs, and four alignment options were identified and evaluated.
- **PEROW/WSAB Corridor ROW Area** – This study area section was focused on the PEROW/WSAB ROW now owned by Metro and OCTA.
- **Southern Connection Area** – This study area section extends south from a proposed Santa Ana-Garden Grove Harbor Boulevard Street Car Station through the civic center and downtown areas

of the City of Santa Ana to the Santa Ana Regional Transportation Center (SARTC). Two alignment alternatives operating in the median of city streets were identified and evaluated.

While both BRT Alternatives were proposed to operate in dedicated lanes along the PEROW/WSAB Corridor and south through the City of Santa Ana similar to the guideway alternatives, their operation would differ in the Northern Connection Area. The Street-Running Option would provide limited stop service with signal priority improvements along Lakewood Boulevard, Firestone Boulevard, Long Beach Boulevard, Slauson Avenue, and Soto Street, with a stop at the Metro Gold Line Soto Street Station, and along Cesar Chavez Avenue to Union Station. The HOV Lane-Running Option would operate in HOV lanes along the I-105 and the I-110/Harbor Transitway and continue in street-running operations north to the 7th/Metro Center Station.

Northern Connection Area

For the guideway alternatives, two sets of alignment options for the connection north from the PEROW/WSAB ROW to Union Station, were proposed operating either along the east or west bank of the Los Angeles River:

- **East Bank Alternative** – This alignment alternative would operate north along the San Pedro Subdivision, cross a corner of the Hobart Intermodal Yard owned by Burlington Northern-Santa Fe (BNSF), to where the ROW intersects with the Union Pacific (UP)-owned ROW used for freight, Metrolink, and Amtrak operations. It would share the UP ROW for a short distance to where the ROW, now owned by Metro and operated by Metrolink, turns north to travel along the east bank of the Los Angeles River and then cross over the river into Union Station.
- **West Bank Alternative** – This alignment alternative would operate north along the San Pedro Subdivision to either operate along the west bank of the river to reach Union Station, or turn west to operate along a former railroad ROW and a Metro-owned ROW to reach Union Station. Three viable options were evaluated during the AA study:
  - **West Bank 1** – This alternative would operate in its own ROW along the west bank of the Los Angeles River to just beyond the Redondo Junction where it would share the Metro-owned and Metrolink-operated ROW with Metrolink and Amtrak service, and possibly Metro Red Line operations.
  - **West Bank 2** – This alternative would turn west to operate in the median of a infrequently used BNSF railroad ROW now owned by UP, through Huntington Park and then turn north to operate in the median of Pacific Boulevard, a former street car ROW until it intersects with the Metro-owned Harbor Subdivision. It would follow the Harbor Subdivision ROW under the Redondo Junction and then operate north along the west bank similar to West Bank option 1.
  - **West Bank 3** – This alternative follows the same alignment as West Bank 2, but rather than turning to operate along the west bank of the river it continues north along the Harbor Subdivision and then along city streets and private property in a combination of aerial and

underground configurations to daylight south of Metro Gold Line Eastside Tokyo Station where it would utilize the existing at-grade Metro Gold Line tracks to reach Union Station.

Southern Connection Area

At the southern end of the PEROW/WSAB ROW, all the alternatives, except the Low Speed Maglev Alternative, would leave the ROW to operate either in the median or curbside of Santa Ana city streets along one of following two alternative routes:

- **Westminster Boulevard/17th Street/Main Street** – From the Harbor Boulevard Station, this service alignment would travel east on Westminster Boulevard/17th Street to Main Street where it would turn south to interface with the Street Car Main Street Station. Passengers would transfer to the Street Car system to reach the SARTC.
- **Harbor Boulevard/1st Street/SARTC** – From the Harbor Boulevard Station, this service alignment would travel south on Harbor Boulevard, turn east on 1st Street, and north on a realigned Santiago Street to the SARTC where passengers could transfer to Street Car, Metrolink, and Amtrak services, along with OCTA and international bus services.

Description of Alternatives

Detailed information was identified for the proposed alternatives, as documented in Chapter 3.0, including vehicle assumptions, service span and frequency, resulting run times, and average operating speeds.

The vehicles for the BRT Alternatives were assumed to be as follows:

- **HOV Lane-Running** Option – 45 foot NABI vehicles similar to those used for Metro Silver Line service, with the decision on whether to use the 60 foot articulated Metro Orange Line vehicles deferred to the future as ridership increases; and
- **Street-Running Option** – 40 foot NABI vehicles similar to those used for Metro Rapid service.

The Guideway Alternatives vehicle assumptions are as follows:

- **Street Car** – Reflecting the anticipated Santa Ana Street Car system, analysis was based on the Siemens S70 Street Car low-floor vehicle, 79’-1” in length, and operated as single cars.
- **LRT Option** – Vehicles similar to those used by Metro for their current LRT service, which are Breda 90’ 2550 LRV vehicles and typically operated by Metro in a three-car consist.
- **Low Speed Maglev Option** – Vehicles used by the Linimo system in Nagoya, Japan, which are Nippon Sharyo HSST-100L vehicles built as an integrated, three-car consist 134’-7” in length.

The LRT and proposed Street Car vehicles are approved for use by the California Public Utilities Commission (CPUC), while the Low Speed Maglev vehicles would require CPUC approval.

Existing bus services in the PEROW/WSAB Corridor are primarily operated by Metro and OCTA, while existing urban rail service is operated by Metro, and there is no current operator for the Street Car and

Low Speed Maglev Alternatives. For the AA-level of analysis of operating plans, Metro was assumed to be the operating agency for all of the alternatives, and the service frequency and span was based on their current policies and future plans. During any subsequent planning efforts, the operator decisions would be revised to reflect evolving operator capabilities.

Using the alternative definition information documented in Chapter 2.0 and the operating inputs presented in Chapter 3.0, including the alternative alignment length and number of stations, end-to-end run times and the average speed were identified for each alternative and are summarized in Table 7.2.

Table 7.2 – Alternative Definition and Resulting Operational Information

Alternative	Number of Stations[1]	Distance[2] (Miles)	Run Time	Average Speed (mph)
BRT				
HOV Lane-Running	22	39.0	1:18:30	32.6
Street-Running	27	38.2	1:21:11	30.3
Street Car				
East Bank 1	23	35.2	1:09:55	30.7
West Bank 1	22	35.2	1:08:20	31.6
West Bank 2	23	35.6	1:10:36	30.7
West Bank 3	24	34.5	1:07:15	31.1
LRT				
East Bank 1	22	35.2	1:02:09	35.3
West Bank 1	21	35.2	1:00:55	35.8
West Bank 2	22	35.6	1:03:45	34.4
West Bank 3	23	34.5	1:00:12	35.5
Low Speed Maglev				
East Bank 1	17	29.7	43:06	40.2
West Bank 1	16	29.6	42:39	41.0
West Bank 2	17	29.9	44:18	40.0
West Bank 3	18	29.2	43:00	40.2

[1] Represents the Harbor Boulevard/1st Street/SARTC Alternative in the Southern Connection Area.
[2] Low Speed Maglev Alternative ends at Harbor Boulevard; does not continue through Santa Ana.

The Final Set of Alternatives were evaluated based on an AA-level (five percent) engineering and operating design, station location, capital and operating cost estimates, ridership forecast modeling, and community and environmental impact analyses. The following sections summarize the technical results. In summary, while providing a new transportation improvement is important to the future mobility and vitality of the Corridor communities, adding any major transit system improvement into this densely built-out, urban corridor will have significant benefits and impacts.

7.4 Public Input

Community, stakeholder, elected official, and agency input has been integral in shaping the PEROW/WSAB Corridor AA process and guiding the direction of the project. Stakeholder comments were received and documented over the course of the 26-month study at meetings and work sessions with elected officials, stakeholders, advisory committee members, and the community. The following major project themes were identified during these outreach efforts:

- ***Current and future traffic congestion will constrain car travel*** – Elected official and community members expressed frustration with current congestion on freeways and arterial streets, and were concerned that congestion could get worse in the future as many freeways and roads are already at or near capacity. They anticipated that future population growth will likely increase the number of cars on the road, and thought that the limited ability to expand the existing highway system would be a significant mobility issue in the future.
- ***Current public transit systems do not adequately serve transportation needs*** – One of the strongest recurring concerns identified was the perception that current local bus transit is inconvenient, inefficient, and inflexible. Other areas of concern related to existing transit were infrequent service, limited hours of operation, slow travel speeds, and the need for frequent transfers, along with a lack of coordination between multiple transit modes and providers making reaching final destinations by transit more difficult.
- ***Enthusiasm for providing public transit in the Corridor*** – Throughout the study, public participants remained excited about the potential for providing high capacity, high speed transit in the Corridor, and were eager to consider and discuss different transportation solutions. They saw the need for public transit to meet future local and regional transportation challenges. Many community members felt that the PEROW/WSAB Corridor ROW was a unique asset that provides a special opportunity to provide a critical link between Los Angeles and Orange counties.
- ***Opportunities for development and neighborhood revitalization along transit service in the Corridor*** – Elected officials, agency staff, and community members were interested in the possibility that a Corridor transit investment could provide a catalyst for needed residential and commercial development. In general, participants felt that mixed-use development near transit stations would be attractive due to the ease of accessing transit, providing connections to jobs, goods, and services, and creating an attractive, pedestrian-friendly environment.
- ***Widespread support for trails and open space adjacent to the transit system*** – Many community members were supportive of creating a linear bicycle and pedestrian trail along the length of the PEROW/WSAB Corridor ROW, and possibly providing dedicated open space adjacent to the transit system. Many participants believed that this pathway system would provide additional connections between stations that would complement and increase the use of a transit system.

During the Initial Screening phase, community and stakeholder comments included the following:

- ***The No Build Alternative was preferred by some Orange County residents living along the PEROW/WSAB Corridor ROW.*** Residents expressed significant concerns about implementing a transit system, which would negatively impact their quality of life and property values. The key concerns expressed were related to noise, vibration, and traffic impacts.

- ***Bus Rapid Transit (BRT) was seen as a pragmatic and sensible solution, but with significant obstacles to successful implementation.*** BRT was viewed possibly as a good solution due to its relatively low cost to build and operate, and perceived shorter construction time. Overall, BRT received lackluster support because many people expressed doubts that the negative public perception of buses could be overcome. Community members doubted its efficiency without dedicated lanes beyond the PEROW/WSAB Corridor ROW.
- ***Although not widely considered a right fit for the Corridor, Street Car service was viewed favorably.*** Participants liked the street car vehicle, and its slow travel speed was viewed as possibly having less community and environmental impacts than the other alternatives. However, a majority of the community members did not see it as a right fit for this Corridor. The slow travel speed and frequent stops were perceived as meeting local transit needs, but not as addressing regional transportation needs viewed as essential for connecting the Corridor communities.
- ***Strong support was expressed for Light Rail Transit (LRT) based on its potential for serving all of the community's transportation needs.*** Community members indicated the strongest preference for the LRT option. Many considered it to be an efficient system that would provide the right balance between local and regional service for Corridor communities. Participants felt the station spacing would support community economic development and revitalization needs. LRT was viewed as a familiar technology that has been proven successful locally.
- ***A High Speed Maglev Alternative was presented, with many participants expressing that it was an unreasonable solution, but others suggesting a lower speed option that could meet community needs.*** Participants were not generally supportive of high speed maglev service, and some people proposed a Low Speed Maglev system option that would have more station stops. Those participants felt that it was more of a cutting-edge approach, and would provide cleaner and quieter service. Others expressed concerns that the technology was unproven in the U.S. and would be incompatible with existing systems.

7.5 Mobility Improvements

An overview of the resulting mobility improvements provided by the Final Set of Alternatives is presented below in Table 7.3. In summary of how the Final Set of Alternatives address and meet the following Mobility Improvement criterion:

- ***Increase the range of transportation options*** – All of the alternatives provide new transit services in the Corridor. The community and many of the cities expressed the belief that the bus services provided by the TSM and BRT Alternatives did not provide a new transportation option, but were a continuation of the existing limited options operating on the same congested streets as vehicular traffic.

- ***Provide connections to the regional transportation system as identified by the Long Range Transportation Plans adopted by Metro and OCTA*** – All of the alternatives would provide connections to the future regional transportation system.
- ***Provide improved linkages to the Los Angeles County Metro Rail system and increase access to the Metrolink system for Corridor Study Area residents*** – All of the alternatives would provide connections to the future regional transportation system with variations in travel speeds and resulting travel times.
- ***Minimize transfers by providing end-to-end Corridor Study Area service*** – All of the alternatives would provide end-to-end study area service, except the Low Speed Maglev Alternatives based on current City of Santa Ana input. This alternative would end at the future Santa Ana-Garden Grove Street Car Harbor Boulevard Station where Low Speed Maglev passengers would be required to transfer to the future Street Car system to complete their trip to downtown Santa Ana and the SARTC. In addition, the Westminster Boulevard/17th Street/Main Street alignment alternative would require Street Car and LRT passengers to transfer to the Santa Ana-Garden Grove Street Car system at the Main Street Station to complete their trip to the SARTC.
- ***Increase access to Corridor activity centers and destinations*** – All of the alternatives would improve access to study area activity centers and destinations.
- ***Increase service for transit-dependent Corridor residents*** – All of the alternatives would provide improved service for transit-dependent Corridor residents
- ***Provide an integrated pedestrian and bicycle system*** – All of the alternatives could provide an integrated pedestrian and bicycle system along large segments of the Corridor Study Area, providing at least 20 miles of Class I bike trails and connecting the Los Angeles River, San Gabriel River, and Coyote Creek. Freeway underpassing ROW width constraints and the inability to share freight rail ROWs appear to preclude provision of an end-to-end system.
- ***Serve major transit hubs*** – Currently, the major Corridor transit hubs are located at Union Station and the Santa Ana Regional Transportation Center, with a minor transit hub providing mid-corridor access to the Metro Rail system at the Metro Green Line Lakewood Boulevard Station. All the alternatives provide connections to these three transit hubs, except the Low Speed Maglev Alternative which would not connect with the SARTC. Implementation of the proposed alternatives will result in the creation of new transit hubs with connecting bus service.

Differences in the mobility improvement areas between the alternatives include the following:

- ***Improve travel speeds over current and future transit and auto travel speeds*** – As shown above in Table 7.2 on page 7-8, not all of the alternatives would provide improved average travel speeds, but still may provide improved travel times due to the ability to run in dedicated operations along the PEROW/WSAB ROW. Though slower than the other transit system options, the BRT and Street Car Alternatives still are projected to operate in the 30-33 mph range. As identified by stakeholders and the public, the two criterion used to determine whether an alternative improves travel speed were: average Metro Blue Line travel speed (25 mph); and average peak period freeway travel speed (used the current and forecast 2035 peak period for the I-5 Freeway, with peak period travel at 35 mph or less). As identified during development of the evaluation criteria, travel speed was to be compared to the Metro Blue Line and the I-5 Freeway travel speeds in 2035. The current bus speed varies significantly throughout the Corridor, and there is no current bus service that replicates the service alignment of the proposed build alternatives.

Table 7.3 –System Travel Times

Alternative	Union Station-Metro Green Line (Minutes:Seconds)	Metro Green Line-Harbor Boulevard (Minutes:Seconds)	Harbor Boulevard-SARTC (Minutes:Seconds)	Total Trip (Hours: Minutes:Seconds)
BRT Alternatives				
Street-Running	34:06	32:36	14:29	1:21:11
Street-Running	31:25	32:36	14:29	1:18:30
Street Car Alternatives				
East Bank	23:55	32:47	13:13	1:09:55
West Bank 2	24:36	32:47	13:13	1:10:36
West Bank 3	21:15	32:47	13:13	1:07:15
LRT Alternatives				
East Bank	21:45	27:53	12:31	1:02:09
West Bank 2	23:21	27:53	12:31	1:03:45
West Bank 3	19:48	27:53	12:31	1:00:12
Low Speed Maglev Alternatives				
East Bank	17:56	25:10	NA	--
West Bank 2	19:08	25:10	NA	--
West Bank 3	17:50	25:10	NA	--

- ***Serve both local and regional trips*** – The BRT and Street Car alternatives more typically serve local trips, while the LRT and Low Speed Maglev options serve both local and regional trips.
- ***Serve current and future travel growth and patterns*** – Based on the resulting capacity analysis, the BRT and Street Car alternatives may not provide sufficient capacity to accommodate the future Corridor ridership; and the TSM Alternative may be constrained in serving future transit demand due to operating on the Corridor's highway system that is forecasted to experience increased congestion.

Travel times could be further reduced for the Street Car and LRT Alternatives by operating them in an entirely grade-separated system similar to the Low Speed Maglev Option. Table 7.4 presents a comparison of the travel times for the combination and entirely grade-separated operations.

Table 7.4 – LRT West Bank 3 Alternative: All Grade-Separated System Travel Times

Operational Alternative	Northern Connection Area (Minutes:Seconds)	PEROW/WSAB Area (Minutes:Seconds)	Southern Connection Area (Minutes:Seconds)	Total Trip (Minutes:Seconds)
Combination: at-grade and grade-separated	19:48	27:53	12:31	60:12
All grade-separated	18:30	27:53	10:47	57:10

Based on an AA-level of system design, the end-to-end travel time from Union Station to the SARTC for the LRT West Bank 3 Alternative would be shortened by just over three minutes. The minor increase represents several constraints and assumptions. At this level of analysis, the run time for both PEROW/WSAB Area alignment alternatives is the same as the current LRT alignment has a major curve (PEROW/WSAB ROW to the San Pedro Subdivision) that requires a speed reduction whether in at-grade or grade-separated operations. This connection could be modified to run faster, but would require major residential property acquisition to do so. In addition, the run time for the combination alternative was based on an assumption of new signals in roadway segments adjacent to stations and signals priority at all other crossings. Also, the West Bank 3 combination alignment alternative was already designed with a 27 percent grade-separated configuration. Analyzing the trade-offs related to grade separation would be refined during any subsequent engineering work based on the Metro *Grade Crossing Policy,* which provides a process for making grade separation decisions based on detailed highway system analysis and transit system design.

Table 7.5 – LRT West Bank 3: Skip Stop System Travel Times

Operational Sections	All Proposed Station Stops (Minutes:Seconds)	Possible Skip Stop Stations (Minutes:Seconds)
Northern Connection Area	19:48	17:28
PEROW/WSAB Area	27:53	24:04
Southern Connection Area	12:31	10:34
Total	**60:12**	**52:06**

Currently, the guideway alternatives have an average station spacing of approximately of two miles between stations. If peak period express or skip-stop service with a five-mile station spacing were implemented, an end-to-end travel time savings of eight minutes could result as shown in Table 7.5. The proposed major stations considered in this analysis were Union Station, Pacific Boulevard, Firestone Boulevard, the Metro Green Line, 183rd Street/Gridley Road, Beach Boulevard, Harbor Boulevard, and SARTC. Further evaluation of express service and the stations to be included may be studied through possible future study efforts, though it is not current Metro policy.

Forecasted Ridership

Ridership projections were prepared using a Corridor-specific model developed from the FTA-reviewed Metro travel demand model that was expanded to include both Los Angeles and Orange counties, and was validated for existing conditions. Due to the significant number of modal and alignment alternatives, the decision was made to perform detailed coding and analysis of a set of base alternatives, along with a series of sensitivity tests to explore other alignment options and system decisions. Also, the West Bank 1 and 2 alignments were so similar in length, number of stations, and physical setting, that only the West Bank 2, which had more agency interest, was analyzed. The full model runs are indicated by a tone in Table 7.6 that presents the forecast ridership and user benefits.

Table 7.6 – Forecast Ridership (2035)

Alternative	Total Daily Project Boardings	Daily New Transit Riders	Daily User Benefits Per Project Boarding (Minutes)	Daily User Benefits (Hours)
No Build	49,760	--	--	--
TSM				
‣ Core Service Project[1]	39,000	16,000	N/A	N/A
‣ Corridor System	85,575	35,815	22.2	21,720
BRT Alternatives				
‣ Street-Running	57,340	18,120	13.2	12,605
‣ HOV Lane-Running	67,210	26,640	15.7	17,580
Street Car Alternatives				
‣ East Bank 1	77,545	28,900	18.9	23,240
‣ West Bank 2	75,750	27,550	18.5	24,365
‣ West Bank 3	79,600	28,945	18.6	24,635
LRT Alternatives				
‣ East Bank 1	84,895	32,730	18.9	26,780
‣ West Bank 2	82,930	31,200	18.5	25,540
‣ West Bank 3	87,150	32,870	18.6	27,075
Low Speed Maglev				
‣ East Bank 1	74,020	28,430	19.2	22,635
‣ West Bank 2	72,310	26,985	18.8	23,735
‣ West Bank 3	75,990	28,430	18.9	23,995

Notes: Colored tone identifies a coded model run; numbers with no tone were derived from sensitivity runs.
[1] Ridership for two bus service projects that represent the same travel corridor as the build alternatives.

The modeling results for 2035 show a strong increase in daily transit boardings in the PEROW/WSAB Corridor with implementation of any of the proposed transit system alternatives, clearly demonstrating the travel demand and need for more transit in the study area. At one end of the transit investment spectrum, the TSM Core Service Project option, which represents the two bus service lines that would serve the same travel corridor as the build alternatives: Union Station-Los Cerritos in Los Angeles County and the Katella Avenue BRT in Orange County. This option would attract and serve 39,000 daily Corridor boardings and approximately 16,000 new riders by the year 2035. A higher level of ridership would be served by the TSM Corridor System option, which includes a 206-mile system of new and enhanced bus services and arterial and intersection operational improvements. This alternative would attract and serve 85,575 daily Corridor boardings primarily in Orange County; only one new Metro bus line and one new Long Beach Transit line is proposed in Los Angeles County compared to improved service on three lines and provision of five new lines in Orange County. At the other end of the ridership spectrum, the approximately 35-mile long LRT alternatives would have the highest projected daily boardings among the guideway options with 82,900 to 87,150 daily boardings, and attracting up to 32,900 new transit riders.

The BRT Alternatives were forecasted to serve an additional 57,000 daily Corridor boardings for the Street-Running Alternative, and 67,000 daily boardings for the HOV Lane-Running Alternative. These two options would attract the lowest number of daily boardings and new riders among the proposed alternatives, other than TSM Core Service Project. For both BRT options, it should be noted that the projected ridership would significantly exceed the hourly and daily capacity typically provided by a BRT system. For example, the Metro Orange Line served 26,900 daily boardings in September 2011.

Construction of the Street Car Alternatives was forecasted to serve from 77,545 to 79,600 daily Corridor boardings, and attract an average of 28,400 daily new transit riders. It should be noted that the forecasted ridership information was based on operating three-car trains using the same street car vehicle proposed for use by the Santa Ana Street Car system. Research identified that the vehicle cannot be coupled together into two or three car trains, but must be operated singly. The capacity provided by a system of single Street Car vehicles would not accommodate the Corridor's forecasted ridership demand.

Daily boardings among the LRT Alternatives were forecasted to be between 82,900 and 87,150 daily boardings, and would attract an average of 32,270 daily new riders. The West Bank 3 Alternative was projected to attract and serve the highest level of daily boardings (87,150) and new riders (32,900) due to having the fastest travel speeds and shortest end-to-end travel times. Looking at forecasted daily user benefits per project boarding, the LRT alternatives are similar to the Street Car and Low Speed Maglev options, but have the highest user benefits on a daily total user benefit basis among the alternatives.

Daily boardings among the Low Speed Maglev Alternatives was forecasted to serve from 72,300 to 76,000 daily Corridor boardings, and attract an average of 27,950 daily new transit riders on a system that is approximately five miles shorter than the other guideway alternatives. The East Bank alignment option has the highest daily user benefits per project boarding among the alternatives, though the total daily user benefits are lower than the LRT Alternatives.

Metro Blue Line Sensitivity Run

A model run was performed to evaluate the ridership impact of operating the LRT Alternative from one identified in the run time analysis spreadsheets to a speed more comparable to actual Metro Rail operations experience. The Metro Blue Line section between the Washington and Willow stations was identified as having an operational configuration similar to that proposed for the PEROW/WSAB Corridor project. This segment operates northbound at 29.7 mph and southbound at 32.9 mph; the northbound speed was used in a run time analysis for the LRT West Bank 3 Alternative that resulted in an average speed of 29.9 mph due to the grade-separation in the northern portion of the alignment. The results presented in Table 7.7 show an increase in end-to-end run time (Union Station to SARTC) of more than five minutes. The eight percent reduction in average speed was forecasted to result in a corresponding eight percent decrease in daily corridor boardings (6,700 fewer riders) and a ten percent decrease in new riders (3,400 less).

Table 7.7 – Comparison of Forecast Ridership based on Metro Blue Line Operating Speed (2035)

Speed Alternative	**Average Speed** (mph)	**Run Time**[2] (Mins:Secs)	**Total Daily Corridor Boardings**	**Daily New Transit Riders**	**Daily User Benefits Per Project Boarding** (Minutes)	**Daily Total User Benefits** (Hours)
Run Time Analysis	35.5	1:00:12	87,150	32,870	18.6	27,075
Metro Blue Line[1]	29.9	1:05:49	80,460	29,435	18.5	24,810

[1] Based on run time analysis using FY2011 Metro Blue Line northbound average speed of 29.7 mph.
[2] End-to-end run time from Union Station to SARTC for LRT West Bank 3 Alternative.

Grade-Separated LRT Sensitivity Run

The first sensitivity test evaluated the ridership impact of entirely grade separating the LRT Alternative using the West Bank Option 3 alignment as the test case. The base ridership projections previously presented in Table 7.6 for the LRT options were based on the construction of an alignment that was a combination of grade-separated and at-grade operations. For the West Bank 3 alignment, 27 percent of the Northern Connection Area was grade-separated, as were eight percent of the PEROW/WSAB and Southern Connection areas. Future system decisions may be made to entirely grade-separate the LRT alignment to improve system performance and reduce traffic impacts. The results of the sensitivity run (Table 7.8) show a slight increase in daily boardings (three percent), new transit riders (four percent), user benefits (four percent), and user benefits per project boarding (two percent). The slight growth in ridership is due to a minor increase in operating speed and decrease in run time.

Table 7.8 – Sensitivity Test: Entirely Grade-Separated LRT Alternative (2035)

Statistic	Combination Alignment	Fully Grade-Separated Alignment
Daily Project Boardings	87,150	89,560
Daily New Riders	32,870	34,320
Daily User Benefits (Hours)	27,075	28,150
User Benefits Per Project Boarding (Minutes)	18.6	18.9

Low Speed Maglev with Private Fare Sensitivity Run

A second sensitivity test evaluated ridership impacts for the Low Speed Maglev Alternative based on whether this option was operated by a private operator rather than a public agency such as Metro or OCTA. This alternative differs from the other Low Speed Maglev alternatives only in the amount charged for passengers to use the system. The West Bank 3 alignment option was used as it had the highest forecasted ridership of the Low Speed Maglev alternatives and would represent the best case scenario.

The identified difference reflects the fare required to generate the operating revenue required to support a public-private partnership with different financing tools and return needs than an entirely publicly-funded project. A revised fare assuming private operations was calculated through financial analysis effort and then used in the Corridor model in place of the Metro rail system fare. The resulting private operations fare was identified as $8.75, and the significant impact on project ridership is presented in Table 7.9. The analysis showed that the public fare-based ridership of 75,990 daily boardings was forecasted to be reduced by 89 percent to 8,255 daily boardings. The results show that in this Corridor, with a large percentage of low-income households, riders would find less expensive travel alternatives to avoid paying the higher fare.

Table 7.9 – Low Speed Maglev Alternative: Private Fare (2035)

Statistic	Public Fare-Based Ridership	Private Fare-Based Ridership
Daily Project Boardings	75,990	8,255
Daily New Riders	28,430	3,090
Daily User Benefits (Hours)	23,995	2,610
User Benefits Per Project Boarding (Minutes)	18.9	18.9

Los Angeles County Minimal Operable Segment Ridership Analysis

A final set of sensitivity tests evaluated the resulting ridership if the Corridor project were built in Los Angeles County with the following MOS segments using the LRT West Bank 3 Alternative:

- **MOS 1** – With a use agreement for the San Pedro Subdivision and construction of a new Metro Green Line station, implementation of the system section connecting north to Union Station;
- **MOS 2** – Implementation of the segment from the new Metro Green Line station along the WSAB Corridor ROW to the future Bloomfield Avenue Station located in Cerritos just west of the county line; and
- **Both** – If both MOSs were constructed from Union Station to the proposed Bloomfield Station in Cerritos and went into operation at the same time.

Table 7.10 – Ridership Projections for Minimum Operable Segments in Los Angeles County

Statistics	MOS 1 Union Station to Metro Green Line[1]	MOS 2 Metro Green Line[1] to County Line	Both Union Station to County Line
Daily Project Boardings	19,620	11,060	38,790
Daily Corridor Boardings	103,820	111,070	125,540
Daily New Riders	1,850	3,350	9,790
Daily User Benefits (Hours)	2,330	3,360	9,940
Daily User Benefits (Minutes)	7.1	18.2	15.4

[1] Based on new Metro Green Line Station to be accessed from the San Pedro Subdivision.

The ridership results presented in Table 7.10 show a strong level of ridership in the Union Station to Metro Green Line portion of the Corridor. This section currently has a high level of transit ridership (15 percent) and the low number of new riders indicates that the project would be primarily serving existing riders better with faster, more direct service. Building and operating MOS 2 alone would attract a lower level of total riders than MOS 1, but it would attract three times more new riders than MOS 1 resulting in a higher level of user benefits. The synergy resulting from operation of both segments is demonstrated by a resulting higher level of ridership than if the ridership of the two segments were added together. Building both segments would result in three times more new riders than MOS 2 alone, and almost nine times more than only MOS 1. The total forecasted ridership for the Los Angeles County only portion of the Corridor system is strong, but not as significant as if a Corridor transit project were to provide service connecting the two counties and their jobs and destinations.

7.6 Cost-Effectiveness/Sustainability

The evaluation of the Corridor AA alternatives was based on an analysis that weighs the benefits accruing from each transit option against their cost and impacts. In this evaluation category, the transportation system efficiency, or the cost-effectiveness, of each option was identified. Cost-effectiveness is a measure used to evaluate how the costs of a transit project (for both construction and operations) compare to the expected benefits (increased transit ridership and user travel time savings benefits). The following discussion presents the capital costs, operating and maintenance (O&M) costs, and the projected ridership for each alternative.

Capital Costs

Table 7.11 presents order of magnitude project capital cost estimates identified for the TSM Alternative and four build options and were divided into cost category. The No Build Alternative was not included in this effort, as all No Build costs are considered to be within the financial capability of Metro and OCTA as reflected in their adopted LRTPs. The transit service projects included in the TSM Alternative were identified with Metro, OCTA, and Long Beach Transit staff, and project costs were based on cost projections developed by each agency or identified in cooperation with the transit agencies. The conceptual estimated costs were reviewed with Metro and OCTA staff and compared to historical pricing data received from Metro and the Exposition Authority and the costs were increased by 27.8 percent reflecting the analytical results.

Alternative-specific vehicle requirements were identified based on each option's run time, or the time it would take to travel from one end of the alignment to the other. Run times vary based on factors such as the alignment length and vertical configuration, and the number of stations proposed for each option. Service frequency and contingency fleet requirements were based on approved Metro and OCTA bus service plans, and Metro's adopted rail operational policies. The West Bank 2 alignment alternative typically required the highest number of vehicles, while the West Bank 1 and 3 alignments resulted in the lowest fleet size.

All of the proposed alternatives would require an overnight vehicle storage facility and a storage and heavy maintenance yard. The capital cost estimates include a placeholder cost of $184 million for construction of a storage and maintenance facility to support system operations for each of the alternatives. This cost represents the purchase of approximately 25 acres to house 80 vehicles along with construction of a related maintenance and repair facility.

The conceptual capital cost estimates range from a low of $239.2 million for the TSM Alternative to a high of $7.5 billion for the Low Speed Maglev West Bank 3 Alternative. The BRT Alternative construction cost of approximately $640 million is for the improvements along the PEROW/WSAB Corridor ROW including bus lanes, stations, intersection signaling, and other related system elements. The Street Car and LRT alternatives are fairly close in cost ranging between $2.6 and $2.9 billion and $2.9 and $3.2 billion respectively. The entirely grade-separated Low Speed Maglev Alternative has the highest estimated capital cost that ranges between $6.6 and $7.5 billion. It should be noted that the Low Speed Maglev costs are for a 30-mile alignment as this alternative ends at Harbor Boulevard in Santa Ana, while the capital costs for the Street Car and LRT options are for an approximately 35-mile system.

Table 7.11 – Capital Cost Breakdown (FY 2010 dollars)

Modal/Alignment Alternative	TSM Cost (Millions)	Main. Yard Cost (Millions)	Vehicle Cost (Millions)	Construction Cost (Millions)	Total Project Cost (Millions)
BRT Alternatives					
Street-Running	$239.2	$184.0	$9.0	$643.0	$1,075.2
HOV Lane-Running	$239.2	$184.0	$18.0	$640.4	$1,081.6
Street Car Alternatives					
East Bank 1	$239.2	$184.0	$411.6	$1,739.9	$2,574.7
West Bank 1	$239.2	$184.0	$396.9	$1,790.9	$2,611.0
West Bank 2	$239.2	$184.0	$411.6	$1,749.5	$2,584.3
West Bank 3	$239.2	$184.0	$396.9	$2,098.0	$2,918.1
LRT Alternatives					
East Bank 1	$239.2	$184.0	$371.1	$2,174.9	$2,969.2
West Bank 1	$239.2	$184.0	$356.5	$2,130.2	$2,909.9
West Bank 2	$239.2	$184.0	$382.2	$2,092.9	$2,898.3
West Bank 3	$239.2	$184.0	$356.5	$2,436.8	$3,216.5
Low Speed Maglev Alternatives					
East Bank 1	$239.2	$184.0	$540.0	$5,657.5	$6,620.7
West Bank 1	$239.2	$184.0	$540.0	$5,651.1	$6,614.3
West Bank 2	$239.2	$184.0	$562.5	$6,191.7	$7,177.4
West Bank 3	$239.2	$184.0	$540.0	$6,513.5	$7,476.7

Operating and Maintenance Costs

Operating and maintenance (O&M) costs are those related to the day-to-day operations of the proposed transit service including labor, vehicle maintenance, and overall transit system maintenance. O&M costs were projected based on the level of service and unit costs for each alternative as discussed in Chapters 3.0 and 5.0.

Project level of service was estimated based on operating plans prepared for each alternative incorporating information including vehicle revenue miles, vehicle revenue hours, and peak vehicles. The O&M unit cost estimates presented below presented in Table 7.12, the costs are based on all Metro operations. To derive unit costs, the total expenses assigned to each supply variable were divided by the annual service quantities; and the unit cost for each supply variable was multiplied by the projected annual units of service to identify annual O&M costs. During any subsequent engineering and environmental review efforts, system components and requirements would become more detailed and updated operator-specific O&M cost assessments would be prepared.

Table 7.12 – Estimated Annual O&M Costs (FY 2011 dollars)

Alternative	Total Annual O&M Cost (Millions)	Incremental Cost over TSM (Millions)
TSM Alternative		
Corridor System	$56.9	--
BRT Alternatives		
Street-Running	$41.6	($15.3)
HOV Lane-Running	$53.1	($3.8)
Street Car Alternatives		
East Bank 1	$217.9	$161.0
West Bank 1	$216.8	$159.9
West Bank 2	$219.4	$162.5
West Bank 3	$217.5	$160.6
LRT Alternatives		
East Bank 1	$216.0	$159.1
West Bank 1	$210.0	$153.1
West Bank 2	$214.1	$157.2
West Bank 3	$204.0	$147.1
Low Speed Maglev Alternatives		
East Bank 1	$152.3	$95.4
West Bank 1	$155.1	$98.2
West Bank 2	$153.2	$96.3
West Bank 3	$151.9	$95.0

Funding Feasibility

As discussed in Chapter 5.0, while there is Measure R funding dedicated to the Los Angeles County portion of any identified project, it is insufficient to fund a majority of the proposed alternatives. This project is not currently included in Metro's list of projects seeking federal New Starts funding. Orange County's Measure M program does not identify any funding for this project at this time. Additional funding would need to be identified and an analysis of resources that could be generated through an increase in county-based sales tax is presented in Chapter 5.0.

Cost-Effectiveness

Projects that utilize the FTA New Starts program to obtain federal funding are evaluated in a number of categories including the Cost-Effectiveness, which is a measure of the hours saved by users of the project compared to its annual cost. While not currently a New Starts project, CEI provides a good comparison measure of the benefits and impacts for the proposed alternatives. The Cost-Effectiveness

Index (CEI) was calculated for each build alternative by comparing its annual cost (combined annualized capital cost and annual operations and maintenance cost) and annual hours saved as compared to the TSM Alternative. While the PEROW/WSAB Corridor AA is not currently in any Metro request for New Starts funding, the CEI measure remains a meaningful way of evaluating the cost-effectiveness of the potential transit investment. Generally, a project must have a CEI of under $25 to move forward into the next study phase and eventually qualify for federal New Starts funding. It should be noted that the CEI threshold, and its importance to a project moving forward, does change over time due evolving federal funding priorities.

A "provisional" CEI has been calculated for each alternative using the West Bank 3 alignment, and is presented in Table 7.13 along with other measures of effectiveness. The resulting CEIs are considered to be provisional because the current TSM alternatives most likely will require revision if any project alternative from this AA is considered for New Starts funding in the future. This issue is discussed below in more detail.

Table 7.13 – Cost-Effectiveness Indices (2035)

Alternative	Average Weekday User Benefits (Hours)	Average Annual User Benefits (Hours)	Cost-Effectiveness Index
TSM			
‣ Corridor System	331,720	10,058,475	$8.15
BRT Alternatives			
‣ Street-Running	12,605	3,997,365	$20.47
‣ HOV Lane-Running	17,575	5,573,670	$16.60
Street Car Alternative			
‣ West Bank 3	24,635	7,811,760	$51.44
LRT Alternative			
‣ West Bank 3	27,075	8,585,485	$48.23
Low Speed Maglev Alternative			
‣ West Bank 3	23,995	7,608,500	$89.90

The TSM Alternative has the highest average daily and annual user benefits and the lowest CEI of the proposed options. The BRT alternatives currently meet the FTA threshold for cost-effectiveness, but have the lowest average daily and annual user benefits. The LRT West Bank 3 Alternative was forecasted to have the lowest CEI of the guideway alternatives, but at this point is above the FTA threshold. The CEI for the Street Car Option is close to the LRT Alternative, but is more than nine percent higher and has approximately 774,000 less hours of annual user benefits. The Low Speed Maglev Alternative has the lowest CEI of the alternatives primarily due to its high construction cost. This option's CEI is approximately two times (1.9) the LRT Alternative's CEI and provides approximately 3,080 less hours of daily user benefits and 978,000 less hours of annual user benefits. If any of the alternatives move forward into the next study phase, the factors contributing to the identification of the CEI, such as capital and operating costs and ridership, would be refined.

Provisional CEI Discussion

There were significant capped user benefits in all of the build alternatives as documented in *Appendix B: PEROW/WSAB Corridor AA Travel Demand Modeling Report.* This can be attributed to the TSM Alternative where the level and span of service provided by the identified projects does not correspond to the build options. In some part, this issue is related to Corridor characteristics that the study team and agencies struggled with in the Los Angeles County portion of the study area.

The proposed Orange County TSM projects provide a robust system of BRT lines on major streets already experiencing a high level of ridership, and peak period express freeway services providing connections to and from Long Beach and Los Angeles County. In Los Angeles County, it was difficult to identify potential bus service improvements. The area south from downtown Los Angeles to the City of South Gate (just north of the Metro Green Line) is densely developed and heavily served by current local and Metro Rapid bus operations. This portion of the Corridor was built in the 1920s and 1930s and has narrow streets with commercial buildings constructed to the edge of the sidewalk. Current bus operations are negatively impacted by the narrow street ROWs, peak period congestion in these heavily traveled corridors, and the high number of Metro and other service operators' buses operating through the area. Peak period bus speeds are between 10 to 14 mph even for the limited stop Metro Rapid service with signal priority improvements. In the future, the average bus speed will decline further with the projected population and employment growth, and related increase in daily travel. While there is an increasing demand for transit service, there is no physical room for additional bus service. Conversely, south of the Metro Green Line, while the rail line and commuter bus service to downtown Los Angeles are heavily used, transit demand is adequately served with 30 foot bus and city circulator services.

7.7 Land Use/Economic Plan Support

A majority of the Corridor cities encourage and support development of transit through policies in their respective general plans, specific plans, and designation of redevelopment areas and development of related plans. Common objectives include:

- Serve Corridor activity centers;
- Achieve a high quality of life through a balanced mix of attractive residential neighborhoods, high-quality public services and economically viable and attractive commercial areas;
- Preserve residential neighborhoods and commercial and industrial districts; and
- Provide an integrated transportation system for the safe and efficient movement of people and goods with a minimal disruption to the environment within and through the city.

Economic Development Effects

The proposed transit investment can provide opportunities for transit-oriented development (TOD), which can serve as catalysts for public and private economic revitalization. As demonstrated by other transit projects, such as those completed related to Metro projects, investments in transit station area development can provide economic benefits and enhanced quality of life to communities, while accommodating forecast population and employment growth and enhancing transit system ridership. Analysis shows that many of the alternatives have a high number of possible TOD opportunities. Additionally, the Corridor city and community plans discuss goals and objectives for developing strong and competitive commercial sectors. Plans identify that transit-oriented development could include a mixture of land uses, promote economic vitality, and serve the needs of the community through well-designed, safe, and accessible areas, while preserving historic and cultural character. A proposed station area land use and policy assessment was completed in order to identify current land uses, compatible transit development, economic development opportunities, and redevelopment potential. Table 7.14 presents an overview of transit supportive land use plans for each proposed station.

Table 7.14 – Summary of Transit Supportive Land Use Plans

City	Station Location	TOD Compatible	Specific Plans	Former Redevelopment Area
Los Angeles	Union Station	✓	✓	✓
	7th St./Alameda St.	✓	✓	✓
	Soto St./Olympic Blvd.	✓	✓	✓
Vernon	Leonis Blvd./District Blvd.	-	-	✓
	Vernon Ave.			
Huntington Park	Pacific Blvd.	✓	✓	✓
	Gage Ave.	✓	✓	✓
South Gate	Firestone Blvd.	✓	✓	✓
Downey	Gardendale St.	✓	✓	✓
	Metro Green Line Station	✓	✓	-
Paramount	Paramount Blvd./Rosecrans Ave.	✓	✓	✓
Bellflower	Bellflower Blvd.	✓	✓	✓
Cerritos	183rd St./Gridley Rd.	✓	✓	✓
Artesia	Pioneer Blvd.	✓	✓	✓
Cerritos	Bloomfield Ave.	✓	✓	✓
Cypress	Cypress College	✓	✓	✓
Anaheim	Knott Ave.	✓	-	✓

Table 7.14 – Summary of Transit Supportive Land Use Plans

City	Station Location	TOD Compatible	Specific Plans	Former Redevelopment Area
Stanton	Beach Blvd.	✓	✓	✓
Garden Grove	Magnolia St.	-	-	-
	Brookhurst St.	✓	✓	✓
	Euclid St.	✓	✓	✓
Santa Ana/Garden Grove	Harbor Blvd.	✓	✓	✓

7.8 Project Feasibility

The following provides a summary of the operational viability of each modal alternative:

- **BRT Alternative –** This service type is currently successfully operated by Metro and OCTA and could easily be implemented by either agency. The capacity of this alternative would not accommodate the future projected Corridor ridership.
- **Street Car Alternative** – This service is being studied by the cities of Santa Ana and Garden Grove for future implementation; no current Southern California operator has experience in providing Street Car service, though many U.S. cities do have extensive service experience. The typical Street Car vehicle is not currently approved to operate in California and a lighter LRT vehicle has been identified for future Orange County operations. All new facilities and staff to serve this option would be required. The capacity of this alternative would not accommodate the future projected Corridor ridership.
- **LRT Alternative** – This service type is currently successfully operated by Metro and could easily be implemented.
- **Low Speed Maglev Alternative** – Low Speed Maglev service is currently operated only in Nagoya, Japan and there is no U.S. experience to draw upon at this time. The Low Speed Maglev would require a costly and lengthy approval process to obtain California and U.S. approval. All new facilities and staff to serve this option would be required.

The following provides a summary of the operational viability of each alignment alternative. All of the alternatives would face the significant challenge of securing the ability to utilize the San Pedro Subdivision to travel north from the PEROW/WSAB ROW.

- **East Bank Alignment** – For this alternative, there would be major coordination requirements that may preclude this alignment from moving forward, including crossing BNSF's very active intermodal facility (Hobart Yard), operating along the UP rail corridor that currently is operating at 85 to 90 percent capacity with a complex mix of freight and passenger traffic, including multiple Metrolink and Amtrak lines and possibly CHST service in the future. It has the fewest maintenance yard options, but has the possibility of sharing a site with the Metro Gold Line.

- **West Bank 1 Alignment** – This alternative has a potential fatal flaw as the alignment is proposed to operate along the western edge of the Los Angeles River that is currently occupied by high tension electrical towers. Significant property acquisition would be required to accommodate any guideway structure in this area. As the alignment proceeds north, it would have to share the west bank ROW with Metrolink, Amtrak, and Metro Red Line operations, and possibly CHST service in the future. This option would have to utilize the constrained track system throat at Union Station.
- **West Bank 2 Alignment** – This alternative has significant challenges as it would have to cross the Redondo Junction which accommodates a high level of freight activity from the Alameda Corridor. Similar to the West Bank 1 alignment option, it would share the west bank ROW with Metrolink, Amtrak, and Metro Red Line operations, and possibly CHST service in the future. This option would have to utilize the constrained track system throat at Union Station.
- **West Bank 3 Alignment** – This alternative faces the challenges of coordinating with UP to use the tracks in the median of Randolph Street, and fitting through the streets of Vernon and Los Angeles as it travels north. It would transition to an underground configuration through much of downtown Los Angeles, but would transition to at-grade operations in Alameda Street in the Little Tokyo area in order to use the Metro Gold Line tracks into Union Station. It does avoid the constrained access into Union Station that the other two West Bank alternatives face.

7.9 Environmental and Community Impacts

At this preliminary level of analysis, with alignment engineering and station design information at a five percent level of completeness, there are minor differences in the level of environmental impacts between the Final Alternatives as summarized below in Table 7.15. While there does not appear to be any insurmountable environmental challenges, there are remaining areas of concern requiring further analysis during any subsequent Draft EIS/EIR effort.

Table 7.15 – Summary of Environmental Impacts

Alternative	Environmental and Community Impacts
No Build	The No Build Alternative is used for comparison purposes to assess the relative benefits and impacts of constructing a new transit project in the study area versus implementing only currently planned projects.
TSM Alternative	This alternative would: • Would require minimal property acquisitions. • Have minimal impacts to visual and aesthetics. • Would result in minimal impacts to noise and vibration.

Table 7.15 – Summary of Environmental Impacts

Alternative	Environmental and Community Impacts
TSM Alternative	• Impact air quality and climate change due to an increase in some mobile source emissions from an increase in the number of busses operating in the Corridor. • Have minimal impact on culturally sensitive resources or parkland and recreational facilities. • Would have major traffic impacts due to the increase in the number of busses using the Corridor's freeway and arterial system. It may support land use plans.
BRT Alternatives	This alternative would: • Require minimal acquisition of property for dedicated bus lane space, other than what would be needed for maintenance facilities. • Would have minor impacts to visual and aesthetics. • Would have potentially minor impacts to noise and vibration from increased bus service. • Would have major traffic impacts due to the increase in the number of buses using the Corridor's freeway and arterial system. • Potentially impact air quality and climate change due to the increase in bus emissions from a combustion of natural gas and other fuel. • Have minimal impacts to cultural or parklands resources. It may support land use plans.
Street Car Alternatives	This alternative would: • Support land use plans and provide economic development opportunities on a community-oriented rail system. • Would require minor property acquisitions for rail ROW, specifically required for rail turning radius' and maintenance facilities. • Would have minor noise and vibration impacts. • Lower travel speeds and more frequent stops could increase congestion and have other traffic impacts, primarily at intersections. • Would have visual and aesthetic impacts, due to the overhead catenary system and other system aspects, when adjacent to residential or commercial land uses. • Would have minor impacts on culturally sensitive resources or parkland and recreational facilities. • Not impact air quality because it is electrified and does not result in mobile source emissions.

Table 7.15 – Summary of Environmental Impacts

Alternative	Environmental and Community Impacts
LRT Alternatives	The alternative would: • Support land use plans and be a catalyst for public/private economic revitalization and station area development opportunities. • Would require minor property acquisitions for rail ROW, specifically required for rail turning radius' and maintenance facilities. • Would have minimal impact on culturally sensitive resources or parkland and recreational facilities. • Would have visual and aesthetic impacts, due to the overhead catenary system and other system aspects, when adjacent to residential or commercial land uses. • Would have noise and vibration impacts, particularly adjacent to residential neighborhoods, or sensitive land uses such as schools and churches. • Not impact air quality impact air quality due to electrified operations and does not result in mobile source emissions. • Would have traffic impacts, particularly in at-grade sections and intersections.
Low Speed Maglev Alternatives	The alternative would: • Support land use plans and be a catalyst for public/private economic revitalization and station area development opportunities. • Require significant property acquisitions for system turning radius requirements, column structures, and a maintenance facility. • Would have significant impacts to culturally significant resources, specifically older, established neighborhoods. • Would have significant impacts to visual and aesthetic resources due to the scale of this entirely grade-separated alternative. The impacts would be significant adjacent to single family residential communities. Have visual impacts on parklands and recreational resources. • Would have minor noise and vibration impacts, particularly adjacent to residential neighborhoods and sensitive land uses. • Not impact air quality due to electrified operations and does not result in mobile source emissions. The low speed maglev technology proposed for the PEROW/WSAB Corridor project is a new technology and energy consumption information is not known. • Would have some traffic impacts due to the structural column placement along the ROW to support the grade-separated system, particularly at intersections.

7.10 Comparative Summary

The resulting technical information, presented in Table 7.16, summarizes the technical information identified in the previous sections. In summary, while providing a new transportation improvement is important to the future mobility and vitality of the Corridor communities, adding any major transit system improvement into this densely built-out, urban corridor will also have significant benefits and impacts. An overview of how each modal alternative would serve the Corridor's needs and challenges, along with the identified impacts, challenges, and benefits follows.

All of the alternatives have the following benefits:

- Provide a new travel option and additional transportation system capacity to serve the Corridor's growing population and employment.
- Attract and serve a significant number of daily boardings and new transit riders.
- Better connect the Corridor, its cities, and its destinations and activity centers.
- Support city land use and economic development plans to varied degrees.
- Better serve the Corridor's low-income and transit-dependent households.

Conversely, all of the alternatives would have the following impacts and challenges to various degrees:

- Result in new environmental impacts, such as noise, vibration, visual, and privacy impacts.
- Result in traffic system impacts.
- Require acquisition.
- Require significant funding commitments to build and operate the future transit system.

Overview of Modal Alternatives

Implementation of the **TSM Alternative** would have the following key benefits:

- Increase Corridor transit ridership with forecasted 85,600 daily boardings and 35,800 new riders over the No Build Option.
- Increase the range of bus service types available; serve commuter travel patterns.
- Provide for implementation flexibility: improvements could be put into service over time by Metro, OCTA, and Long Beach Transit as resources become available; and supports local control as service can be reallocated to meet evolving transit needs.
- Have the lowest capital cost and the third lowest operating cost of the proposed alternatives.
- Have the lowest Cost-Effectiveness Index (CEI) of the alternatives – $8.15.

Implementation of the **TSM Alternative** would have the following key impacts and challenges:

- May only serve as an interim improvement as it may not offer sufficient system carrying capacity to address long-term travel demand; though it has the flexibility to possibly address.

- In public comments made throughout the study process, many participants were adverse to bus transit expressing that this option was a continuation of the current situation, and did not offer a new mode for the Corridor.
- Operate on same congested highway system as Corridor auto travel resulting in minimal, if any, improvement to travel speeds and travel times experienced by current bus riders.
- Result in air quality and climate change impacts due to increased bus activity contributing to local and regional congestion.
- While this option would better serve transit-dependent residents, it may not significantly contribute to attracting choice riders from their cars.
- Provide minimal service improvements to serving the Corridor's changing job patterns– connecting local residents to employment opportunities.
- Continue Los Angeles- and Orange County-centric services and does not address some of the identified transit service issues such as providing improved service coordination across county lines and between multiple service providers.

Implementation of the **BRT alternatives** would have the following key benefits:

- Increase Corridor transit ridership with forecasted 57,340 daily boardings and 18,200 new riders over the No Build Option for the Street-Running Alternative, and 67,210 boardings and 26,640 new riders for the HOV Lane-Running Alternative.
- Provide transit service serving local communities; the HOV Lane-Running Alternative would provide the better regional service of the two options.
- Increase the range of bus service types available; the HOV Lane-Running Alternative would serve commuter travel patterns.
- Increase transit service for low-income and transit-dependent households – the Street-Running Alternative would improve local service for transit-dependent communities.
- Have the second lowest capital and operating costs of the proposed alternatives.
- Have the second lowest Cost-Effectiveness Index (CEI) of the alternatives – $20.47 for the Street-Running Alternative and $16.60 for the HOV Lane-Running Option.

Implementation of the **BRT alternatives** would have the following key impacts and challenges:

- Even with attracting the lowest ridership and new riders among the alternatives, the projected ridership exceeds bus system capacity. While the proposed BRT service may be sufficient in early implementation stages, as the forecasted ridership reaches the 2035 demand levels, this alternative would be beyond carrying capacity provided by a BRT system, and riders would be better served by a guideway system alternative.
- A significant capital cost is required for PEROW/WSAB Area segment to build busway, stations, and signal coordination systems. If converted to a guideway system in future, this investment could not be reused and subregion would have to wait their turn in the funding cycle again.

- Operate on the same congested highway system as Corridor auto travel resulting in minimal improvement to travel speeds and travel times experienced by current bus riders; operating along congested highway system, it is subject to same accidents and travel delays as auto travel.
- Add buses to the Corridor's arterial and freeway system contributing to increased congestion levels.
- Result in air quality and climate change impacts due to increased bus activity contributing to local and regional congestion.
- Has a high operating and maintenance cost.
- In public comments made throughout the study process, many participants were adverse to bus transit expressing that this option was a continuation of the current situation, and did not offer a new mode for the Corridor.
- Many Corridor cities do not support this option; not seen as strongly supporting local land use and economic development plans.

Implementation of the **Street Car Alternative** would have the following key benefits:

- Increase Corridor transit ridership with forecasted 75,800 to 79,600 daily boardings and an average of 28,500 new riders over the No Build Option.
- Provide a new travel mode in Corridor.
- Support local land use and economic development plans.
- Provide air quality and local climate change benefits.

Implementation of the **Street Car Alternative** would have the following key impacts and challenges:

- Best serve local communities of the guideway alternatives; provide poor regional service.
- Provide minimal service improvement to serve changing job patterns – connecting local residents to regional jobs.
- In public comments made in the study process, many participants felt that this option did not provide the right fit for the Corridor. The slower travel speed and more frequent stops were seen as serving local travel needs, but not regional transportation needs.
- Vehicle type has several fatal flaws for this Corridor:
  1. Though analyzed in three-car trains to accommodate anticipated ridership demand, the selected vehicles cannot be coupled together and must be operated as single vehicles. This would not provide sufficient capacity to meet Corridor ridership demand, and would result in significant operational costs and traffic impacts due to need for more frequent trains.
  2. Cannot interline with Metro's urban rail system: selected vehicles are low floor vehicles and cannot be accommodated at Metro's platforms; Metro Design Criteria precludes use of low floor vehicles.
  3. Cannot share Metro rail facilities; could share future Santa Ana system facilities, though may overwhelm currently planned Street Car storage and maintenance yard facilities.

4. If another vehicle would be selected, it would be an LRT vehicle.
5. Would preclude the West Bank 3 alignment alternative: could not operate on Metro tracks from Little Tokyo into Union Station.
6. Street Car service and vehicles designed for short, local trips with fewer seats and more space provided for standing easy on-and-off, bicycles, and strollers. Longer Corridor trip riders would want seats. High level of standees may not meet Metro Transit Policy standards.
7. May not meet Federal Railroad Administration (FRA) requirements for operations in an active railroad ROW.

- New mode would require all new facilities and staff and operational learning curve;
- Require identification of system operator: Metro and OCTA would decline to operate a new mode; future Santa Ana system may be option.
- Have operating cost equal to or more than the LRT alternatives with no advantage over LRT service; more than Low Speed Maglev alternatives.
- Have the second highest CEI of the alternatives – $51.44 which does not currently meet the FTA threshold.

Implementation of the **LRT Alternative** would have the following key benefits:

- Provide the highest Corridor transit ridership among the proposed alternatives with a forecasted 87,200 daily boardings and an average of 32,300 new riders over the No Build Option.
- Offer highest travel speed and shortest travel time between Union Station and the SARTC.
- Provide local and regional service.
- Provide a new travel mode.
- Support for local land use and economic development plans demonstrated in region.
- Provide air quality and local climate change benefits.
- Provides service improvement to serve changing job patterns – connecting local residents to regional jobs – with direct service possible to Union Station and other Metro rail stations, providing the best regional system connectivity.
- New mode can share existing Metro rail transit facilities and staff; can interline with Metro system providing rider connectivity benefits.
- In public comments made in the study process, participants expressed the strongest support for the LRT Alternative. It was viewed as a familiar technology that has been proven successful locally, and that the Corridor’s LRT system would be compatible with the Metro system.
- Would operate as fast as Low Speed Maglev Alternative if curve speeds were increased; would require revision to Metro Design Criteria.
- Provide highest cost-effectiveness among guideway alternatives: $48.23.

Implementation of the **LRT Alternative** would have the following impacts and challenges:

- Would result in some significant environmental impacts requiring mitigation, primarily increases in noise, vibration, and traffic impacts
- Have the second highest capital and operating cost.

Implementation of the **Low Speed Maglev Alternative** would have the following key benefits:

- Provide high Corridor transit ridership with forecasted 72,300 to 76,000 daily boardings and an average of 27,900 new riders over the No Build Option.
- Offer the highest travel speed and shortest travel time from Union Station to the Harbor Boulevard Station.
- Have the lowest operating cost of the guideway alternatives.
- Provide local and regional service.
- Provide a new travel mode.
- Provide fast service improvement to serve changing job patterns – connecting local residents to regional jobs.
- Support local land use and economic development plans.
- Provide air quality and local climate change benefits.
- Have the lowest level of noise, vibration, and traffic impacts among the guideway alternatives.
- In public comments made in the study process, participants expressed the opinion that this modal option was a more cutting edge approach for the Corridor, and would provide quieter and cleaner service than the other alternatives.

Implementation of the **Low Speed Maglev Alternative** would have the following key impacts and challenges:

- Result in implementation concerns as only one system operating in world; the only existing system built as service for a world's fair and was not extended.
- Result in implementation costs and schedule constraints due to unproven technology in U.S. – would require lengthy and costly CPUC and FRA approval process, and FTA exemption for vehicles from Buy America requirement.
- Require the highest level of property acquisition to accommodate system turns.
- Result in significant environmental impacts in the following areas: privacy, visual and aesthetics, and cultural resources, as well as possible visual and noise impacts to parklands and sensitive land uses.
- In public comments made in the study process, participants expressed concerns that the technology is unproven in the U.S. and would be incompatible with existing systems.
- Private sector funding does not appear viable.
- New mode would require all new facilities and staff and operational learning curve;

- Require identification of a system operator.
- Have the highest capital cost among the alternatives due to the need for an entirely grade-separated system and unknown costs related to migrating the technology to Southern California.
- Has the highest CEI of the alternatives – $89.90.

7.11 Discussion/Comparison of Alignment Alternatives

The description of the build alternatives was divided into three alignment sections for analytical purposes and to reflect different coordination requirements and possible phasing decisions:

1. **Northern Connection Area** – consisted of the study area extending north from the PEROW/WSAB Corridor terminus in Paramount to downtown Los Angeles. Possible alignments to Union Station were explored along several active and inactive railroad ROWs, and four possible alignment options were identified and evaluated.
2. **PEROW/WSAB Corridor ROW Area** – included the PEROW/WSAB Corridor ROW now owned by Metro and OCTA, with only the reuse of the ROW considered in this area.
3. **Southern Connection Area** – consisted of the area extending from the southern PEROW/WSAB Corridor terminus at Raitt Street in Santa Ana east through the city's civic center and downtown to the SARTC; two alignment alternatives were identified and evaluated.

Overview of Northern Connection Area Alignment Options

There were two sets of options for the connection north from the PEROW/WSAB Corridor ROW to Union Station, either operating along the east or west bank of the Los Angeles:

- **East Bank Alternative** – This alignment alternative would operate north along the San Pedro Subdivision, cross a corner of the Hobart Intermodal Yard owned by Burlington Northern-Santa Fe (BNSF), to where the ROW intersects with the Union Pacific (UP)-owned ROW used for freight, Metrolink, and Amtrak operations. It would share the UP ROW for a short distance to where the ROW, now owned by Metro and operated by Metrolink, turns north to travel along the east bank of the Los Angeles River and then cross over the river into Union Station.
- **West Bank Alternative** – This alignment alternative would operate north along the San Pedro Subdivision to either operate along the west bank of the river to reach Union Station, or turn west to operate along a former railroad ROW and a Metro-owned ROW to reach Union Station. Three viable options were evaluated during the AA study:
  - **West Bank 1** – This alternative would operate in its own ROW along the west bank of the Los Angeles River to just beyond the Redondo Junction where it would share the Metro-owned and Metrolink-operated ROW with Metrolink and Amtrak service, and possibly Metro Red Line operations.
  - **West Bank 2** – This alternative would turn west to operate in the median of a infrequently used BNSF railroad ROW now owned by UP, through Huntington Park and then turn north to operate in the median of Pacific Boulevard, a former street car ROW until it intersects with the

Table 7.16 – Summary of Final Screening Results

Criteria	TSM	BRT		Street Car		LRT		Maglev	
		Street	HOV	East Bank	West Bank 3	East Bank	West Bank 3	East Bank	West Bank 3
Alignment Length (miles)	206	38.2	39.0	35.2	34.5	35.2	34.5	29.7	29.2
Number of Stations	Varies	27	22	23	24	22	23	17	18
End-to-End Run Time[1]	Varies	1:21:11	1:18:30	1:09:55	1:07:15	1:02:09	1:00:12	43:06[2]	43:00[2]
Average Speed (mph)	Varies	32.4	32.6	30.7	31.1	35.2	34.5	40.2	40.2
Daily Boardings	85,580	57,340	67,210	77,545	79,600	84,900	87,150	74,020	75,990
New Riders	35,820	18,120	26,640	28,900	28,950	32,730	32,780	28,430	28,430
Cost to Ride ($2011)	Varies[3]	$1.50	$2.45[4] $3.00[5]	$1.50	$1.50	$1.50	$1.50	$1.50 $8.75[6]	$1.50 $8.75[6]
Corridor Boardings	100,670	126,000	133,680	133,035	140,180	144,670	147,340	142,360	146,150
Cost to Build ($2010, millions)	$249	$1,075	$1,082	$2,575	$2,918	$2,969	$3,216	$6,6200	$7,476
Annual Operating Cost ($2011, millions)	$56.9	$41.6	$53.1	$217.9	$217.5	$216.0	$204.0	$152.3	$151.9
Cost-Effectiveness Index	$8.15	$20.47	$16.60		$51.44	$48.26	$48.23		$89.90
Environmental Impacts:									
Acquisition	Minor	0-10	0-15	15-20	15-20	15-20	15-20	50-70	50-70
Noise and Vibration	Minor	Minor	Minor	Medium	Medium	Major	Major	Minor	Minor
Visual and Privacy	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Major	Major
AQ and Climate Change Benefits	Minor	Minor	Minor	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Impacts	Major	Major	Major	Major	Major	Major	Major	Minor	Minor
Other Impacts[7]	Minor	Minor	Minor	Minor	Minor	Minor	Minor	Major	Major
Transfers: Union Station	1	1	1	1	1	0	0	1	1
SARTC	1	1	1	1	1	1	1	2	2

Notes:
[1] Union Station – SARTC
[2] Union Station – Santa Ana Street Car harbor Boulevard Station.
[3] TSM Alternative includes local, limited stop, and Intercounty express service.
[4] Metro Silver Line fare.
[5] OCTA Intercounty Express Route fare.
[6] Private Operator fare.
[7] Other Impacts include: Land Use, Economic Development, Cultural Resources, Parks and Recreation Resources, Energy, Safety and Security, and Environmental Justice and Equity.

Metro-owned Harbor Subdivision. It would follow the Harbor Subdivision ROW under the Redondo Junction and then operate north along the west bank similar to West Bank option 1.

- **West Bank 3** – This alternative follows the same alignment as West Bank 2, but rather than turning to operate along the west bank of the river it continues north along the Harbor Subdivision and then along city streets and private property in a combination of aerial and underground configurations to daylight south of Metro Gold Line Eastside Tokyo Station where it utilizes the existing at-grade Metro Gold Line tracks to reach Union Station.

The following provides a summary of the viability of each alignment alternative:

- **East Bank Alignment** – This alternative, while typically the second most costly among the alignment alternatives, provides good travel speeds and run times. This alignment does not serve Huntington Park or downtown Los Angeles, but does serve an edge of Vernon and East Los Angeles. The guideway alternatives using this alignment typically have the second highest ridership and new riders, along with strong user benefits. The Low Speed Maglev East Bank Alternative had the highest user benefit per project boarding of all of the guideway alternatives.

  There would be major coordination requirements that may preclude this alignment from moving forward, including crossing BNSF's very active intermodal facility (Hobart Yard), operating along the UP rail corridor that currently is operating at 85 to 90 percent capacity with a complex mix of freight and passenger traffic – multiple Metrolink and Amtrak lines and possibly CAHSR service in the future. It has the fewest maintenance yard options, but has the strong possibility of sharing a future site with the Metro Gold Line.

- **West Bank 1 Alignment** – This alignment typically has the second lowest capital cost, it has the highest cost per mile among the guideway alternatives. It has the lowest travel speed and results in the lowest ridership and new riders. This alignment does not serve Huntington Park, downtown Los Angeles, but does serve an edge of Vernon.

  This alternative has a potential fatal flaw as the alignment is proposed to operate along the western edge of the Los Angeles River that is currently occupied by high tension electrical towers, and significant property acquisition would be required to accommodate any guideway structure. As the alignment proceeds north, it would have to share the west bank ROW with Metrolink, Amtrak, and Metro Red Line operations, and possibly CHST service in the future. This option would have to make a sharp curve, reducing travel speeds, to utilize the constrained track system throat at Union Station.

- **West Bank 2 Alignment** – While this alternative is typically the least costly alternative from a total cost and cost per mile, it does have the highest vehicle requirements and costs due to having the slowest operational speed and the resulting highest run times of all of the options.

Table 7.17 – Overview of Northern Connection Area Alignment Options

Option	Benefits	Challenges
East Bank 1	• Has second or third fastest end-to-end run times • Result in second highest ridership and new riders • May be able to share future Metro Gold Line maintenance yard	• Second highest capital cost • Does not serve Huntington Park or Downtown Los Angeles • Significant coordination requirements with multiple railroads, passenger service agencies, and possibly future CAHSR service
West Bank 1	• Second lowest total capital cost	• Second lowest travel times • Lowest ridership and new riders • Does not serve Huntington Park or Downtown Los Angeles • Potential fatal flaw along LA River due to ROW use by high tension electrical towers • Shares west bank ROW Metrolink, Amtrak, Metro Red Line operations, and possibly future CAHSR service • Operates through constrained track system throat into Union Station
West Bank 2	• Lowest total capital cost • Serves Huntington Park	• Slowest travel speed; highest run times • Highest vehicle needs and costs • Highest O&M cost • Third lowest ridership and new riders • Does not serve Downtown Los Angeles • Similar to West Bank 1: must share river bank ROW and enter through constrained Union Station throat
West Bank 3	• Fastest end-to-end travel time • Highest ridership and new riders • Lowest O&M cost • Serves Huntington Park and Downtown Los Angeles • Opportunity for LRT service to interline with Metro LRT system • Uses existing Gold Line tracks into Union Station	• Highest total capital cost (most stations and grade-separation) • Transitions from underground to at-grade operations in Alameda Street in Little Tokyo area

For the Low Speed Maglev Alternative, this alignment is the second most expensive from both a total cost and per mile perspective. A grade separation crossing of the Redondo Junction adds significantly to the cost of this alignment. This alignment does serve the hearts of Huntington Park and Vernon, but does not serve downtown Los Angeles.

This alternative has significant challenges as it would have to share the west bank ROW with Metrolink, Amtrak, and Metro Red Line operations, and possibly CHST service in the future. This option would have to make a sharp curve, reducing travel speeds, to utilize the constrained track system throat at Union Station.

- **West Bank 3 Alignment** – This alignment has the highest cost among all of the alternatives due to the highest percentage of grade-separation (Street Car and LRT) and the most stations, but it provides the fastest operational speeds and run times, and correspondingly, the highest ridership for all of the modal alternatives. This option serves the hearts of Huntington Park and Vernon, and the Central City East portion of downtown Los Angeles. It also provides the opportunity for the LRT alternatives to interline with the Metro rail system.

  This alternative faces the significant challenges of coordinating with UP to use the tracks in the median of Randolph Street, and fitting through the streets of Vernon and Los Angeles as it travels north. It would transition to an underground configuration through much of downtown Los Angeles, but would transition to at-grade operations in Alameda Street in the Little Tokyo area in order to use the Metro Gold Line tracks into Union Station. It does avoid the constrained access into Union Station that the other two West Bank alternatives face.

Overview of Southern Connection Area Alignment Options

At the southern end of the PEROW/WSAB Corridor ROW, all the alternatives, except the Low Speed Maglev Alternative, would leave the ROW to operate at-grade on Santa Ana city streets along one of two alternative routes which would have following benefits and challenges. The Low Speed Maglev Alternative would end at Harbor Boulevard with passengers transferring to the Santa Ana-Garden Grove Fixed Guideway Project to complete their trip. The BRT, Street Car, and LRT alternatives would leave the former PE ROW to operate on one of two alternative routes:

- **Harbor Boulevard/1st Street/SARTC Alternative** would leave the Corridor ROW after a future Harbor Boulevard Station to travel south on Harbor Boulevard, east on 1st Street, and then north on a realigned Santiago Street to the SARTC.
- **Westminster Boulevard/17th Street/Main Street Alternative** would serve the future Harbor Boulevard Station and then travel east on Westminster Boulevard/17th Street, and south on Main Street where riders would transfer to future Santa Ana-Garden Grove Street Car system to travel to the SARTC.

The benefits and challenges of the two alignment alternatives are presented below in Table 7.18.

Table 7.18 – Overview of Southern Connection Area Alignment Options

Option	Benefits	Challenges
Westminster/ 17th/Main	• Lower total capital cost (3.7 miles) shorter alignment length	• Has fewer stations • No direct connection to the SARTC • Lower ridership and new riders • Sensitive land uses on Westminster Boulevard/17th Street • Constrained ROW width on Main Street; lined with historic buildings • No possible maintenance facility location in Santa Ana
Harbor/1st/ SARTC	• Higher ridership and new riders • Direct connection to the SARTC • Possible maintenance facility in the SARTC area	• Higher capital cost due to longer alignment • Higher number of impacted Intersections

7.12 Recommended Alternatives

The technical results presented above in sections 7.4 through 7.11 were presented and discussed through public and advisory committee outreach efforts which are summarized in section 7.12.2 below. Based on technical evaluation results and community and stakeholder input, project findings and recommendations were developed by staff and by the project's advisory committees. The staff recommendations and Project Steering Committee recommendations differed in only one respect, regarding the Low Speed Maglev alternative. In January 2013, after considerable deliberation, SCAG's Transportation Committee (TC) approved the staff recommendations. In February 2013, the SCAG Regional Council (RC) approved the TC recommendations. The RC-approved recommendations will be forwarded to the Metro and OCTA Boards for consideration and further action. As owners of the PEROW/WSAB right-of-way (ROW), Metro and OCTA will make the ultimate decision on whether to move forward with future study efforts.

7.12.1 Summary of Project Findings

The following project findings were developed with the project's Technical Advisory Committee (TAC) and confirmed by the Steering Committee.

- The AA study clearly identified that development of an effective transit system is imperative to meet the future mobility needs of the Corridor residents and businesses by providing vital linkages both within the Corridor and beyond to the expanding regional rail system.
- The publicly-owned, 20-mile long PEROW/WSAB Corridor ROW provides Corridor communities, and the region, with the unique opportunity to build a new transit system connecting to the regional rail system with minimal displacement impacts and right-of-way acquisition costs. The Corridor right-of-way would provide approximately 60 percent of the alignment length of the identified alternatives.

- There is a high-level of potential transit demand in the Corridor. All of the modes increase Corridor transit ridership and attract new riders. The guideway alternatives (Street Car, Light Rail Transit, and Low-Speed Magnetic Levitation) would attract and serve a significant number of new riders – people who do not currently use transit.
- The future Corridor ridership potential is so high that it exceeds the capacity that several of the modal alternatives could provide.
- While not universal, there is a significant level of city support for implementation of a future transit system as demonstrated by adopted transit-oriented plans and policies.
- There is a high level of community support for implementation of a future transit system as residents view congestion and mobility as worsening in the future.

7.12.2 Public Input

Community, stakeholder, elected official, and agency input has been integral in shaping the PEROW/WSAB Corridor AA process, guiding the direction of the project, and developing the Final Recommendations. Stakeholder comments were received and documented over the course of the 29-month study at meetings and work sessions with elected officials, stakeholders, advisory committee members, and the community. During the development of the Final Recommendations, six community meetings were held throughout the Corridor Study Area and the following summarizes the comments that were received, and are presented in detail in Section 6.2.3 of this report:

- ***Additional transportation options are needed to meet future transportation needs of the growing region.*** A majority of the community members were enthusiastic about the opportunity providing transit in the Corridor. Community members who opposed the No Build Alternative commented that it would be a continuation of the status quo, and that there would be major consequences for not proactively taking action to address the region's transportation problems. The No Build Alternative was viewed as not providing a viable future solution as congestion would increase with future Corridor travel demand growth.
- ***The TSM Alternative was not seen as a long-term solution.*** Many community members supported the TSM Alternative as a way to address the region's transportation challenges in the short term, but did not see it as a comprehensive long-term solution. This option was not supported because it did not provide an alternative to use of the Corridor's congested road and highway network.
- ***BRT was seen as practical but not the best transportation solution of the Corridor.*** The public was not enthusiastic about the BRT Alternative. Some community members stated that BRT was better than no transportation solution at all, and that it could serve as an interim transportation solution and a precursor to a future solution. Lack of support for this option was based on the belief that it would not appeal strongly enough to people to choose it over driving, and it would have to operate in the already congested street network, leading to unpredictable travel times and contributing to further congestion.

- ***Streetcar was not seen as the transportation solution for the Corridor.*** Most community members commented that this option was not worth the investment compared to other alternatives based on similar costs and impacts as the other alternatives. The Streetcar Alternative also would have a lower projected ridership, slower travel speeds than other alternatives, and it would not be compatible with the existing Metro system.
- ***Light Rail Transit was seen as the best investment of all the transit alternatives and would provide a beneficial transportation solution for the region.*** Community members expressed strong support for the LRT Alternative, and commented that it was the best fit for the Corridor because it would have faster speeds, higher capacity, and higher projected ridership. LRT was also seen as being compatible with the existing Metro transit system, and would benefit from using existing facilities. In addition, LRT is already known to be reliable, is a proven technology in the region, and is familiar to transit riders.
- ***The cost of providing Low Speed Magnetic Levitation seems prohibitive, but the technology could provide a new solution to meet future transportation needs.*** The Low Speed Maglev Alternative had support from some community members because it would be quieter and would cause fewer environmental impacts than the other alternatives. Other community members expressed concerns that it had a significantly higher capital cost, was an unproven technology in the United States, and would require significant property acquisition that would displace residents who live adjacent to the Corridor.

7.12.3 Final Recommendations

Based on the technical evaluation results and community and stakeholder input, Final Recommendations were developed by the project team and advisory committees, and were provided to the SCAG Transportation Committee and Regional Council for consideration. The following recommendations, describing technology, alternative description, and phasing recommendations, were approved by the Regional Council on February 7, 2013.

Technology/Modal Options

The recommendations for the six modal options included in the Final Set of Alternatives were:

- The ***No Build Alternative is required*** to move forward to provide a baseline comparison in future environmental evaluation study efforts. It was noted that in the last set of community meetings, this alternative was overwhelmingly identified as not viable by the public as they voiced the strong opinion that the Corridor required a transit system with connections to the regional rail system to function successfully in the future.
- The ***Transportation System Management (TSM) Alternative is required*** to move forward to provide a baseline comparison in future environmental evaluation study efforts. This alternative was supported by the public as a way to address the region's transportation challenges in the short term, but was not seen as providing a comprehensive long term solution. This alternative would provide additional bus transit service and capacity, but was projected to have the lowest

ridership of the alternatives. The TSM Alternative would have negative impacts on traffic and air quality due to the large number of additional buses operating through the Corridor. The bus service improvements proposed in this alternative were not perceived to be attractive to new riders, nor were they viewed as permanent transportation system improvements that could support city economic development and revitalization needs and efforts. Many stakeholders did support provision of pedestrian and bicycle paths that was proposed in this alternative, which may be incorporated with the other alternatives.

- The ***Bus Rapid Transit (BRT) Alternative was not recommended*** for further study as this alternative would not provide sufficient capacity to accommodate future Corridor ridership demand. While this alternative has the lowest initial capital cost among the build alternatives, funding for vehicle replacement costs would have to be found every 12-15 years. This 35-mile long alternative was not perceived to be attractive for getting people out of their cars as it would operate on the same congested highway system on either end of the dedicated 20-mile long PEROW/WSAB ROW, and not provide a high enough travel time savings. BRT was not viewed as being supportive of city economic development and revitalization needs and efforts, and many cities did not want this option to operate on the former PEROW through their communities. It should be noted that many cities did not want the ROW used for bus or BRT operations, and that street-running alignments would have to be identified through this portion of the Corridor if these modal alternatives are studied further. The cities were not supportive of BRT operations on the PEROW/WSAB ROW due to three key reasons: 1) they did not support any transit system use of the ROW; 2) they felt BRT services would work better, and integrate more closely with local bus services, on city streets; or 3) they wanted the ROW preserved for future use by a high-capacity guideway system.
- The ***Street Car Alternative was not recommended*** for further study primarily because this community-based alternative would not serve the identified more-regional Corridor trip purpose and length. It would not provide sufficient capacity to accommodate future Corridor ridership demand due to required single car operations. This option could not interline with the existing Metro rail system and facilities due to the low-floor design and different catenary requirements, as a result it would require all new facilities. This modal option's capital cost was identified to be similar to that of the LRT alternative, without providing sufficient capacity to serve forecasted ridership or connectivity with existing rail facilities.
- The ***Light Rail Transit Alternative was recommended*** for further study based on its projected ridership, which is the highest among all of the alternatives, and its ability to provide sufficient capacity for the projected Corridor demand. LRT would address the Corridor trip purpose and length, and allow for interlining with the Metro rail system and use of existing facilities and operational experience. It is the most cost-effective of the guideway alternatives, and has the highest community and stakeholder support among all of the alternatives. The resulting noise and vibration impacts could be mitigated based on long-term Metro experience and community precedence in addressing these impacts. While traffic impacts can be mitigated to a lower level

of impact, there still would be impacts that may be expected to be balanced by the resulting benefits.

- The ***Low Speed Magnetic Levitation Alternative was not recommended*** for further study primarily due to the cost and uncertainty of using an unproven technology. This option would require unknown changes to meet the federal and state regulatory setting, which would have related implementation cost and schedule impacts. This option would have the highest capital cost and the lowest cost-effectiveness when weighed against the resulting system ridership. This system must be totally grade-separated and would not allow the flexibility to meet different city vertical alignment needs related to development plans and existing city scale, especially in Corridor sections with primarily one- and two-story buildings. The resulting visual impacts would be significant, particularly in the environmental justice communities along the San Pedro Subdivision north of the Metro Green Line. This option would require the acquisition of a large number of residential properties to accommodate system requirements, significantly more than any other alternative. In some cases, the required height of the system to cross over freeways may preclude some stations, such as where the alignment passes over the I-605 Freeway approximately 60 feet above-grade. Additionally, the OCTA has indicated that this option will not be considered or approved based on its adopted principles on transit technologies in its *2010 Long Range Transportation Plan*.

Alternative Descriptions

Detailed descriptions for each of the modal alternatives was developed including the following three key elements: 1) ***stations*** identified in working sessions with the Corridor cities; 2) ***vertical configuration*** or whether the option would operate in an at-grade, aerial, or a combination of the two cross-section; and 3) ***horizontal alignment*** or how the system alignment would operate through the Corridor.

Stations

An initial set of stations was identified in working sessions with affected Corridor cities and agencies, and while future system design and station area land use planning and operational analysis may refine the location of the stations presented in Section 2.0 of this report, the Regional Council confirmed the city-based location and number of stations identified in the AA study process with the understanding that any future study efforts identifying the more precise station locations may result in the shifting, relocating, and/or adding of stations. There was one exception: the Bloomfield Station in the City of Cerritos was recommended by the Project Steering Committee for removal from further study.

Vertical Alignment

While the Low Speed Maglev Alternative was designed as an entirely grade-separated system, the Light Rail Transit Alternative was conceptually designed in a combination of at-grade and grade-separated operations based on Metro's *Grade Crossing Policy for LRT*. The Regional Council approved the recommendation that future study efforts evaluate all alternatives operating in a fully grade-separated configuration.

Horizontal Alignment

Alignment options have been identified and studied for the three segments of the Corridor Study Area: the Northern Connection, PEROW/WSAB Corridor, and the Southern Connection areas. The following alignment recommendations were approved by the Regional Council.

Northern Connection Area – This portion of the Corridor Study Area extends from Los Angeles Union Station south to the Metro Green Line. Of the four alignment options studied in this section of the Corridor, the ***West Bank 3 Alternative was recommended*** for further study based on the higher number of key cities and destinations served, the resulting higher level of ridership, connectivity to the existing Metro rail system, and city/agency support. The ***East Bank 1 Alternative was recommended*** for further study to allow for the consideration of two possible alignments north connecting to Los Angeles Union Station or other viable downtown Los Angeles terminus. Additional engineering, traffic, and right-of-way evaluation work is required to identify the most viable alignment and Metro rail system connections in the Little Tokyo and Union Station areas.

- The ***West Bank 1 Alternative was not recommended*** for further study as the proposed alignment along the west bank of the Los Angeles River is occupied by a system of high-power electrical transmission towers. There is insufficient room to add a transit system without negatively impacting electrical power operations.
- The ***West Bank 2 Alternative was not recommended*** for further study due to two findings. First, this alignment option would require a significant and costly structure to cross over the Redondo Junction, which is where the Alameda Corridor freight trains surface after traveling north in from the ports in a tunnel section. While initial engineering work has shown that it is possible to construct such a structure, the resulting transit system configuration may exceed current rail operational and passenger comfort standards. In addition, the proposed operation along the west bank of the Los Angeles River into Union Station is constrained by heavy activity related to the Metro Red Line storage and maintenance facility, and Metrolink and Amtrak operations.
- It should be noted that the East Bank Alternative was not recommended for further study by the Project Study Team primarily due to the heavy utilization and capacity constraints of this section of the regional freight and passenger rail system by the UPRR, Metrolink, and Amtrak, along with the proposed use by the future CHSR system. Passenger rail operations along this alignment would negatively impact operations related to the UP and Burlington Northern-Santa Fe (BNSF) intermodal facilities.

PEROW/WSAB Corridor – This portion of the Corridor Study Area extends from just short of the Metro Green Line in the City of Paramount south along the 20-mile long ROW of the former Pacific Electric Railway Company to Harbor Boulevard located in the cities of Garden Grove and Santa Ana. During the AA study, a center-running alignment along the PEROW/WSAB Corridor was studied. As this alignment is owned by Metro and OCTA and has sufficient ROW width to accommodate any of the selected transit options, along with related pedestrian and bicycle facilities (except at freeway underpasses), ***this***

alignment was recommended to be studied further to define the most appropriate alignment to meet system operational and city-specific development needs.

Southern Connection Area – This portion of the Corridor Study Area extends from Harbor Boulevard, located in the cities of Garden Grove and Santa Ana, through the city of Santa Ana to the Santa Ana Regional Transportation Center (SARTC). Of the two alignments studied, which were identified with Santa Ana city staff, the Harbor Boulevard/1st Street/SARTC option provided higher ridership and fewer impacts to the city's historic/cultural resources and sensitive land uses than the Westminster Boulevard/ 17th Street/Main Street option. The ***Harbor Boulevard/1st Street/SARTC alignment was recommended*** for further study. Future study efforts should evaluate the most appropriate horizontal and vertical system configurations that maintain street lane capacity, working closely with Santa Ana city staff.

City-Specific Alignment Recommendations

The Steering Committee recommended that the following city-specific preferences be addressed in any future study efforts:

- The City of Huntington Park City Council has adopted a resolution requesting the relocation of the Gage Station to Florence Boulevard, and the consideration of an alternative alignment that would travel north from the Randolph Street median alignment to connect north with the Metro-owned Harbor Subdivision to avoid operations on Pacific Boulevard.
- The City of Vernon has submitted a letter requesting that an alignment through their city consider operating in an elevated configuration and avoiding use of Pacific Boulevard.
- A letter was received from the Little Tokyo community requesting consideration of a station serving their community to be located along the West Bank 3 alignment alternative.

Phasing Options

It is likely that a 35-mile long transit system would be built in segments known as Minimal Operable Segments (MOSs) to reflect funding availability and construction capacity issues. The ***Los Angeles County segments were recommended to be constructed first*** in recognition of project priorities and funding availability. Orange County is currently addressing other transit priorities identified in their renewed Measure M program and 2010 Long Range Transportation Plan. In Los Angeles County, the two MOSs identified as providing viable operational segments were:

- ***MOS 1*** – This 6.9-mile segment runs between Los Angeles Union Station and the Metro Green Line, and has five stations. This MOS would operate along street ROWs, the Harbor Subdivision, and the San Pedro Subdivision to a new Metro Green Line station.
- ***MOS 2*** – This 7.5-mile segment runs from the Metro Green Line (either from a new station located on the San Pedro Subdivision or from the existing Lakewood Boulevard Station) to the Los Angeles-Orange County Line, and has six stations. This MOS would operate south along the West Santa Ana Branch ROW to the county line.

The decision on the MOS sequencing will be based on future more detailed engineering and environmental review work. Construction of MOS 1 first and then extending the system south along the WSAB ROW towards Orange County would have several advantages. First, it would provide the Corridor transit system with the vital connections to downtown Los Angeles from the start. Secondly, it would provide the northern communities, who have lost and will continue to lose jobs, with the much needed connections to the regional rail system for employment opportunities elsewhere in the region. These communities currently have a 15 percent transit mode share and providing improved transit service would build on and increase that ridership base, making the system viable from the start. In addition, constructing this section first would provide these communities with station area economic development and revitalization opportunities early in the process. The possible maintenance and storage yard facility sites are all located in this portion of the Los Angeles County section.

The major challenges related to this segment, whether constructed first or not, will be addressing the design challenges in this segment and securing use of two railroad rights-of-way for any future transportation project. Designing the portion of the system connecting north from the Metro Green Line into downtown Los Angeles must address significant challenges including: multiple freeway crossings; interfacing with freight and passenger rail operations and city street-running operations; integrating into developed residential neighborhoods and commercial and industrial areas; and minimizing impacts to the large number historic resources, including several significant bridges.

Operation on two railroad rights-of-way would require the cooperation of multiple rail agencies or possible acquisition: the San Pedro Subdivision and the Randolph Street median. The San Pedro Subdivision, which would be used to provide the connection north from the end of the PEROW/WSAB Corridor ROW in Paramount to downtown Los Angeles, is currently owned by the Ports of Long Beach and Los Angeles and the Union Pacific Railroad (UPRR) has the first right to repurchase the right-of-way. The median-running Randolph Street rail operations are now owned by UPRR for shuttling of empty rail cars to storage along the rail lines that run parallel to the Metro Blue Line.

While MOS 2 is projected to attract and serve more new riders, providing the important connections to downtown Los Angeles from the beginning will enhance the system's attractiveness to non-transit users. This segment also requires the construction of a system section north from the PEROW/WSAB Corridor ROW to the existing Metro Green Line Lakewood Boulevard Station in the center of Lakewood Boulevard to provide riders with a connection to the regional rail system via the Metro Green Line until MOS 1 is constructed. When the system is extended further north using the PEROW/WSAB Corridor ROW through the City of Paramount to connect with the San Pedro Subdivision, this connection would be removed. Extending the system south to the county line could position consideration of extension of the system into Orange County as proposed local transit systems are constructed and in operation. Additionally, timing of further project development could coincide with the possible renewal of Measure M, where new transit projects could be identified and included in the program.

APPENDICES

A. **Urban Design Report (Submitted Separately)**

B. **Travel Demand Modeling**

C. **Air Quality and Climate Change Technical Results**

D. **Capital Cost Analysis**

E. **Operating and Cost Estimate and Financial Analysis**

F. **Outreach Meeting Record**

G. **Public Comment Log**

Appendix A: Urban Design Report
(Submitted Separately)

Appendix B: Travel Demand Modeling Report

Pacific Electric ROW/West Santa Ana Branch Alternatives Analysis

Travel Demand Modeling Report

Final

March 2012

AECOM

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FIGURES

TABLES

ABBREVIATIONS / ACRONYMS

AA....................Alternatives Analysis
AVTA................Antelope Valley Transit Authority
BRT ....Bus Rapid Transit
Caltrans ....California Department of Transportation
CEI ....Cost Effectiveness Index
CBD..................Central Business District
CEQA ....California Environmental Quality Act
CRT ....Commuter Rail Transit
EIR ....Environmental Impact Report
EIS....................Environmental Impact Statement
FTA ....Federal Transit Administration
HBO ....Home-Based Other
HBW ....Home-Based Work
HBU ....Home-Based University
HOV ....High-Occupancy Vehicle
KNR..................Kiss-And-Ride
LADOT ....Los Angeles Department of Transportation
LAUS ....Los Angeles Union Station
LAWA...............Los Angeles World Airports
LAX ....Los Angeles International Airport
LRT...................Light Rail Transit
LRTP.................Long Range Transportation Plan
MAX.................Municipal Area Express
Metro ....Los Angeles County Metropolitan Transportation Authority
Mi ....Miles
Min ....Minutes
MPH ....Miles per Hour
NEPA................National Environmental Policy Act
NHB ....Non-Home Based
OCTA ....Orange County Transportation Authority
O&M................Operations and Maintenance
OP....................Off-Peak
PK ....Peak
PNR..................Park-And-Ride
ROW ....Right-of-Way
RTC ....Regional Transit Center
SCAG................Southern California Association of Governments
SOV..................Single Occupancy Vehicle
SPR ....Self-Propelled Railcar
TAZ ....Traffic Analysis Zone
TSM ....Transportation Systems Management

1. INTRODUCTION

This document summarizes the results of the patronage forecasting effort for the Pacific Electric ROW/West Santa Ana Branch (PEROW/WSAB) Alternatives Analysis (AA). These forecasts have been prepared using the most recent version of the Los Angeles County Metro Transportation Authority's Transportation Model validated to corridor conditions.

Several alternatives along the 33 mile PEROW/WSAB corridor were evaluated to study the impact of technology adopted, station locations and alignment on the ridership of the proposed project.

Following this introduction, this report is organized in the following sections:

- Model Validation
- Travel Demand Model Results
- Cost Effectiveness Index
- Summary and Conclusions
- Appendices

2. MODEL VALIDATION

The ridership and mobility benefit forecasts for the Pacific Electric ROW/West Santa Ana Branch (PEROW/WSAB) Alternatives Analysis are based on the latest version of the Metro Transportation Analysis Model. This model is generally consistent with current Federal Transit Authority (FTA) guidance related to transit New Starts forecasting.

The LACMTA model was selected as the preferred model for the AA effort over two other possible choices of model for this study the Southern California Association of Governments (SCAG) regional travel demand model, and the Orange County Transportation Authority (OCTA) Transportation Analysis Model (OCTAM). The LACMTA Model was chosen because it includes the entire study corridor, and is the only one of the three candidate models that has already been reviewed by the FTA for use in Section 5309 New Starts forecasts.

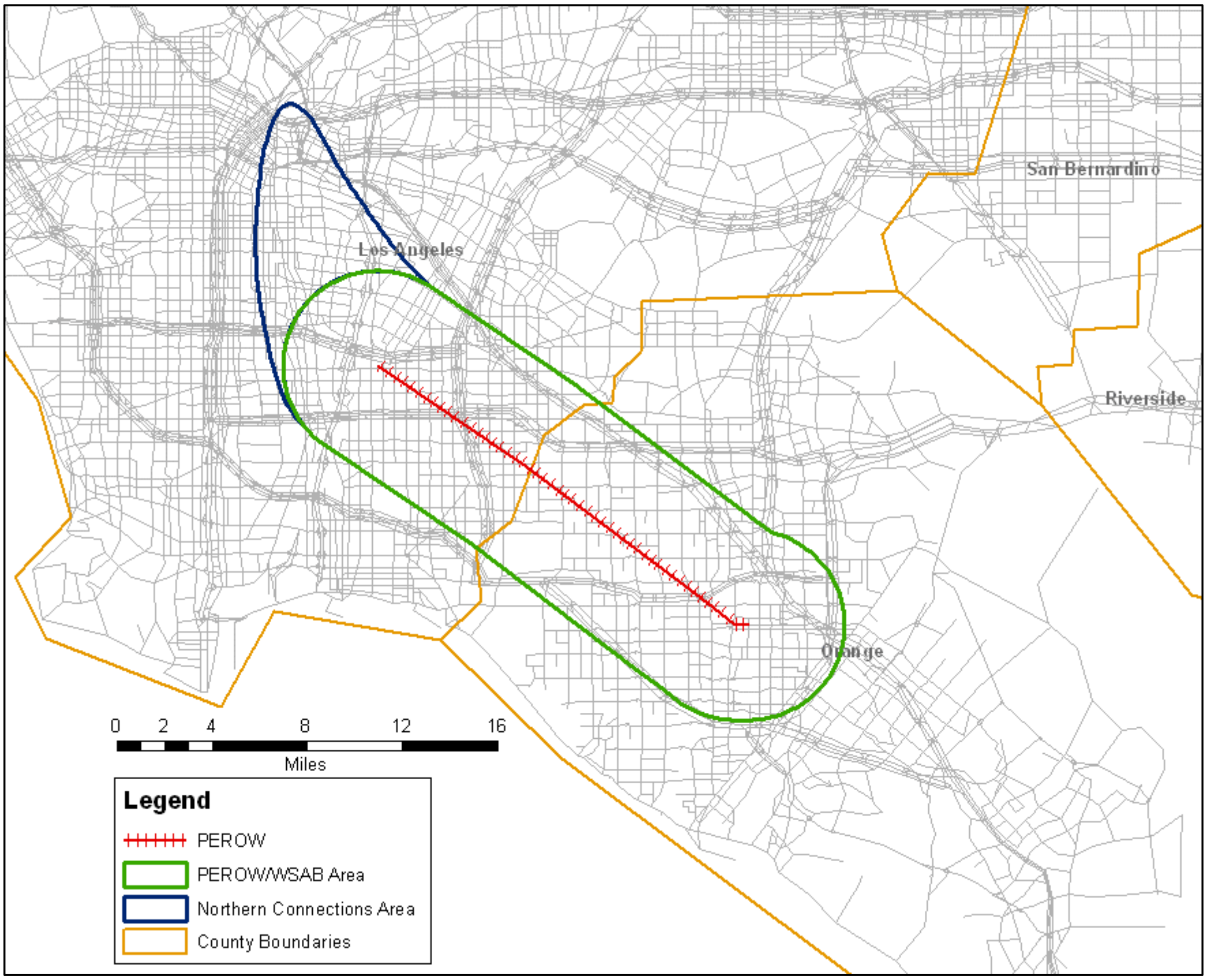
The LACMTA Model is designed to forecast travel demand for highways and transit systems in Los Angeles County, but covers the entire SCAG region from Ventura County in the west to Imperial County in the southeast. It is consistent with SCAG socioeconomic and transportation network data with additional detail in Los Angeles County. It has recently been updated for use in supporting FTA transit New Starts and Measure “R” projects in Los Angeles County. The updated LACMTA model was reviewed by FTA staff in the summer of 2009, and the model structure, calibration, and validation were found to be acceptable. Please note, however, that FTA staff do not formally approve models, they only approve the resulting forecasts.

The performance of the transit model was calibrated and validated by PB Americas by comparing transit boardings from the observed boarding data for the calibration year of 2001 and by comparing district-to-district transit flows to data obtained from the regional on-board survey. The model was also validated to year 2006 conditions to make sure Orange Line Bus Rapid Transit service, opened in 2005, is properly represented.

For the purposes of the PEROW/WSAB AA Study, the LACMTA was re-validated to ensure that it replicates observed travel patterns in the specific markets in the PEROW/WSAB Corridor. The validation involved comparing aspects of the model to available empirical information such as observed transit ridership and transit travel times. The validated model was then used to forecast ridership and user benefits fir various alternatives.

The Corridor is defined as comprising two study areas: the “PEROW/WSAB Area” and a “Northern Connections Area” as shown in Figure 2.1. The PEROW/WSAB Area has a boundary defined as four miles from the PEROW/WSAB right-of-way. The Northern Connections Area extends north from the former railroad right-of-way to incorporate connections to Downtown Los Angeles and Union Station.

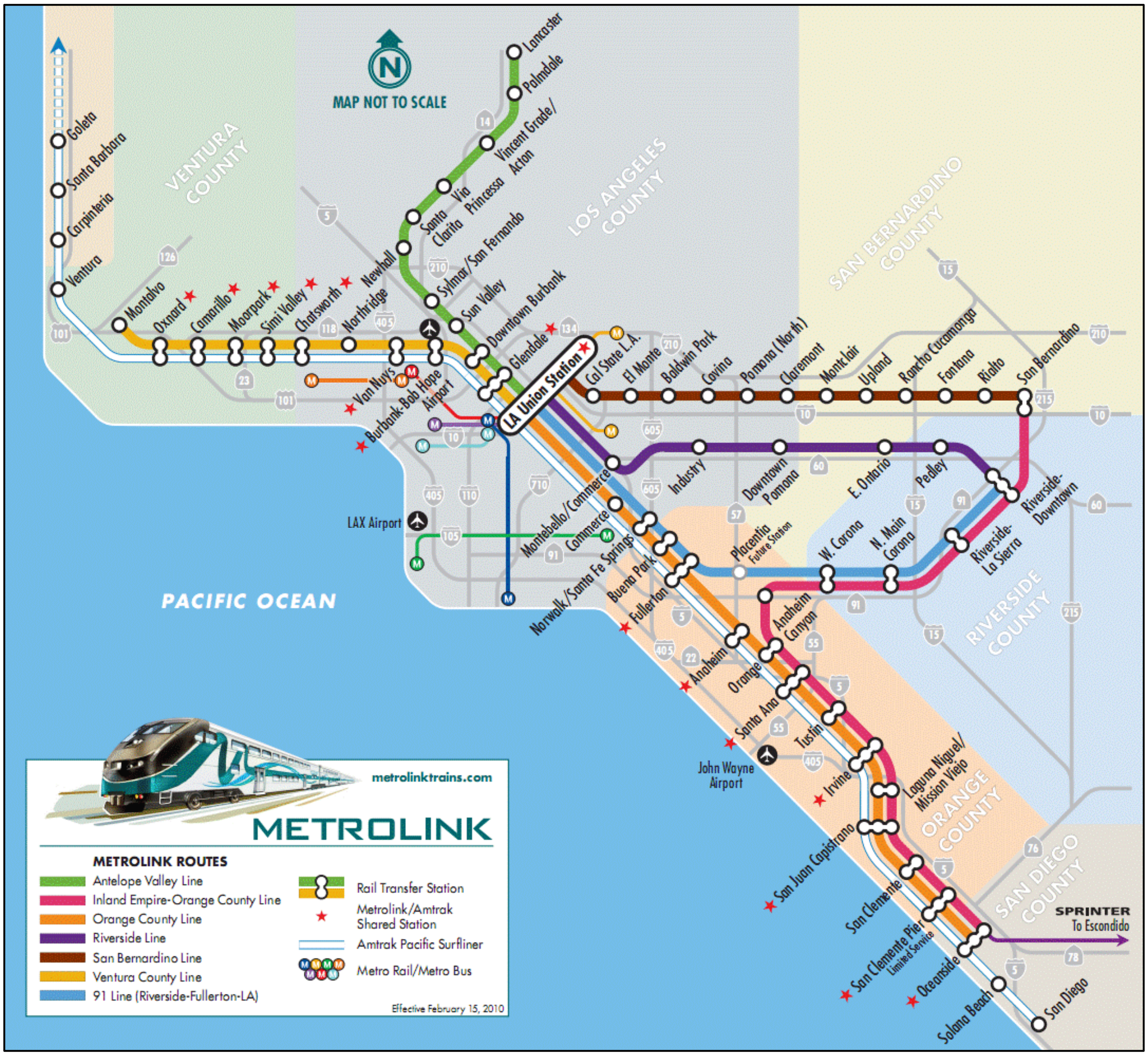
Figure 2.1 – Pacific Electric ROW/West Santa Ana Branch and Northern Connections Areas



2.1. TRANSIT ROUTES SELECTED FOR VALIDATION

In the Corridor Study Area, there are multiple transit operators. LACMTA operates bus and light rail services, mostly in the northwestern part of the study area. OCTA operates buses in Orange County, and various municipal operators and cities run services in and around the study area. Metrolink operates commuter rail services throughout the Los Angeles Metro area and Orange County; and three Metrolink lines run through the study area. These are the Orange County, the Inland Empire-Orange County, and the 91 lines and are shown in the Metrolink service map presented below in Figure 2.2.

Figure 2.2 - Metrolink Service Map



For the travel demand model validation effort, the following data were available:

- 2001 Metro On-Board survey (includes line level daily boardings for bus and rail);
- 2001-2008 System Level Metro Boardings data (includes bus and rail);
- 2007 OCTA line level daily boardings;
- SCAG 2003 Post-Census Regional Household Travel Survey;
- 2008 Metrolink line level daily passenger counts; and
- Bus travel times from 2010 timetables for MTA and OCTA buses.

In order to calculate observed 2006 boardings for Metro bus services, a 2001 to 2006 growth factor was derived from the 2001-2008 system level data and applied to the 2001 line level data. The growth factor was 1.09.

The 2001 Metro and 2007 OCTA data sets include counts for many of the bus routes operating in the Corridor Study Area, but the counts were not split by time period (peak/off-peak). However, the household survey trip data did provide details of time of day and mode of travel. Analysis of this data provided the proportion of trips in the peak and off-peak periods for buses operating in the study area, which is shown in Table 2.1.

Table 2.1 - Proportion of Transit Travel in Peak and Off-Peak Periods

	Entire MTA Model Area		PEROW/WSAB Area	
Time	**Transit Trips**	**Proportion**	**Transit Trips**	**Proportion**
Peak	573,672	60%	62,851	65%
Off-Peak	386,906	40%	34,059	35%
Total Daily	**960,579**	**100%**	**96,910**	**100%**

Source: SCAG 2003 Post-Census Regional Household Travel Survey

Tables 2.2 and 2.3 show bus services in the PEROW/WSAB and Northern Connections study areas for which reliable count data was available. A service was considered to operate within the study area if approximately 10% or more of the route is within the boundaries shown in Figure 2.1.

Table 2.2 - PEROW/WSAB Area Bus Services Included in Validation

Operator	Route	Description
MTA	60	Downtown LA – Artesia Station via Long Beach Blvd.
MTA	111	Norwalk to LAX City Bus Center via Florence Ave.
MTA	117	LAX City Bus Center - Downey via Century Blvd., 103rd St., Tweedy Blvd. & Imperial
MTA	127	Compton Station - Downey via Compton Blvd. & Somerset Blvd.
MTA	202	Willowbrook - Compton – Wilmington
MTA	265	Pico Rivera - Lakewood Center Mall via Paramount Blvd.
OCTA	21	Fullerton - Huntington Beach via Valley View St./Bolsa Chica Rd.
OCTA	25	Fullerton - Huntington Beach via Knott Ave./Goldenwest St.
OCTA	29	La Habra - Huntington Beach via Beach Blvd.
OCTA	33	Fullerton - Huntington Beach via Magnolia St.
OCTA	35	Fullerton - Huntington Beach via Brookhurst St.
OCTA	37	La Habra - Fountain Valley via Euclid St.
OCTA	43	Fullerton - Costa Mesa via Harbor Blvd.
OCTA	46	Los Alamitos - Orange via Ball Rd./Taft Ave.
OCTA	47	Fullerton - Newport Beach via Anaheim Blvd./Fairview St.
OCTA	50	Long Beach - Orange via Katella Ave.
OCTA	51	Santa Ana - Costa Mesa via Flower St.
OCTA	53	Orange - Irvine via Main St.
OCTA	54	Garden Grove - Orange via Chapman Ave.
OCTA	70	Sunset Beach - Tustin via Edinger Ave.
OCTA	71	Yorba Linda - Balboa via Tustin Ave./Red Hill Ave./Newport Blvd.
OCTA	72	Sunset Beach - Tustin via Warner Ave.
OCTA	76	Huntington Beach - Newport Beach via Talbert Ave./MacArthur Blvd.

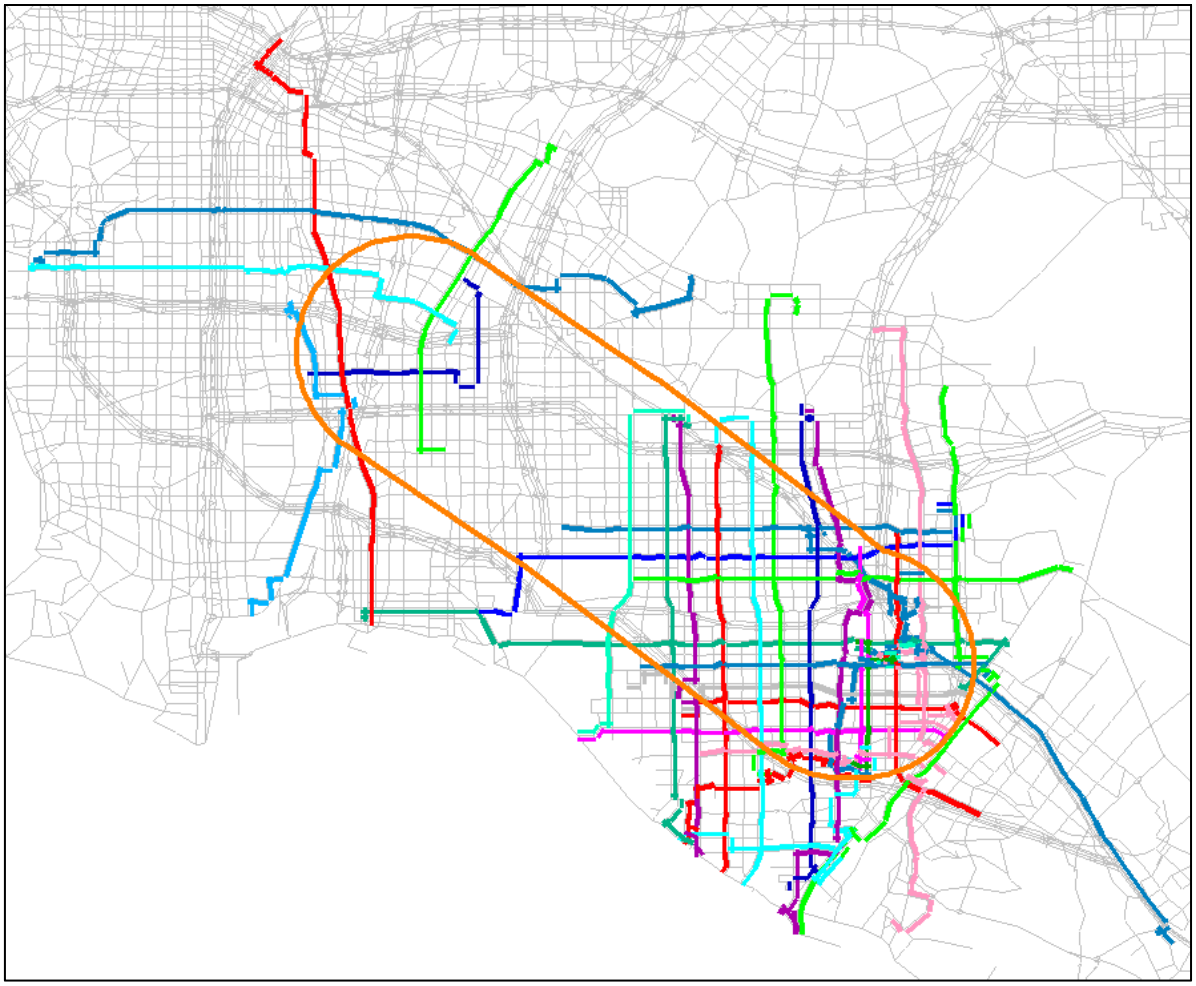
Operator	Route	Description
OCTA	83	Anaheim - Laguna Hills via 5 Fwy/Main St.
OCTA	145	Santa Ana - Costa Mesa via Raitt St./Greenville St./Fairview St.
OCTA	172	Huntington Beach - Costa Mesa via Main St.
OCTA	173	Huntington Beach - Costa Mesa via Atlanta Ave.
OCTA	453	Orange Transportation Center - St. Joseph's Hospital
OCTA	462	The Depot at Santa Ana - Civic Center via Santa Ana Blvd./Civic Center Dr.
OCTA	463	The Depot at Santa Ana - Hutton Centre via Grand Ave.
OCTA	55	Santa Ana - Newport Beach via Standard Ave./Bristol St./Fairview St./ 17th St.
OCTA	56	Garden Grove - Orange via Garden Grove Blvd.
OCTA	57	Brea - Newport Beach via State College Blvd./Bristol St.
OCTA	59	Anaheim - Irvine via Kraemer Blvd./Glassell St./Grand Ave./Von Karman Ave.
OCTA	60	Long Beach - Tustin via Westminster Ave./17th St.
OCTA	64	Huntington Beach - Tustin via Bolsa Ave./1st St.
OCTA	66	Huntington Beach - Irvine via McFadden Ave./Walnut Ave.

Table 2.3 - Northern Connections Area Bus Services Included in Validation

Operator	Route	Description
MTA	42	LAX - Downtown LA via LAX City Bus Center, LaTijera Bl, Stocker St & M.L.King Blvd.
MTA	65	Washington, CSULA
MTA	66	Wilshire Center - Montebello via 8th St & Olympic Blvd.
MTA	70	Los Angeles – El Monte via Marengo St & Garvey Av.
MTA	76	El Monte – Downtown LA via Valley Blvd.
MTA	78	Arcadia - Los Angeles via Huntington Dr & Las Tunas Dr.
MTA	102	Baldwin Village - South Gate via Coliseum St.
MTA	107	Huntington Park – Inglewood
MTA	108	Marina Del Rey to Pico Rivera via Slauson Ave.
MTA	110	Playa Vista - Bell Gardens via Jefferson Blvd. - Gage Ave.
MTA	124	El Segundo – Willowbrook
MTA	250	LAC USC Medical Center - Olympic/Boyle
MTA	251	Cypress Park - Lynwood via Soto St.
MTA	259	El Sereno - South Gate
MTA	305	UCLA - Willowbrook via Sunset, San Vicente & Western
MTA	605	Grande Vista Ave.- Boyle Heights - LA County + USC Medical Center
MTA	620	Boyle Heights via Cesar Chavez Ave & State St.
MTA	111	Norwalk to LAX City Bus Center via Florence Ave.
MTA	720	Santa Monica - Commerce via Wilshire Blvd. & Whittier Blvd.
MTA	760	Downtown LA – Artesia Station via Long Beach Blvd.
MTA	487	El Monte - Downtown LA | Temple City - Downtown LA
MTA	489	El Monte - Downtown LA | Temple City - Downtown LA
MTA	490	Venice/Flower - Diamond Bar

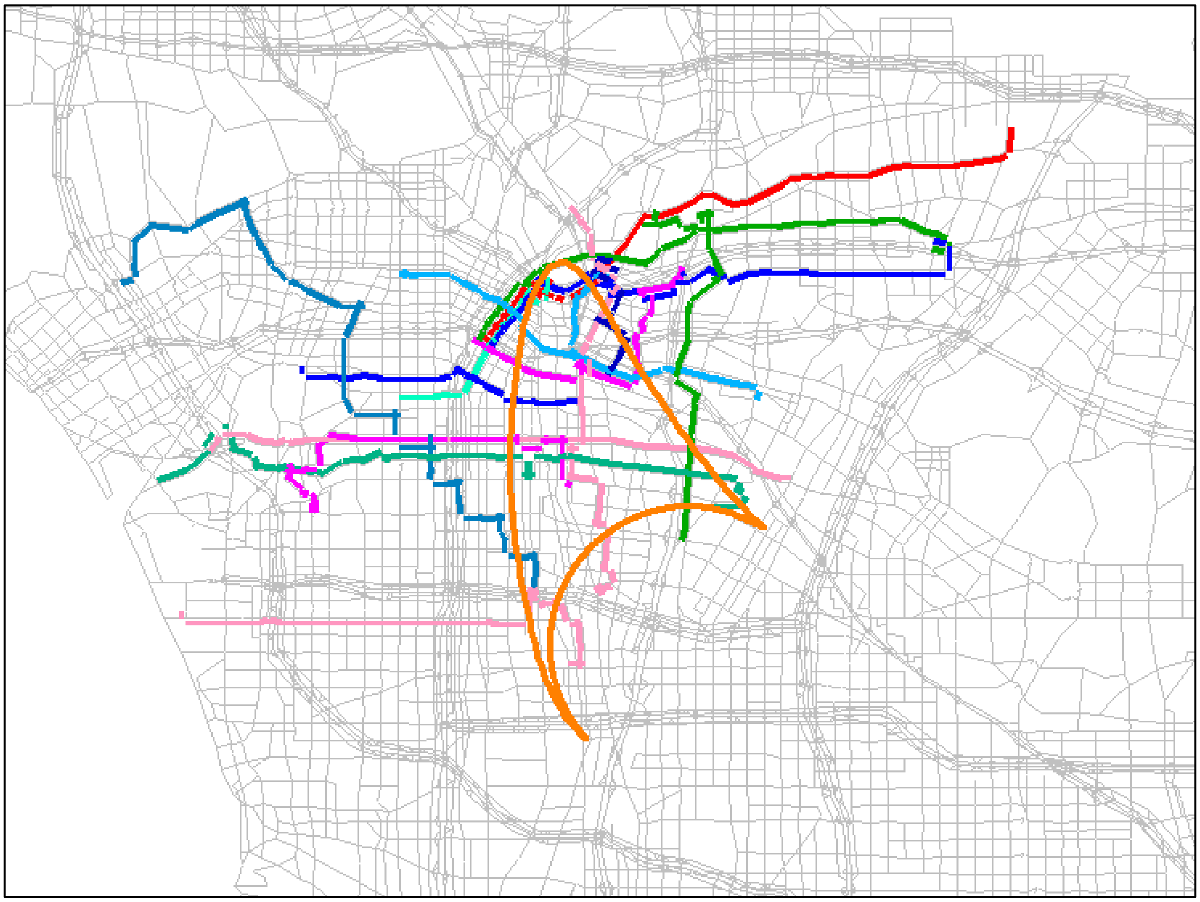
Timetables for bus services operating in the study area were obtained from MTA and OCTA's websites. The timetables provide the expected travel times for services by route and time of day. The timetables used are for 2010 bus services and provide a reasonable indication of travel time in 2006.

Figure 2.3 - PEROW/WSAB Area Validation Bus Routes



PEROW/WSAB area boundary shown in orange

Figure 2.4 - Northern Connections Area Validation Bus Routes



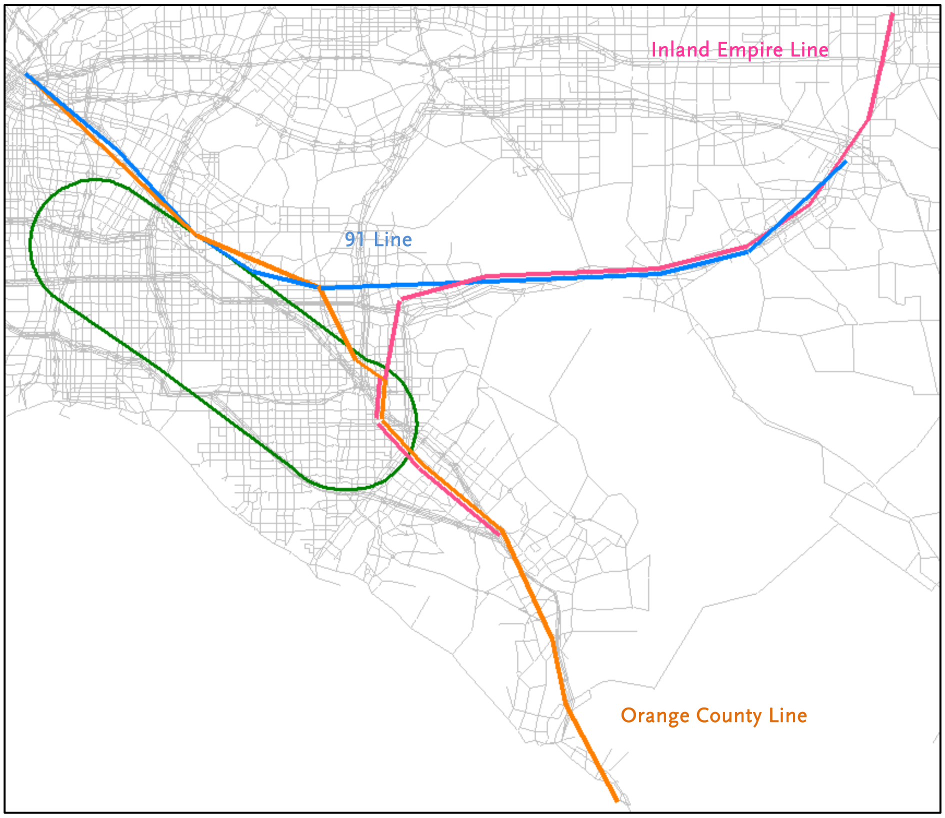
Northern Connection area boundary shown in orange

The Metrolink survey dataset includes passenger counts for trains that operate between Los Angeles County, Orange County and Riverside County. The Metrolink lines included in the model validation are described in Table 2.4 and the location of these lines in relation to the PEROW/WSAB Area is shown in Figure 2.5. The Metrolink survey data records are split by time period.

Table 2.4 - Metrolink Commuter Rail Lines Included in Validation

Operator	Line	Description
Metrolink	Orange County Line	LA Union Station to Oceanside
Metrolink	Inland Empire Line	LA Union Station to Riverside-Downtown
Metrolink	91 Line	San Bernardino to Oceanside

Figure 2.5 - Metrolink Lines Included in Validation

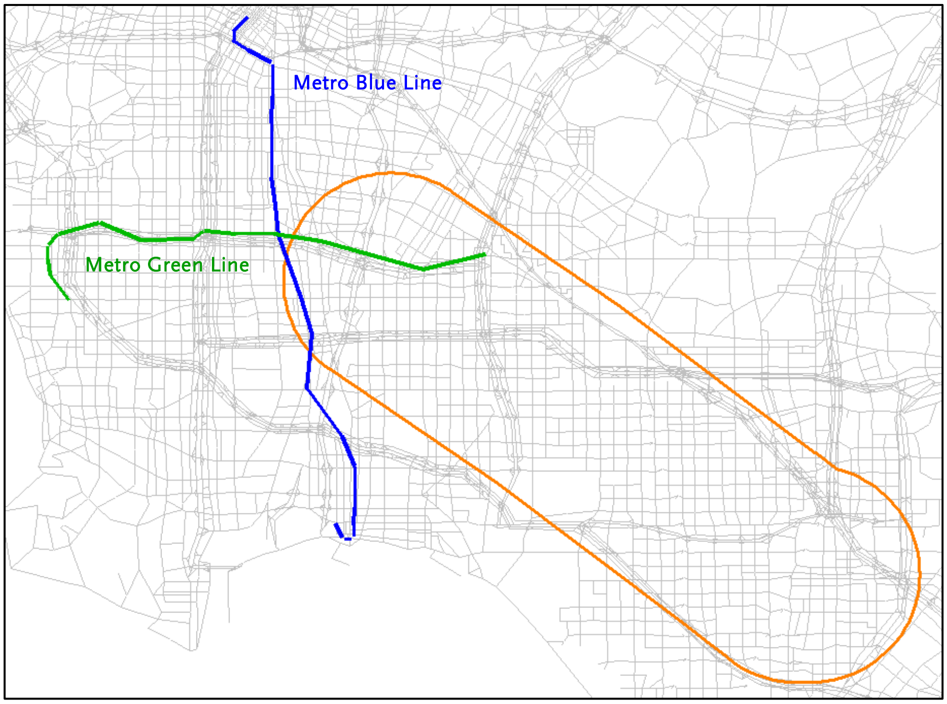


Two Metro Rail lines operate in the primary study area, as described in Table 2.5 and shown in Figure 2.6. Ridership data, by time period, was available for both lines.

Table 2.5 - Metro Rail Lines Included in Validation

Operator	Line	Description
Metro Rail	Green Line	Norwalk to Redondo Beach
Metro Rail	Blue Line	Downtown LA to Long Beach

Figure 2.6 - Metro Rail Lines Included in Validation



PEROW/WSAB area boundary shown in orange

2.2. HIGHWAY NETWORK MODIFICATIONS

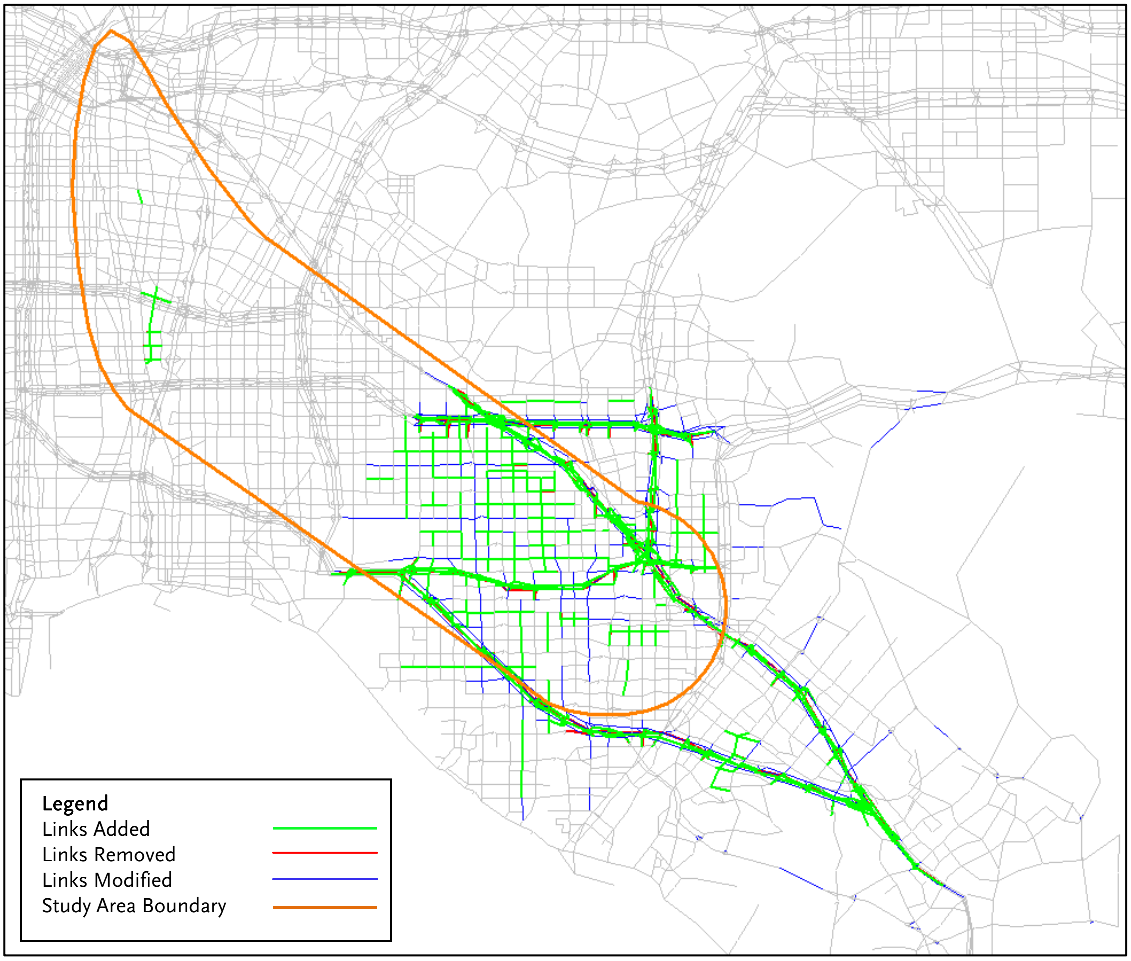
The LACMTA Model includes the entire PEROWWSAB ROW corridor, but the highway network for Orange County was not coded to a high enough level of detail to allow accurate coding of bus routes. The highway network for the Corridor Study Area was reviewed for accuracy, by comparing it with the Orange County Transportation Analysis Model (OCTAM). This analysis showed that several key arterial highway routes were not included in the model network. Insufficient network detail may have a detrimental effect on the model's ability to represent both auto and transit trips in the area. To resolve this issue, the highway network in the study area was enhanced and bus routes re-coded accordingly. Links added, removed and modified are shown in Figure 2.7.

The TAZ system was not modified as the size of TAZs in the study area were deemed suitable for this type of project and reasonable validation results were achieved.

The model process includes initial highway assignments which provide congested travel time and distance skims for mode choice calculations. As described above, the highway network was modified, so it was necessary to update the initial assignments using the new network.

Bus travel times on the new highway network were compared against the equivalent times from the original model to check that the highway network updates had not significantly impacted bus travel times. No significant changes to bus travel times were observed, and the overall change in transit travel time for all lines was approximately 0.1%.

Figure 2.7 - 2006 Base Model Highway Network Modifications



2.3. TRANSIT NETWORK MODIFICATIONS

In addition to the improvements to the highway network, the model's transit network was also updated to better represent the actual system. Approximately 40 bus routes were added, one service was removed, and approximately 30 services were modified, either due to incorrect coding or updates related to the highway network changes. The bus route modifications are listed in Tables 2.6 through 2.8.

Table 2.6 - Bus Route Modifications – PEROW/WSAB Area

Operator	Route	Change
OCTA	83	Added
OCTA	90	Added
OCTA	453	Added
OCTA	472	Added
OCTA	473	Added
OCTA	758	Added
OCTA	794	Added
MTA	127	Made consistent with timetable
MTA	128	Made consistent with timetable
MTA	130	Made consistent with timetable
MTA	251	Made consistent with timetable
MTA	252	Made consistent with timetable
MTA	258	Extended
MTA	715	Added
MTA	760	Added
MTA	762	Added
City of Paramount	Easy Rider	Added
City of Long Beach	52	Added
City of Long Beach	63	Added
City of Long Beach	23	Added
City of Bell Gardens	Fixed Route	Added
Compton Renaissance	COM1	Added
Compton Renaissance	COM2	Added
Compton Renaissance	COM3	Added
Compton Renaissance	COM4	Added
Compton Renaissance	COM5	Added
Downey Link	Northeast Route	Added
Downey Link	Southeast Route	Added
Downey Link	Northwest Route	Added
Downey Link	Southwest Route	Added
City of Norwalk	8	Added (2006)

Source: PEROW- Project Work Task and Network Data Update/Revision Summary Memorandum, Iteris, July 2010

Table 2.7 - Bus Route Modifications – Northern Connections Area

Operator	Route	Change
MTA	26	Extended
MTA	31	Delete
MTA	35	Added
MTA	38	Split from Route 71
MTA	71	Split from Route 38
MTA	207	Extended
MTA	335	Added
MTA	450	Added
MTA	620	Added
MTA	665	Added (2006)
MTA	704	Added (2006); Extended (2035)
MTA	714	Added (2035)
MTA	728	Added (2006)
MTA	730	Made 2-Way
MTA	740	Added (2035)
MTA	753	Added (2006)
MTA	770	Added
City of Montebello	M341	EB Added
Santa Clarita Transit	SC794	Changed to NB in AM, SB in MD
Foothill Transit	FT481	Terminate at El Monte Metro
Foothill Transit	SLVR STRK	Added
Huntington Park	COMBI	Added

Source: PEROW- Project Work Task and Network Data Update/Revision Summary Memorandum, Iteris, July 2010

Table 2.8 - Bus Route Modifications Due to Highway Network Changes

Operator	Route	Change
OCTA	83 NB	Highway network modifications
OCTA	83 SB	Highway network modifications
OCTA	205 SB	Highway network modifications
OCTA	205 NB	Highway network modifications
OCTA	206 SB	Highway network modifications
OCTA	211 EB	Highway network modifications
OCTA	212 NB	Highway network modifications
OCTA	216 NB	Highway network modifications
OCTA	460 SB	Highway network modifications
OCTA	460 NB	Highway network modifications
OCTA	464 SB	Highway network modifications
OCTA	701 NB	Highway network modifications
OCTA	721 SB	Highway network modifications
OCTA	721 NB	Highway network modifications
OCTA	757 SB	Highway network modifications
OCTA	758 NB	Highway network modifications
OCTA	758 SB	Highway network modifications

Source: PEROW- Project Work Task and Network Data Update/Revision Summary Memorandum, Iteris, July 2010

2.4. Initial Model Run

Following the network updates, an initial model run was performed (referred to as the "Run with Network Modifications" for the remainder of this memorandum) to assess the impact of the model updates. Assigned transit boardings were compared with surveys and the bus travel times were compared with current timetables. The run with network modifications was compared with the original LACMTA model 2006 calibration.

Trip table summaries are also provided in this section. The summaries show the total person trips for each of the four modeled trip purposes, followed by a comparison of observed and modeled Home-based Work (HBW) transit trips.

In these summaries, TAZ level production to attraction trips have been aggregated into five districts:

- **LA County Non-PSA** - TAZs in Los Angeles County that are not in the "Project Study Area" (PSA);
- **Orange County Non-PSA** - TAZs in Orange County that are not in the PSA;
- **LA County PSA** - TAZs in Los Angeles County that lie fully or partly within the PSA;
- **Orange County PSA** - TAZs in Orange County that lie fully or partly within the PSA;
- **Other** - All other TAZs in the model (San Bernardino County, Riverside County, etc).

Total person trip summaries are provided in Table 2.9 through Table 2.12. The trip purposes are HBW, Home-based Other (HBO), Non Home-based (NHB), and Home-based University (HBU).

Table 2.9 - 2006 HBW Average Weekday Person Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	4,517,078	105,756	208,629	73,028	132,245	**5,036,736**
Orange County Non-PSA	128,708	755,427	30,588	244,373	21,759	**1,180,854**
LA County PSA	259,270	32,594	144,419	32,890	4,599	**473,771**
Orange County PSA	71,264	256,737	27,005	260,027	8,704	**623,736**
Other	306,119	85,629	19,522	42,353	1,905,089	**2,358,712**
Total	**5,282,439**	**1,236,142**	**430,162**	**652,671**	**2,072,395**	**9,673,809**

Table 2.10 - 2006 HBO Average Weekday Person Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	13,621,831	150,773	387,272	99,324	240,188	**14,499,388**
Orange County Non-PSA	160,751	2,883,015	48,108	470,334	45,817	**3,608,025**
LA County PSA	471,941	43,513	835,140	71,809	4,001	**1,426,404**
Orange County PSA	108,362	366,264	69,235	1,146,428	8,611	**1,698,900**
Other	407,601	64,919	8,719	25,546	6,905,190	**7,411,975**
Total	**14,770,486**	**3,508,484**	**1,348,474**	**1,813,441**	**7,203,807**	**28,644,692**

Table 2.11 - 2006 NHB Average Weekday Person Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	9,194,921	136,004	303,908	102,806	213,413	**9,951,052**
Orange County Non-PSA	154,058	1,732,380	48,731	335,439	41,836	**2,312,444**
LA County PSA	312,612	44,207	377,955	61,580	5,167	**801,521**
Orange County PSA	111,414	328,579	64,543	647,789	14,426	**1,166,751**
Other	249,260	45,758	7,029	17,449	4,340,934	**4,660,430**
Total	**10,022,265**	**2,286,928**	**802,166**	**1,165,063**	**4,615,776**	**18,892,198**

Table 2.12 - 2006 HBU Average Weekday Person Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	895,956	18,308	9,503	2,000	4,307	**930,074**
Orange County Non-PSA	9,619	163,960	491	8,193	64	**182,327**
LA County PSA	58,064	4,820	41,792	3,025	12	**107,713**
Orange County PSA	17,962	62,363	1,856	48,144	13	**130,338**
Other	47,719	24,711	317	862	352,611	**426,220**
Total	**1,029,320**	**274,162**	**53,959**	**62,224**	**357,007**	**1,776,672**

Table 2.13 shows total HBW person trips in the year 2000 US Census Transportation Planning Package (CTPP) travel to work data set, adjusted to match the model 2006 HBW person trips total. Table 2.14 shows the difference between the CTPP HBW person trips and the model run with network modifications.

Table 2.13 - 2000 CTPP HBW Average Weekday Person Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	4,571,784	106,068	211,379	71,917	118,978	**5,080,126**
Orange County Non-PSA	138,004	786,323	35,089	256,197	23,348	**1,238,960**
LA County PSA	262,260	32,282	151,962	31,963	4,871	**483,339**
Orange County PSA	76,309	262,527	30,332	269,531	9,281	**647,980**
Other	307,202	81,472	20,045	41,450	1,773,236	**2,223,405**
Total	**5,355,559**	**1,268,672**	**448,806**	**671,058**	**1,929,714**	**9,673,809**

Table 2.14 - Difference in HBW Average Weekday Person Trips - Run with Network Modifications vs CTPP Observed

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	-54,706	-312	-2,750	1,111	13,267	**-43,390**
Orange County Non-PSA	-9,295	-30,896	-4,501	-11,824	-1,590	**-58,106**
LA County PSA	-2,991	311	-7,543	927	-271	**-9,567**
Orange County PSA	-5,045	-5,790	-3,327	-9,504	-577	**-24,244**
Other	-1,083	4,157	-523	903	131,853	**135,307**
Total	**-73,120**	**-32,530**	**-18,644**	**-18,387**	**142,681**	**0**

Table 2.15 shows the number of daily HBW transit trips according to year 2000 US Census CTPP data. This data has been scaled so that the region-wide trip total is the same as the model. Table 2.16 shows the number of HBW transit trips in the Original LACMTA Model and Table 2.17 shows the number of HBW transit trips after the network modifications described in the previous section were applied.

Table 2.15 - CTPP HBW Average Weekday Transit Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	529,359	348	7,183	185	1,088	**538,163**
Orange County Non-PSA	813	29,602	45	9,544	0	**40,004**
LA County PSA	14,153	101	9,611	510	0	**24,376**
Orange County PSA	1,301	24,634	179	38,641	0	**64,755**
Other	8,591	550	0	662	56,658	**66,460**
Total	**554,217**	**55,234**	**17,019**	**49,542**	**57,746**	**733,758**

Table 2.16 - Original LACMTA Model HBW Average Weekday Transit Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	511,741	4,598	20,909	4,216	5,180	**546,643**
Orange County Non-PSA	6,922	21,883	731	11,400	205	**41,141**
LA County PSA	22,433	1,005	9,056	1,320	137	**33,951**
Orange County PSA	4,553	18,088	1,025	22,876	95	**46,637**
Other	14,920	2,015	501	1,890	24,386	**43,712**
Total	**560,568**	**47,588**	**32,222**	**41,703**	**30,003**	**712,084**

Table 2.17 - Run with Network Modifications HBW Average Weekday Transit Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	520,624	4,550	21,925	4,255	5,287	**556,641**
Orange County Non-PSA	7,898	22,359	742	11,732	226	**42,956**
LA County PSA	23,958	1,068	9,171	1,352	152	**35,701**
Orange County PSA	5,231	18,379	994	22,635	157	**47,396**
Other	19,061	3,218	813	2,906	25,065	**51,064**
Total	**576,772**	**49,573**	**33,645**	**42,880**	**30,888**	**733,758**

A comparison of the Table 2.16 and Table 2.17 trip totals shows that the network modifications have caused an increase in transit trips. This is not unexpected, since numerous bus routes have been added or modified, increasing the attractiveness of transit for some travelers.

The absolute difference between the model run with network modifications and the CTPP trips is shown in Table 2.18. This shows that the model does not replicate the 2000 CTPP trip patterns perfectly, but the scale of trips to/from each area is generally appropriate.

Table 2.18 - Difference in HBW Average Weekday Transit Trips - Run with Network Modifications vs CTPP Observed

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	-8,735	4,202	14,742	4,070	4,200	**18,478**
Orange County Non-PSA	7,085	-7,243	697	2,188	226	**2,952**
LA County PSA	9,805	967	-440	841	152	**11,325**
Orange County PSA	3,930	-6,254	814	-16,006	157	**-17,359**
Other	10,471	2,669	813	2,244	-31,593	**-15,396**
Total	**22,555**	**-5,660**	**16,626**	**-6,663**	**-26,858**	**0**

Summaries of transit boardings and travel time comparisons for the Original LACMTA Model and the Run with Network Modifications are shown in Table 2.19 through Table 2.22.

The key findings from this initial model run were:

- Bus ridership in the Corridor Study Area was higher than observed ridership;
- Metrolink ridership is generally representative of the observed (some percentage differences are large, but absolute differences are generally small);
- Bus travel times were lower than observed (speeds were too fast).

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Table 2.19 - Model Run with Network Modifications and Original LACMTA Model vs Observed - Bus Boardings Summary

Area	Bus Operator	2006/7 Observed			Original LACMTA Model			%Difference (Original LACMTA - Observed)			Run With Network Modifications			%Difference (Network Modifications Run - Observed)		
		Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
PEROW/ WSAB	MTA Bus	45,245	24,363	69,608	48,786	24,515	73,301	8%	1%	5%	51,089	23,323	74,412	13%	-4%	7%
PEROW/ WSAB	OCTA	113,272	60,992	174,264	123,524	65,813	189,337	9%	8%	9%	128,494	66,094	194,588	13%	8%	12%
Northern Connections	MTA Bus	161,068	86,579	247,647	162,229	75,806	238,035	1%	-12%	-4%	167,355	75,108	242,463	6%	-11%	0%
	Total	**319,585**	**171,934**	**491,519**	**334,539**	**166,134**	**500,673**	**5%**	**-3%**	**2%**	**346,938**	**164,525**	**511,463**	**9%**	**-3%**	**5%**

Source: Observed boardings from 2001 Metro On-Board Survey (factored to 2006 with 2001-2006 Metro system level data) and 2007 OCTA line level daily boardings

Table 2.20 - Model Run with Network Modifications and Original LACMTA Model vs Observed - Metro Rail Boardings Summary

Metro Rail Line	2006 Observed			Original LACMTA Model			%Difference (Original LACMTA - Observed)			Run With Network Modifications			%Difference (Network Modifications Run - Observed)		
	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Metro Rail Blue Line	55,807	22,941	78,748	51,494	20,915	72,409	-8%	-9%	-8%	53,952	20,230	74,182	-3%	-12%	-6%
Metro Rail Green Line	24,707	10,156	34,863	23,309	9,834	33,143	-6%	-3%	-5%	23,635	9,780	33,415	-4%	-4%	-4%
Total	**80,514**	**33,097**	**113,611**	**74,803**	**30,749**	**105,552**	**-7%**	**-7%**	**-7%**	**77,587**	**30,010**	**107,597**	**-4%**	**-9%**	**-5%**

Source: Observed boardings from 2006 Metro system level data

Table 2.21 - Model Run with Network Modifications and Original LACMTA Model vs Observed - Metrolink Boardings Summary

Metrolink Line	2008 Observed			Original LACMTA Model			%Difference (Original LACMTA - Observed)			Run With Network Modifications			%Difference (Network Modifications Run - Observed)		
	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily
Orange Line	6,155	1,007	7,162	5,667	925	6,592	-8%	-8%	-8%	4,383	919	5,302	-29%	-9%	-26%
Inland Empire	4,428	156	4,584	2,743	587	3,330	-38%	276%	-27%	5,210	624	5,834	18%	300%	27%
91 Line	2,246	107	2,353	1,812	37	1,849	-19%	-65%	-21%	3,252	37	3,289	45%	-65%	40%
Total	**12,829**	**1,270**	**14,100**	**10,222**	**1,549**	**11,771**	**-20%**	**22%**	**-17%**	**12,845**	**1,580**	**14,425**	**0%**	**24%**	**2%**

Table 2.22 - Run With Network Modifications Study Area Total Bus Travel Time Summary

		Observed		Iteris PE ROW Model Run					
		Travel Time (mins)		Travel Time (mins)		Difference (mins)		% Difference	
Type	Route	Peak	Off Peak	Peak	Off Peak	AM Peak	Off Peak	AM Peak	Off Peak
Metro Bus	125	87	93	64	80	-23	-13	-26%	-14%
Metro Bus	127	43	43	32	40	-11	-3	-26%	-6%
Metro Bus	128	55	59	38	47	-17	-13	-32%	-21%
Metro Bus	130	95	103	73	83	-22	-20	-23%	-19%
Metro Bus	202	63	-	42	42	-21	-	-33%	-
Metro Bus	251	77	80	66	63	-10	-17	-13%	-21%
Metro Bus	265	63	64	42	49	-20	-15	-32%	-23%
Metro Bus	266	87	91	76	82	-11	-9	-12%	-10%
Metro Bus	715	61	65	43	49	-18	-16	-30%	-24%
Metro Bus	760	70	73	46	51	-24	-22	-34%	-30%
Metro Bus	762	94	100	78	85	-15	-15	-16%	-15%
OCTA	21	72	-	39	47	-32	-	-45%	-
OCTA	25	84	88	52	54	-32	-33	-39%	-38%
OCTA	29	87	93	64	73	-23	-20	-26%	-22%
OCTA	33	59	61	27	34	-32	-26	-54%	-43%
OCTA	35	84	82	46	44	-38	-37	-45%	-46%
OCTA	37	77	73	66	72	-11	0	-15%	0%
OCTA	43	87	96	52	79	-35	-16	-40%	-17%
OCTA	46	75	66	43	53	-31	-14	-42%	-20%
OCTA	47	99	102	82	93	-17	-8	-17%	-8%
OCTA	50	80	81	31	38	-49	-43	-61%	-53%
OCTA	51	33	33	28	29	-5	-4	-14%	-11%
OCTA	53	66	68	62	64	-4	-3	-6%	-5%
OCTA	54	77	78	50	57	-27	-21	-35%	-27%
OCTA	55	93	98	52	75	-41	-22	-44%	-23%
OCTA	56	60	65	44	48	-17	-17	-28%	-26%
OCTA	57	102	106	57	76	-45	-30	-44%	-28%
OCTA	59	78	78	72	73	-6	-5	-8%	-6%
OCTA	64	62	63	38	44	-24	-19	-38%	-30%
OCTA	66	68	67	58	70	-9	4	-14%	6%
OCTA	70	66	65	72	84	6	19	10%	29%
OCTA	72	60	58	56	66	-4	8	-7%	14%
OCTA	76	77	75	51	61	-25	-14	-33%	-19%
OCTA	145	35	35	27	29	-8	-5	-23%	-16%
OCTA	172	50	51	38	40	-12	-11	-23%	-21%
All Metro		791	769	600	670	-191	-141	**-24%**	**-18%**
All OCTA		1726	1675	1206	1404	-520	-317	**-30%**	**-19%**
Total		2517	2443	1806	2074	-711	-458	**-28%**	**-19%**

2.5. Bus Run Times Validation

The initial model run described above showed that in the Corridor Study Area, the bus ridership was higher than observed and bus travel times were faster than observed. The two trends are linked, so reducing the bus travel speeds in the study area would have the effect of reducing bus ridership, resulting in a model that better represents observed conditions.

In the LACMTA model, bus travel time is determined using “INET” functions that link bus travel time to the highway network travel time, with different functions for peak and off-peak periods, and for different types of bus (local bus, rapid bus, etc). For the Corridor Model, adjustments were made to the bus travel time functions for specific groups of bus lines in the study area so that the model calibration elsewhere was not significantly affected. Separate adjustments were made to buses in the PEROW/WSAB Area (mostly OCTA buses) and the Northern Connections Area (mostly MTA buses).

Several iterations of bus speed adjustments were carried out until the modeled bus ridership in the study area was closer to the observed ridership. Where necessary, a maximum speed cap of 55 mph was applied, which is the maximum speed applied in the original functions. The final bus speed adjustments applied are as shown in Table 2.23.

Table 2.23 - Bus Speed Adjustments Applied

Time Period	PEROW/WSAB Area Bus Speed Adjustments	Northern Connections Area Bus Speed Adjustments
Peak	-17%	13%
Off-Peak	-12%	-12%

The resultant bus travel speed functions that apply to buses in the study area are shown graphically in Figures 2.8 through 2.11. The graphs show the original speed functions for each bus and facility type, with the adjusted functions applied to PEROW/WSAB Area and Northern Connections Area buses.

Figure 2.8 - Bus Speed Functions - Peak Period, Local Bus

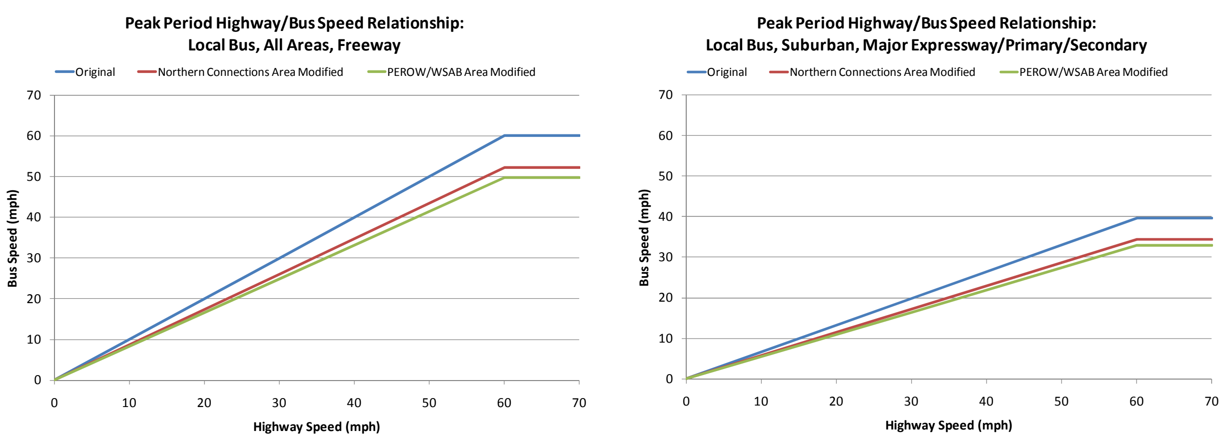


Figure 2.8 (Cont): Bus Speed Functions - Peak Period, Local Bus

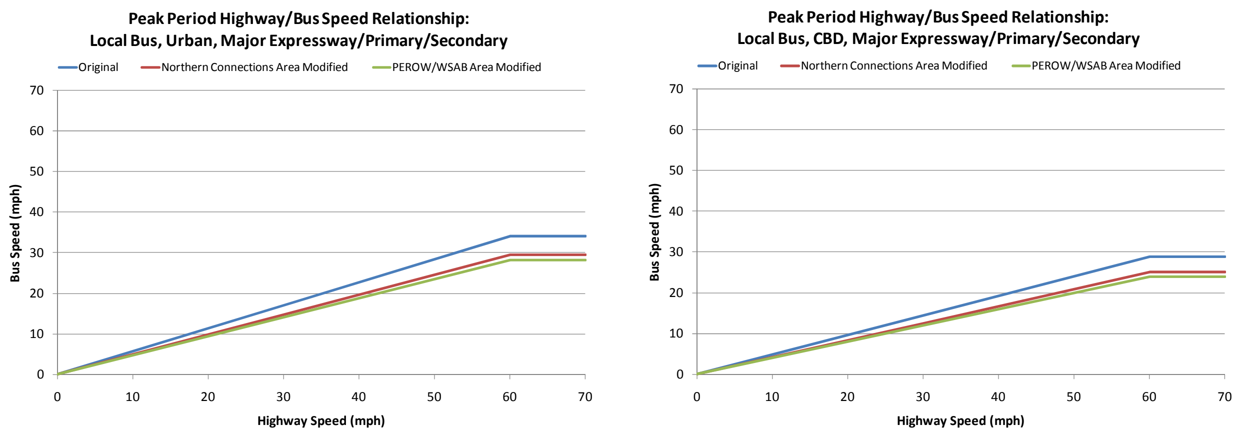


Figure 2.9 - Bus Speed Functions - Peak Period, Rapid Bus

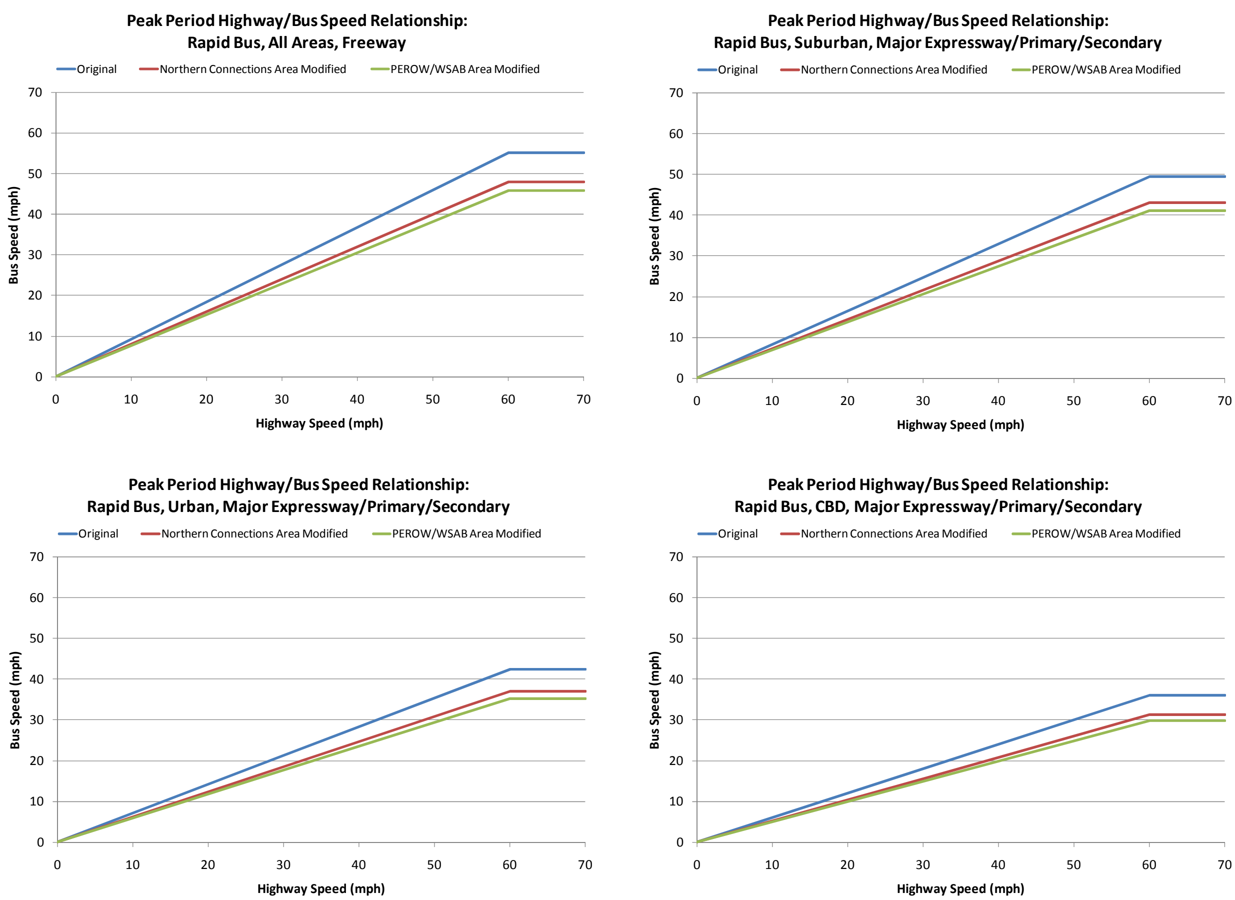


Figure 2.10 - Bus Speed Functions - Off-Peak Period, Local Bus

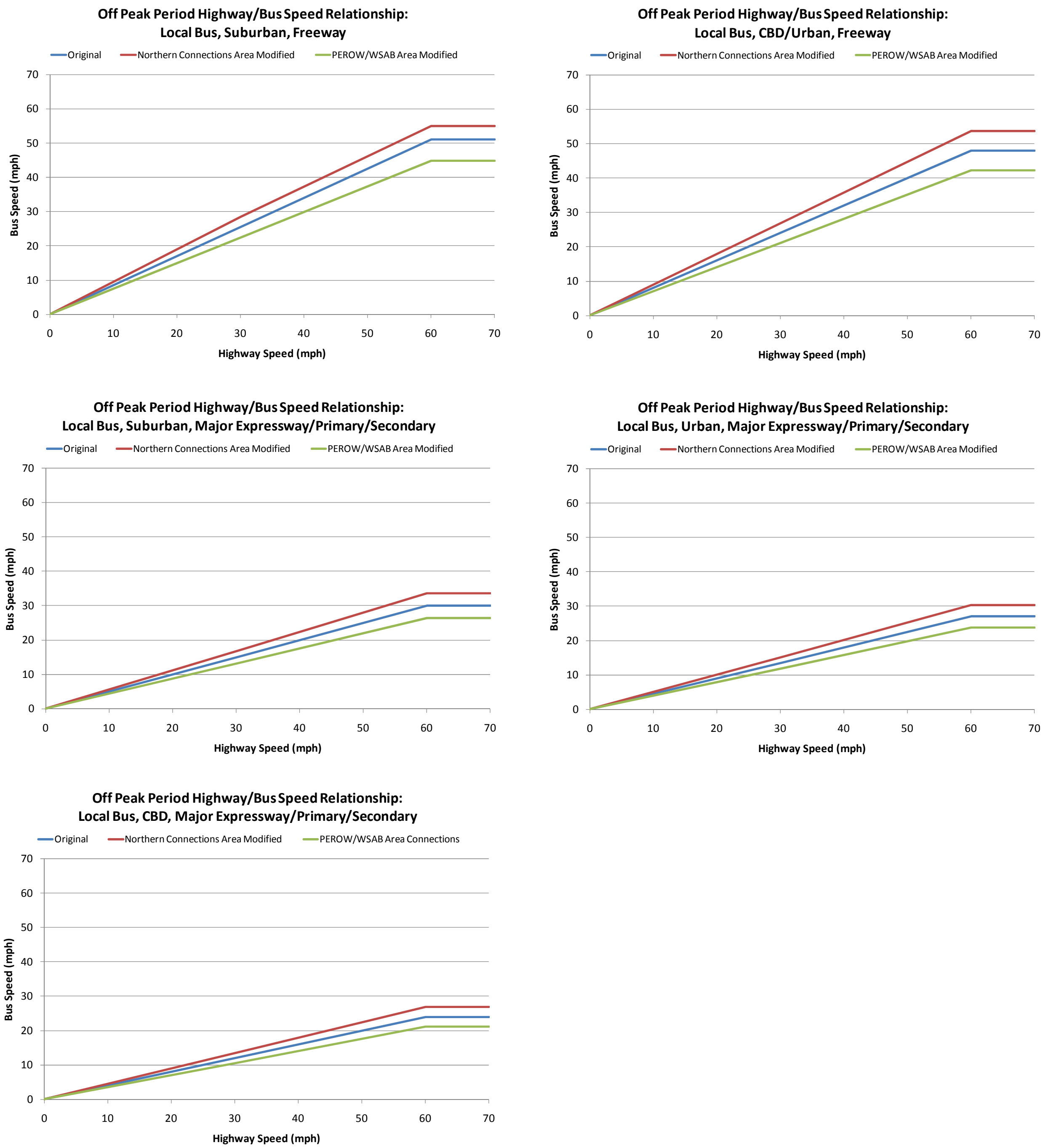
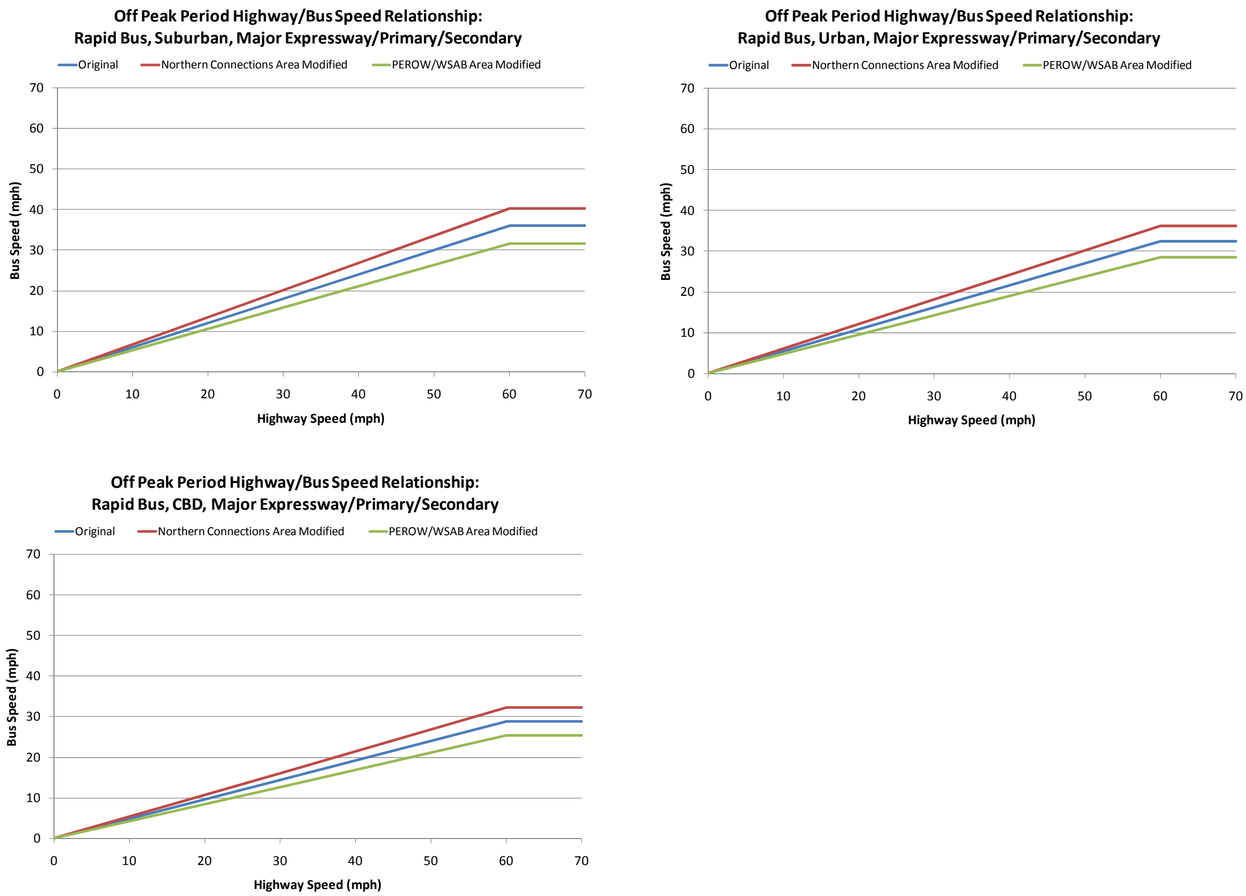


Figure 2.11 - Bus Speed Functions - Off-Peak Period, Rapid Bus



The speed function adjustments were applied to the routes listed in Table 2.24 and Table 2.25. the OCTA and Non-OCTA transit services that were impacted by the bus speed function changes are summarized in Table 2.26 and Table 2.27 respectively.

Table 2.24 - Northern Connections Area MTA Bus Routes Impacted by Bus Speed Function Changes

Metro Route	Description
30	Pico/Rimpau - Dozier/Rowan
42	MLK/Western - Union Station
53	CSU Dominguez Hills - 5th/Beaudry
53	Imperial/Avalon - 5th/Beaudry
53	Central/Slauson - 5th/Beaudry
55	Downtown LA - Imperial/Wilmington Station via Compton Av
58	LA/Alameda-Spring
60	Downtown LA - Artesia Station via Long Beach Blvd
65	Washington/Figueroa - CSU LA
66	Wilshire Center - Montebello via 8th St & Olympic Blvd
68	Washington/La Brea - Atlantic/Chavez
68	WLATC - Atlantic/Chavez

Metro Route	Description
68	WLATC - Rowan/Chavez
70	El Monte - 18th/Main
71	Los Angeles - Cal State LA via Wabash Av & City Terrace Dr
102	Coliseum/La Brea - 37th/Soto
107	Locust/Grace - Florence/Seville
108	Slauson/Paramount - Mesmer
108	Slauson/Paramount - Slauson/Western
110	Playa Vista - Bell Gardens via Jefferson Blvd. - Gage Ave.
111	Norwalk to LAX City Bus Center via Florence Ave.
115	Manchester/Sepulveda - Firestone/Atlantic
115	I105/I605 - Pacific/Culver
115	Norwalk Metro - Manchester/Sepulveda
117	Lakewood Metro - LAX
121	Imperial/Wilmington Station - Whittwood Mall via Imperial Hwy.
124	Compton/Willowbrook - Grand/Main
125	El Segundo - Downey via Rosecrans Ave.
127	Compton Station - Downey via Compton Blvd. & Somerset Blvd.
128	Compton - La Mirada via Alondra Blvd.
130	Redondo Beach - Cerritos via Artesia Blvd.
202	Willowbrook - Compton – Wilmington
205	Imperial/Wilmington Sta. - San Pedro via Wilmington Ave., Vermont Ave. & Western Ave.
250	LAC/USC - Olympic/Boyle
251	Cypress Park - Lynwood via Soto St.
252	Soto/Olympic - Lincoln Park/Broadway
253	8th/Lorena - LAC/USC
254	Boyle Heights - 103rd St. Station via Lorena St. & Boyle Ave.
260	Altadena - Artesia Blue Line Station via Fair Oaks Ave. & Atlantic Blvd.
265	Pico Rivera - Lakewood Center Mall via Paramount Blvd.
266	Lakewood - Pasadena via Rosemead Blvd. & Lakewood Blvd.
275	Beverly/Durfee - Cerritos
315	LAX - Norwalk Metro
315	96th/Sepulveda - Firestone/Atlantic
350	Downtown LA - Avalon Station
361	Artesia Station - Fair Oaks/Loma Alta
362	226th/Norwalk - 5th/Beaudry
605	Grande Vista Ave - Boyle Heights - LA County + USC Medical Center
611	Huntington Park Shuttle
612	South Gate Shuttle
620	Boyle Heights via Cesar Chavez Ave & State St.
665	Cal State LA - City Terrace Shuttle
681	Watts - Huntington Park
715	Metro Rapid (LAX - Downey via Manchester Ave. and Firestone Blvd.)
720	Metro Rapid (Santa Monica - Commerce via Wilshire Blvd. & Whittier Blvd.)
745	Metro Rapid (Downtown Los Angeles - Harbor Freeway Station via Broadway)
753	Metro Rapid (Downtown LA - Imperial/Wilmington Station via Central Ave.)
760	Metro Rapid (Downtown LA - Artesia Station via Long Beach Blvd.)
762	Metro Rapid (Pasadena - Artesia Blue Line Station via Fair Oaks & Atlantic)
770	Metro Rapid (Los Angeles - El Monte via Cesar E. Chavez Ave. & Garvey Ave.)

Table 2.25 - Northern Connections Area Other (Non-MTA) Bus Routes Impacted by Bus Speed Function Changes

Route Number	Description
	Metrolink Shuttle
	Dash - South East
	Dash - Downtown B
	Dash - Downtown D
	Dash - Downtown A
	Dash - Watts
	Dash - Chesterfield Sq
	Dash - City Hall
40	Montebello 40
343	Montebello 343
341	Montebello 341
342	Montebello 342
	Metrolink Shuttle

Table 2.26 - PEROW/WSAB Area OCTA Bus Routes Impacted by Bus Speed Function Changes

OCTA Route	Description
21	Fullerton - Huntington Beach via Valley View St./Bolsa Chica Rd.
25	Fullerton - Huntington Beach via Knott Ave./Goldenwest St.
26	Fullerton - Yorba Linda via Commonwealth Ave./Yorba Linda Blvd.
29	La Habra - Huntington Beach via Beach Blvd.
30	Cerritos - Anaheim via Orangethorpe Ave.
33	Fullerton - Huntington Beach via Magnolia St.
35	Fullerton - Huntington Beach via Brookhurst St.
37	La Habra - Fountain Valley via Euclid St.
38	Lakewood - Anaheim Hills via Del Amo Blvd./La Palma Ave.
42	Seal Beach - Orange via Seal Beach Blvd./Los Alamitos Blvd./Lincoln Ave.
43	Fullerton - Costa Mesa via Harbor Blvd.
46	Los Alamitos - Orange via Ball Rd./Taft Ave.
47	Fullerton - Newport Beach via Anaheim Blvd./Fairview St.
50	Long Beach - Orange via Katella Ave.
51	Santa Ana - Costa Mesa via Flower St.
53	Orange - Irvine via Main St.
54	Garden Grove - Orange via Chapman Ave.
55	Santa Ana - Newport Beach via Standard Ave./Bristol St./Fairview St./ 17th St.
56	Garden Grove - Orange via Garden Grove Blvd.
57	Brea - Newport Beach via State College Blvd./Bristol St.
59	Anaheim - Irvine via Kraemer Blvd./Glassell St./Grand Ave./Von Karman Ave.
60	Long Beach - Tustin via Westminster Ave./17th St.
62	62-Huntng Beach-Santa An
64	Huntington Beach - Tustin via Bolsa Ave./1st St.
66	Huntington Beach - Irvine via McFadden Ave./Walnut Ave.
70	Sunset Beach - Tustin via Edinger Ave.
72	Sunset Beach - Tustin via Warner Ave.
74	Slater - Dyer - Barranca
76	Huntington Beach - Newport Beach via Talbert Ave./MacArthur Blvd.

OCTA Route	Description
83	Anaheim - Laguna Hills via 5 Fwy/Main St.
145	Santa Ana - Costa Mesa via Raitt St./Greenville St./Fairview St.
147	Orange - Brea
164	Seal Beach - Westminster
172	Huntington Beach - Costa Mesa via Main St./Garfield Ave./Ellis Ave./MacArthur Blvd./Sunflower St.
205	Anaheim - Laguna Hills
211	Seal Beach - Irvine Express via 405 Fwy
430	Anaheim Metrolink Station/Amtrak Station - Anaheim Resort Area via
453	Orange Transportation Center - St. Joseph's Hospital via Chapman Ave./Main St./La Veta Ave.
462	The Depot at Santa Ana - Civic Center via Santa Ana Blvd./Civic Center Dr.
463	The Depot at Santa Ana - Hutton Centre via Grand Ave.
464	The Depot at Santa Ana - Costa Mesa via 5 Fwy/55 Fwy/Sunflower Ave.
757	Pomona - Santa Ana Express via 57 Fwy
794	Riverside/Corona - South Coast Metro Express via 91 Fwy/55 Fwy

Table 2.27 - PEROW/WSAB Area Other (Non-OCTA) Bus Routes Impacted by Bus Speed Function Changes

Route Number	Description
1	Norwalk Transit 1
2	Norwalk Transit 2
3	Norwalk Transit 3
4	Norwalk Transit 4
5	Norwalk Transit 5
8	Norwalk Transit 8
7	Long Beach: Orange Ave.
21	Long Beach: Cherry Ave.
22	Long Beach: Downey Ave.
51	Long Beach: Long Beach Blvd. to Artesia Station
61	Long Beach: Atlantic Ave. to Artesia Station
61	Long Beach: Atlantic Ave. to Artesia Station
61	Long Beach: Atlantic Ave. to Artesia Station
63	Long Beach: Atlantic Ave.
91	Long Beach: 7th St. / Bellflower Blvd.
92	Long Beach: 7th St. / Woodruff Ave.
93	Long Beach: 7th St. / Clark Ave.
101	Long Beach: Carson St. / Centralia
102	Long Beach: Willow / Spring
103	Long Beach: Carson St. to Lakewood Mall
112	Long Beach: Broadway / Clark Ave.
172	Long Beach: PCH / Palo Verde to Norwalk Station
173	Long Beach: PCH / Studebaker to Norwalk Station
191	Long Beach: Santa Fe / Del Amo Blvd.
192	Long Beach: Santa Fe / South St.
	Cerritos On Wheels
	Bellflower Green
	Bellflower Orange
	Bellflower Blue

2.6. METROLINK SERVICE ADJUSTMENT

The Metrolink commuter rail service headways for the Orange County Line, Inland Empire Line and the 91 Line were adjusted so that modeled Metrolink ridership on these lines better matched the ridership. 2010 Metrolink timetables were reviewed to ensure that coded headways were generally representative of actual headways.

2.7. TRANSIT VALIDATION SUMMARY

Total daily person trips by trip purpose are shown in Table 2.9 through Table 2.12; these numbers have not changed as a result of the calibration efforts described in the last section. Table 2.28 shows the number of daily HBW transit trips according to year 2000 CTPP data. This data has been scaled so that the region-wide trip total is the same as the model. Table 2.29 shows the number of HBW transit trips in the final validation model run. Comparing Table 2.29 with Table 2.17 shows that the number of HBW transit trips has changed slightly as a result of the bus speed modifications described in the previous section.

Table 2.28 - CTPP HBW Daily Transit Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	526,981	346	7,151	184	1,083	**535,745**
Orange County Non-PSA	809	29,469	45	9,501	0	**39,824**
LA County PSA	14,090	100	9,568	508	0	**24,266**
Orange County PSA	1,295	24,523	179	38,468	0	**64,464**
Other	8,552	547	0	659	56,404	**66,161**
Total	**551,727**	**54,986**	**16,942**	**49,320**	**57,487**	**730,461**

Table 2.29 - Final Validation Model Run HBW Average Weekday Transit Trips

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	527,142	3,928	21,737	3,575	5,368	**561,751**
Orange County Non-PSA	7,503	21,148	645	10,761	220	**40,277**
LA County PSA	23,099	854	8,953	1,165	148	**34,220**
Orange County PSA	4,841	16,878	904	21,646	151	**44,421**
Other	18,929	2,748	753	2,337	25,026	**49,792**
Total	**581,514**	**45,557**	**32,993**	**39,484**	**30,914**	**730,461**

The absolute difference between the Validation Model Run HBW transit trips and the equivalent CTPP trips is shown in Table 2.30. The differences show a slight improvement over the "Run with Network Modifications", shown in Table 2.18.

Table 2.30 - Difference in HBW Average Weekday Transit Trips - Final Validation Model Run vs CTPP Observed

Production\Attraction Area	LA County Non-PSA	Orange County Non-PSA	LA County PSA	Orange County PSA	Other	Total
LA County Non-PSA	161	3,582	14,586	3,391	4,285	**26,006**
Orange County Non-PSA	6,694	-8,321	601	1,260	220	**453**
LA County PSA	9,010	754	-615	657	148	**9,954**
Orange County PSA	3,546	-7,645	726	-16,822	151	**-20,044**
Other	10,376	2,201	753	1,678	-31,377	**-16,370**
Total	**29,787**	**-9,429**	**16,051**	**-9,836**	**-26,573**	**0**

Summaries of the final validation comparison of observed and modeled transit ridership are shown in Table 2.31, Table 2.32 and Table 2.33. Complete tables of bus lines compared are provided in Table 2.35.

The results in Table 2.31 show that the modeled bus boardings in the Corridor Study Area closely match the observed boardings, and the model calibration is significantly improved over the initial run described previously in this memorandum. The modeled total bus boardings for the peak period across the entire study area are within one percent of the observed total. In the off-peak, the modeled bus boardings are only two percent lower than observed.

Table 2.32 shows the boardings for Metro Rail (Blue and Green Lines) which have not changed significantly with the adjustments to bus speeds. Peak period Metro Rail boardings have improved slightly with the bus speed updates, and off-peak boardings have become very slightly worse; a small net improvement over the entire day.

The Metrolink validation results in Table 2.33 show a change from the initial model run, with total daily boardings matching the observed more closely.

Table 2.34 shows the modeled bus travel times compared with timetable travel times. The final model travel times are on average lower than the timetables by between 10 percent and 11 percent. This represents an overall improvement since the initial model run prior to speed adjustments. It should also be noted that full timetables were only available for 2010, while the model was calibrated for 2006 and it is possible that the actual travel times have increased slightly over four years.

Table 2.31 - Validation Run, Model Run with Network Modifications and Original LACMTA Model vs Observed - Bus Boardings Summary

Area	Bus Operator	2006/7 Observed			Original LACMTA Model			% Difference (Original LACMTA - Observed)			Run With Network Modifications			% Difference (Network Modifications Run - Observed)			Validation Run			% Difference (Validation Run - Observed)		
		Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
PEROW/ WSAB	MTA Bus	45,245	24,363	69,608	48,786	24,515	73,301	8%	1%	5%	51,089	23,323	74,412	13%	-4%	7%	43,966	26,168	70,134	-3%	7%	1%
PEROW/ WSAB	OCTA	113,272	60,992	174,264	123,524	65,813	189,337	9%	8%	9%	128,494	66,094	194,588	13%	8%	12%	113,285	60,914	174,199	0%	0%	0%
Northern Connections	MTA Bus	161,068	86,579	247,647	162,229	75,806	238,035	1%	-12%	-4%	167,355	75,108	242,463	6%	-11%	0%	162,802	81,097	243,899	1%	-6%	-2%
	Total	**319,585**	**171,934**	**491,519**	**334,539**	**166,134**	**500,673**	**5%**	**-3%**	**2%**	**346,938**	**164,525**	**511,463**	**9%**	**-3%**	**5%**	**320,053**	**168,179**	**488,232**	**0%**	**-2%**	**-1%**

Source: Observed boardings from 2001 Metro On-Board Survey (factored to 2006 with 2001-2006 Metro system level data) and 2007 OCTA line level daily boardings

Table 2.32 - Validation Run, Model Run with Network Modifications and Original LACMTA Model vs Observed - Metro Rail Boardings Summary

Metro Rail Line	2006 Observed			Original LACMTA Model			% Difference (Original LACMTA - Observed)			Run With Network Modifications			% Difference (Network Modifications Run - Observed)			Validation Run			% Difference (Validation Run - Observed)		
	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Metro Rail Blue Line	55,807	22,941	78,748	51,494	20,915	72,409	-8%	-9%	-8%	53,952	20,230	74,182	-3%	-12%	-6%	54,080	20,373	74,453	-3%	-11%	-5%
Metro Rail Green Line	24,707	10,156	34,863	23,309	9,834	33,143	-6%	-3%	-5%	23,635	9,780	33,415	-4%	-4%	-4%	24,105	9,677	33,782	-2%	-5%	-3%
Total	**80,514**	**33,097**	**113,611**	**74,803**	**30,749**	**105,552**	**-7%**	**-7%**	**-7%**	**77,587**	**30,010**	**107,597**	**-4%**	**-9%**	**-5%**	**78,185**	**30,050**	**108,235**	**-3%**	**-9%**	**-5%**

Source: Observed boardings from 2006 Metro system level data

Table 2.33 - Validation Run, Model Run with Network Modifications and Original LACMTA Model vs Observed - Metrolink Boardings

Metrolink Line	2008 Observed			Original LACMTA Model			% Difference (Original LACMTA - Observed)			Run With Network Modifications			% Difference (Network Modifications Run - Observed)			Validation Run			% Difference (Validation Run - Observed)		
	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily	Peak	Off Peak	Daily
Orange Line	6,155	1,007	7,162	5,667	925	6,592	-8%	-8%	-8%	4,383	919	5,302	-29%	-9%	-26%	5,458	960	6,418	-11%	-5%	-10%
Inland Empire	4,428	156	4,584	2,743	587	3,330	-38%	276%	-27%	5,210	624	5,834	18%	300%	27%	4,580	102	4,682	3%	-35%	2%
91 Line	2,246	107	2,353	1,812	37	1,849	-19%	-65%	-21%	3,252	37	3,289	45%	-65%	40%	3,042	42	3,084	35%	-61%	31%
Total	**12,829**	**1,270**	**14,100**	**10,222**	**1,549**	**11,771**	**-20%**	**22%**	**-17%**	**12,845**	**1,580**	**14,425**	**0%**	**24%**	**2%**	**13,080**	**1,104**	**14,184**	**2%**	**-13%**	**1%**

Table 2.34 - Validation Run vs Run with Network Modifications vs Observed - Study Area Bus Travel Times Comparison

		Observed		Iteris PE ROW Model Run						AECOM PE ROW Model Run					
		Travel Time (mins)		Travel Time (mins)		Difference (mins)		% Difference		Travel Time (mins)		Difference (mins)		% Difference	
Type	Route	Peak	Off Peak	Peak	Off Peak	AM Peak	Off Peak	AM Peak	Off Peak	Peak	Off Peak	AM Peak	Off Peak	AM Peak	Off Peak
Metro Bus	125	87	93	64	80	-23	-13	-26%	-14%	73	71	-14	-21	-16%	-23%
Metro Bus	127	43	43	32	40	-11	-3	-26%	-6%	36	36	-6	-7	-15%	-16%
Metro Bus	128	55	59	38	47	-17	-13	-32%	-21%	43	41	-12	-18	-22%	-30%
Metro Bus	130	95	103	73	83	-22	-20	-23%	-19%	83	74	-12	-29	-13%	-28%
Metro Bus	202	63	-	42	42	-21	-	-33%	-	48	37	-14	-	-23%	-
Metro Bus	251	77	80	66	63	-10	-17	-13%	-21%	76	56	0	-24	0%	-30%
Metro Bus	265	63	64	42	49	-20	-15	-32%	-23%	49	44	-14	-20	-22%	-31%
Metro Bus	266	87	91	76	82	-11	-9	-12%	-10%	88	73	1	-18	1%	-20%
Metro Bus	715	61	65	43	49	-18	-16	-30%	-24%	49	43	-12	-22	-19%	-33%
Metro Bus	760	70	73	46	51	-24	-22	-34%	-30%	53	45	-17	-27	-25%	-38%
Metro Bus	762	94	100	78	85	-15	-15	-16%	-15%	90	75	-4	-25	-4%	-25%
OCTA	21	72	-	39	47	-32	-	-45%	-	53	59	-19	-	-26%	-
OCTA	25	84	88	52	54	-32	-33	-39%	-38%	63	72	-21	-16	-25%	-18%
OCTA	29	87	93	64	73	-23	-20	-26%	-22%	86	95	-1	2	-1%	2%
OCTA	33	59	61	27	34	-32	-26	-54%	-43%	54	63	-5	2	-8%	3%
OCTA	35	84	82	46	44	-38	-37	-45%	-46%	66	73	-18	-8	-22%	-10%
OCTA	37	77	73	66	72	-11	0	-15%	0%	79	82	2	10	3%	13%
OCTA	43	87	96	52	79	-35	-16	-40%	-17%	89	89	2	-6	2%	-6%
OCTA	46	75	66	43	53	-31	-14	-42%	-20%	52	60	-23	-6	-30%	-10%
OCTA	47	99	102	82	93	-17	-8	-17%	-8%	97	105	-3	3	-3%	3%
OCTA	50	80	81	31	38	-49	-43	-61%	-53%	71	81	-9	0	-11%	0%
OCTA	51	33	33	28	29	-5	-4	-14%	-11%	34	33	1	1	3%	2%
OCTA	53	66	68	62	64	-4	-3	-6%	-5%	74	73	9	6	14%	8%
OCTA	54	77	78	50	57	-27	-21	-35%	-27%	60	65	-17	-13	-23%	-17%
OCTA	55	93	98	52	75	-41	-22	-44%	-23%	76	86	-17	-12	-18%	-12%
OCTA	56	60	65	44	48	-17	-17	-28%	-26%	49	53	-11	-12	-18%	-18%
OCTA	57	102	106	57	76	-45	-30	-44%	-28%	68	86	-34	-20	-33%	-19%
OCTA	59	78	78	72	73	-6	-5	-8%	-6%	86	83	8	5	10%	6%
OCTA	64	62	63	38	44	-24	-19	-38%	-30%	46	50	-16	-12	-25%	-20%
OCTA	66	68	67	58	70	-9	4	-14%	6%	74	83	6	16	9%	25%
OCTA	70	66	65	72	84	6	19	10%	29%	86	95	20	30	30%	46%
OCTA	72	60	58	56	66	-4	8	-7%	14%	54	56	-6	-2	-10%	-3%
OCTA	76	77	75	51	61	-25	-14	-33%	-19%	61	70	-16	-5	-20%	-7%
OCTA	145	35	35	27	29	-8	-5	-23%	-16%	32	33	-2	-1	-7%	-3%
OCTA	172	50	51	38	40	-12	-11	-23%	-21%	46	46	-4	-5	-8%	-10%
	All Metro	791	769	600	670	-191	-141	**-24%**	**-18%**	688	595	-103	-211	**-13%**	**-27%**
	All OCTA	1726	1675	1206	1404	-520	-317	**-30%**	**-19%**	1555	1688	-171	-45	**-10%**	**-3%**
	Total	2517	2443	1806	2074	-711	-458	**-28%**	**-19%**	2243	2283	-274	-255	**-11%**	**-10%**

Table 2.35 - Final Model Validation - Bus Boardings by Line

			2006/7 Observed			2006 Validation Model Run			Difference (Validation Run - Observed)			% Difference (Validation Run - Observed)		
Operator	Line	Area	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Metro Bus	60	PEROW / WSAB	19,526	10,514	30,039	21,081	12,625	33,706	1,555	2,111	3,667	8%	20%	12%
Metro Bus	111	PEROW / WSAB	15,689	8,448	24,137	16,115	7,628	23,743	426	-820	-394	3%	-10%	-2%
Metro Bus	117	PEROW / WSAB	6,982	3,760	10,742	6,582	5,370	11,952	-400	1,610	1,210	-6%	43%	11%
Metro Bus	127	PEROW / WSAB	809	436	1,245	31	21	52	-778	-415	-1,193	-96%	-95%	-96%
Metro Bus	202	PEROW / WSAB	1,121	603	1,724	152	435	587	-969	-168	-1,137	-86%	-28%	-66%
Metro Bus	265	PEROW / WSAB	1,118	602	1,720	5	89	94	-1,113	-513	-1,626	-100%	-85%	-95%
OCTA	21	PEROW / WSAB	447	240	687	231	234	465	-216	-6	-222	-48%	-3%	-32%
OCTA	25	PEROW / WSAB	2,157	1,161	3,318	1,337	1,274	2,611	-820	113	-707	-38%	10%	-21%
OCTA	29	PEROW / WSAB	7,093	3,820	10,913	9,457	3,444	12,901	2,364	-376	1,988	33%	-10%	18%
OCTA	33	PEROW / WSAB	1,775	956	2,731	1,571	1,277	2,848	-204	321	117	-12%	34%	4%
OCTA	35	PEROW / WSAB	2,666	1,436	4,102	3,665	1,451	5,116	999	15	1,014	37%	1%	25%
OCTA	37	PEROW / WSAB	3,434	1,849	5,283	4,087	1,662	5,749	653	-187	466	19%	-10%	9%
OCTA	43	PEROW / WSAB	11,146	6,001	17,147	10,141	4,404	14,545	-1,005	-1,597	-2,602	-9%	-27%	-15%
OCTA	46	PEROW / WSAB	2,746	1,479	4,225	1,793	1,000	2,793	-953	-479	-1,432	-35%	-32%	-34%
OCTA	47	PEROW / WSAB	7,433	4,003	11,436	7,174	5,009	12,183	-259	1,006	747	-3%	25%	7%
OCTA	50	PEROW / WSAB	3,894	2,097	5,990	5,527	2,025	7,552	1,634	-72	1,562	42%	-3%	26%
OCTA	51	PEROW / WSAB	895	482	1,377	969	1,027	1,996	74	545	619	8%	113%	45%
OCTA	53	PEROW / WSAB	7,446	4,010	11,456	8,953	7,280	16,233	1,507	3,270	4,777	20%	82%	42%
OCTA	54	PEROW / WSAB	3,844	2,070	5,914	4,400	1,469	5,869	556	-601	-45	14%	-29%	-1%
OCTA	55	PEROW / WSAB	5,218	2,810	8,028	5,676	2,079	7,755	458	-731	-273	9%	-26%	-3%
OCTA	56	PEROW / WSAB	1,724	928	2,652	1,005	1,040	2,045	-719	112	-607	-42%	12%	-23%
OCTA	57	PEROW / WSAB	10,913	5,876	16,789	9,016	7,184	16,200	-1,897	1,308	-589	-17%	22%	-4%
OCTA	59	PEROW / WSAB	3,135	1,688	4,823	6,835	2,025	8,860	3,700	337	4,037	118%	20%	84%
OCTA	60	PEROW / WSAB	9,006	4,849	13,855	9,957	5,002	14,959	951	153	1,104	11%	3%	8%
OCTA	64	PEROW / WSAB	7,220	3,887	11,107	3,527	3,121	6,648	-3,693	-766	-4,459	-51%	-20%	-40%
OCTA	66	PEROW / WSAB	7,319	3,941	11,260	6,629	2,500	9,129	-690	-1,441	-2,131	-9%	-37%	-19%
OCTA	70	PEROW / WSAB	4,466	2,405	6,871	3,886	1,866	5,752	-580	-539	-1,119	-13%	-22%	-16%
OCTA	71	PEROW / WSAB	2,710	1,459	4,169	1,630	1,351	2,981	-1,080	-108	-1,188	-40%	-7%	-28%
OCTA	72	PEROW / WSAB	2,092	1,126	3,218	1,543	909	2,452	-549	-217	-766	-26%	-19%	-24%
OCTA	76	PEROW / WSAB	775	418	1,193	887	191	1,078	112	-227	-115	14%	-54%	-10%
OCTA	83	PEROW / WSAB	2,228	1,199	3,427	1,954	1,293	3,247	-274	94	-180	-12%	8%	-5%
OCTA	145	PEROW / WSAB	632	340	972	365	139	504	-267	-201	-468	-42%	-59%	-48%
OCTA	172	PEROW / WSAB	164	89	253	180	321	501	16	232	248	9%	263%	98%
OCTA	173	PEROW / WSAB	298	161	459	163	218	381	-135	57	-78	-45%	36%	-17%
OCTA	453	PEROW / WSAB	139	75	214	42	119	161	-97	44	-53	-70%	59%	-25%
OCTA	462	PEROW / WSAB	163	88	250	306	0	306	144	-88	56	88%	-100%	22%
OCTA	463	PEROW / WSAB	94	51	145	379	0	379	285	-51	234	302%	-100%	161%
Metro Bus	42	N. Connections	2,892	1,557	4,449	3,587	2,144	5,731	695	587	1,282	24%	38%	29%
Metro Bus	65	N. Connections	1,696	913	2,609	2,200	81	2,281	504	-832	-328	30%	-91%	-13%
Metro Bus	66	N. Connections	18,095	9,744	27,839	11,929	7,680	19,609	-6,166	-2,064	-8,230	-34%	-21%	-30%
Metro Bus	70	N. Connections	11,246	6,056	17,302	14,500	10,454	24,954	3,254	4,398	7,652	29%	73%	44%
Metro Bus	76	N. Connections	7,803	4,202	12,005	10,857	5,157	16,014	3,054	955	4,009	39%	23%	33%
Metro Bus	78	N. Connections	7,427	3,999	11,426	7,247	3,654	10,901	-180	-345	-525	-2%	-9%	-5%
Metro Bus	102	N. Connections	449	242	691	4	7	11	-445	-235	-680	-99%	-97%	-98%
Metro Bus	107	N. Connections	1,476	795	2,271	51	54	105	-1,425	-741	-2,166	-97%	-93%	-95%
Metro Bus	108	N. Connections	11,475	6,179	17,653	17,491	6,480	23,971	6,016	301	6,318	52%	5%	36%
Metro Bus	110	N. Connections	7,547	4,064	11,611	6,535	2,880	9,415	-1,012	-1,184	-2,196	-13%	-29%	-19%
Metro Bus	124	N. Connections	1,196	644	1,840	352	106	458	-844	-538	-1,382	-71%	-84%	-75%
Metro Bus	250	N. Connections	231	124	355	0	79	79	-231	-45	-276	-100%	-37%	-78%
Metro Bus	251	N. Connections	15,019	8,087	23,107	16,309	7,845	24,154	1,290	-242	1,047	9%	-3%	5%
Metro Bus	259	N. Connections	1,437	774	2,210	660	617	1,277	-777	-157	-933	-54%	-20%	-42%
Metro Bus	305	N. Connections	2,669	1,437	4,106	1,343	1,403	2,746	-1,326	-34	-1,360	-50%	-2%	-33%
Metro Bus	605	N. Connections	1,001	389	1,390	227	130	357	-774	-259	-1,033	-77%	-67%	-74%
Metro Bus	620	N. Connections	1,224	659	1,883	33	510	543	-1,191	-149	-1,340	-97%	-23%	-71%
Metro Bus	111	N. Connections	15,689	8,448	24,137	16,115	7,628	23,743	426	-820	-394	3%	-10%	-2%
Metro Bus	720	N. Connections	38,613	20,791	59,404	38,112	16,837	54,949	-501	-3,954	-4,455	-1%	-19%	-7%
Metro Bus	760	N. Connections	5,896	3,175	9,071	4,890	2,725	7,615	-1,006	-450	-1,456	-17%	-14%	-16%
Metro Bus	460	N. Connections	2,857	1,539	4,396	4,660	2,962	7,622	1,803	1,423	3,226	63%	93%	73%
Metro Bus	487	N. Connections	1,918	1,033	2,950	1,661	791	2,452	-257	-242	-498	-13%	-23%	-17%
Metro Bus	489	N. Connections	604	325	929	628	0	628	24	-325	-301	4%	-100%	-32%
Metro Bus	490	N. Connections	2,608	1,404	4,012	3,411	873	4,284	803	-531	272	31%	-38%	7%
		Total	**319,585**	**171,934**	**491,519**	**320,053**	**168,179**	**488,232**	**468**	**-3,755**	**-3,287**	**0%**	**-2%**	**-1%**

3. TRAVEL DEMAND MODEL RESULTS

3.1. RESULTS OVERVIEW

This chapter documents the results of the travel demand forecasting process. Included in this chapter is a description of the types of data used to assess and compare each alternative, followed by detailed model results for each alternative.

An important measure in characterizing the efficiency and utility of a transit alternative is transit ridership. A transit alternative that attracts more new riders will do more to reduce highway and local street congestion and will improve the mobility of both the new and existing transit riders as well as the remaining highway users. Transit ridership covers a broad range of statistics that depict the ability of a project to attract riders and the ability of the bus and rail system to serve the traveling public. Key statistics include:

- Unlinked Transit Trips (Boardings) – Unlinked transit trips (also known as boardings) represent the number of times a traveler boards a new transit vehicle. With this statistic, a commuter driving to a train station and taking the train downtown counts as one unlinked transit trip. A traveler walking from home to a feeder bus who then transfers to another bus or train counts as a two unlinked transit trips. This statistic has the disadvantage that an alternative that adds an extra transfer adds an extra unlinked trip. This effect can result in cases where the inconvenience of the extra transfer can reduce the market share and linked trips while showing an increase in unlinked trips. The advantage of this statistic, however, is that can be measured at the route or station level and provides the most intuitive understanding of whether a project is able to attract ridership.
- Project Boardings – Project boardings are a subset of the unlinked transit trips statistic and represent those boardings making use of a new project. For a stand-alone fixed guideway system (such as PEROW/WSAB project alternative), project boardings are equal to the number of boardings forecast for that service. For projects that are extensions of a pre-existing service (such as the Metro Green Line Extension's Light Rail Alternative for example), boardings are equal to the number of boardings at each new station plus the number of travelers who are on-board the trains as they leave the last existing station and travel towards the first new station
- Station Boardings – Station boardings are the number of boardings occurring at each station and can also show the modes of access and egress (e.g., walk, bus, park-and-ride or kiss-and-ride). This statistic provides information on the locations where the project is forecasted to attract demand. It is also useful in understanding the impacts that each station may have on the surrounding community.
- Transportation System Total User Benefits. Total User Benefits is a system-wide measure of the benefits that are derived by travelers related to the implementation of the project. This statistic is expressed as person-hours of equivalent in-vehicle time savings when the project is compared to the TSM Alternative. Although the key benefit of a new fixed guideway project is expected to be faster running times (i.e., in-vehicle time), fixed guideway projects may also include improved access, egress, frequencies and costs and all of these elements are embedded in the User Benefit measure. User Benefits are a key component of the FTA's Cost Effectiveness Index, which is part of the process that FTA uses to evaluate potential projects for Federal funding.

The remainder of this section documents the projected ridership impacts of each of the modeled alternatives according to these different statistics. All results discussed in this section are for an average weekday in the forecast year (2035).

In case the project one day needs to enter the FTA New Starts program, the analysis and results required by the FTA have been produced for all TSM and Build Alternatives. This analysis is intended for local planning purposes only at this time, and not to support an FTA Section 5309 New Starts application.

3.2. No Build

The Project No Build Alternative is based on the year 2035 Regional "Measure R" No Build. This was rerun with the updated networks and model procedures used in the corridor validation. After a review of the transit service assumptions in this model, Santa Ana Street Car project operating between Harbor Boulevard & Westminster Avenue and SARTC was coded in the networks. System-Wide unlinked transit trips (boardings) and boardings on key Metrolink and Metro Rail services operating close to the project corridor are shown in Table 3.1.

Table 3.1 - Key Ridership Results – Project No Build Alternative

Daily Unlinked Trips (2035)	Project No Build
System-Wide	3,394,001
Metro Green Line	46,763
Metro Blue & Gold Line	161,257
Orange County Line	5,156
Inland Empire	8,285
91 Line	5,452
Santa Ana Streetcar	15,290

3.3. TSM Alternative

Ridership results and user benefits of the TSM Alternative are provided in this section.

The PEROW/WSAB AA is not currently being considered as a Section 5309 New Starts project, so at this stage it is not necessary to define a TSM Alternative for the project that would require FTA approval. However, if the project was to advance forward under the New Starts guidelines, further review and discussion with the FTA would need to take place to select the most suitable TSM Alternative(s) for the projects. Key ridership statistics for this alternative and the Project No Build are shown in Table 3.2.

Table 3.2 - Key Ridership Results – TSM Alternative

Daily Unlinked Trips (2035)	Project No Build	TSM
System-Wide	3,394,001	3,497,587
Metro Green Line	46,763	49,097
Metro Blue & Gold Line	161,257	162,762
Orange County Line	5,156	5,028
Inland Empire	8,285	8,769

Daily Unlinked Trips (2035)	Project No Build	TSM
91 Line	5,452	5,304
Project Boardings	-	85,572
Santa Ana Streetcar	15,290	15,091

The total daily project boardings for this scenario are 85,572. This includes boardings on all new services introduced in the OCTA and MTA regions.

Table 3.3 shows the performance of this scenario in terms of measures used by the FTA to describe and evaluate projects. These measures are calculated against the project No Build alternative and include project boardings and Transportation System User Benefits, and characteristics of the User Benefits such as benefit per customer. User benefits are defined as the weighted travel time savings for all users of each of the project alternatives.

Table 3.3 - User Benefits – TSM Alternative

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					85,572
Daily New Riders					35,814
Daily User Benefits (hours)	14,734	8,808	4,505	3,673	31,720
User Benefits per Project Boarding (mins)					22.2
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-8.4%	-25.9%	-30.3%	-11.0%	-16.7%

Note that the percentages of user benefits that are capped by the FTA Summit program are expected to be high since there is a lot of new service in TSM compared to the No Build.

3.4. Build Alternatives

There are several different operating scenarios for the proposed project, which include LRT, BRT, Maglev and Streetcar. The scenarios differ not just in the technology adopted but also differ in stations and alignment/track used. This section summarizes the ridership and user benefits for all the build alternatives. Unlike TSM, all the FTA evaluation measures for the build alternatives are computed against TSM.

3.4.1. Light Rail Alternative – East Bank Option 1

In this alternative, the project LRT connects to Union Station via the Rail Road ROW on East Bank of Los Angeles River. The project operates with frequency of 5 minutes (peak) and 10 minutes (off-peak).

Key ridership results for this alternative are shown in Table 3.4. Boardings at individual stations and by mode are shown in Appendix A. User Benefits data are shown in Table 3.5.

Table 3.4 - Key Ridership Results – Light Rail Alternative – East Bank Option 1

Daily Unlinked Trips (2035)	Project No Build	LRT East Bank 1
System-Wide	3,394,001	3,497,587
Metro Green Line	46,763	50,188
Metro Blue & Gold Line	161,257	158,570
Orange County Line	5,156	4,059
Inland Empire	8,285	9,519
91 Line	5,452	4,163
Project Boardings	-	84,893
Santa Ana Streetcar	15,290	9,812

Table 3.5 - User Benefits – Light Rail Alternative – East Bank Option 1

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					84,893
Daily New Riders					32,727
Daily User Benefits (hours)	16,613	7,704	1,622	841	26,779
User Benefits per Project Boarding (mins)					18.9
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-19.4%	-42.8%	-46.6%	-9.3%	-27.5%

The Light Rail Alternative is estimated to carry about 85,000 riders per day in 2035. The user benefits per project boarding number is reasonable and in the same range as what was seen for similar projects in the LA region. It should be noted that the percentage of user benefits capped is relatively high than what FTA would normally expect. Such high percentages usually suggest that the TSM alternative is not robust enough to be a replacement for build alternative. But that will not impact the goal of the current study as it is a matter of picking one alternative among many and not FTA New Starts submission.

3.4.2. Light Rail Alternative – West Bank Option 2

In this alternative, the project LRT connects to the Union Station via the Pacific Boulevard and Harbor Subdivision. The project operates with frequency of 5 minutes (peak) and 10 minutes (off-peak).

Key ridership results for this alternative are shown in Table 3.6. Boardings at individual stations and by mode are shown in Appendix A. User Benefit data are shown in Table 3.7.

Table 3.6 - Key Ridership Results – Light Rail Alternative – West Bank Option 2

Daily Unlinked Trips (2035)	Project No Build	LRT West Bank 2
System-Wide	3,394,001	3,562,952
Metro Green Line	46,763	49,758
Metro Blue & Gold Line	161,257	157,964
Orange County Line	5,156	4,049
Inland Empire	8,285	9,503
91 Line	5,452	4,145
Project Boardings	-	82,927
Santa Ana Streetcar	15,290	9,800

Table 3.7 - User Benefits – Light Rail Alternative – West Bank Option 2

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					82,927
Daily New Riders					31,197
Daily User Benefits (hours)	15,662	7,560	1,507	808	25,537
User Benefits per Project Boarding (mins)					18.5
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-19.2%	-40.1%	-45.5%	-9.0%	-26.6%

The user benefits and total boardings for this alternative are similar to those for East Bank Option 1. They are slightly lower mainly because West Bank Option 2 is slightly slower than East Bank Option 1. The same note regarding capping discussed in LRT East Bank Option 1 applies to this alternative.

3.4.3. Light Rail Alternative – West Bank Option 3

In this alternative, the project LRT connects to Union Station via the existing Gold Line Tracks.

Key ridership results for this alternative are shown in Table 3.8. Boardings at individual stations and by mode are shown in Appendix A. User Benefits data are shown in table 3.9.

Table 3.8 - Key Ridership Results – Light Rail Alternative – West Bank Option 3

Daily Unlinked Trips (2035)	Project No Build	LRT West Bank 3
System-Wide	3,394,001	3,565,636
Metro Green Line	46,763	49,819
Metro Blue & Gold Line	161,257	156,466
Orange County Line	5,156	4,104
Inland Empire	8,285	9,564
91 Line	5,452	4,118
Project Boardings	-	87,149
Santa Ana Streetcar	15,290	9,810

Table 3.9 - User Benefits – Light Rail Alternative – West Bank Option 3

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					87,149
Daily New Riders					32,867
Daily User Benefits (hours)	16,805	7,811	1,645	815	27,075
User Benefits per Project Boarding (mins)					18.6
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-18.8%	-38.9%	-44.1%	-8.9%	-25.8%

This alternative had the best end-to-end running time compared to East Bank Option 1 and West Bank Option 2. This is reflected in the overall project boardings and user benefits shown in Table 3.9. Again, the note regarding the capping discussed earlier applied to this alternative.

3.4.4. Maglev Alternative – West Bank Option 3

This alternative differs from the LRT alternative mainly in the technology used to run the proposed project. Low speed Maglev technology is considered in this alternative instead of the Light Rail technology that is common throughout the United States in major cities. In addition, the project is terminated at Harbor Boulevard and it is assumed that all Maglev passengers to SARTC would transfer to the Santa Ana Streetcar system to complete their trip.

Key ridership results for this alternative are shown in Table 3.10. Boardings at individual stations and by mode are shown in Appendix A. User Benefits data are shown in table 3.11.

Table 3.10 - Key Ridership Results – Maglev Alternative – West Bank Option 3

Daily Unlinked Trips (2035)	Project No Build	Maglev West Bank 3
System-Wide	3,394,001	3,563,585
Metro Green Line	46,763	48,901
Metro Blue & Gold Line	161,257	156,051
Orange County Line	5,156	3,873
Inland Empire	8,285	8,690
91 Line	5,452	5,064
Project Boardings	-	75,991
Santa Ana Streetcar	15,290	17,935

Table 3.11 - User Benefits – Maglev Alternative – West Bank Option 3

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					75,991
Daily New Riders					28,429
Daily User Benefits (hours)	14,765	6,945	1,451	83	23,994
User Benefits per Project Boarding (mins)					18.9
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-17.8%	-35.5%	-44.5%	-8.7%	-24.2%

This alternative shows similar results as all the LRT alternatives presented earlier in this section. The overall boardings on the project are lower than LRT alternatives because of the fewer stations but the user benefits per project boarding number is comparable to the LRT alternatives. As expected, there are significant number of transfers from the Maglev line to the Santa Ana Streetcar.

3.4.5. Bus Rapid Transit – HOV Running

This alternative is one of the two Bus Rapid Transit options considered in this study. The segment in the north section of the project between L.A. Downtown and Greenline Metro Rail operates on HOV lanes on I-105 and I-110 Freeways. Note that this alternative terminates at 7th/Metro in downtown and has no easy connection to Union Station unlike most of the alternatives in the study.

Since this alternative operated very similar to the existing Harbor Transitway service and not the Orange Line BRT, the project was coded as transitway in the model. Key ridership results for this alternative are shown in Table 3.12. Boardings at individual stations and by mode are shown in Appendix A. User Benefits data are shown in table 3.13.

Table 3.12 - Key Ridership Results – BRT Alternative – HOV Running

Daily Unlinked Trips (2035)	Project No Build	BRT HOV Running
System-Wide	3,394,001	3,573,523
Metro Green Line	46,763	50,911
Metro Blue & Gold Line	161,257	161,295
Orange County Line	5,156	4,266
Inland Empire	8,285	9,063
91 Line	5,452	4,703
Project Boardings	-	67,208
Santa Ana Streetcar	15,290	14,116

Table 3.13 - User Benefits – BRT Alternative – HOV Running

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					67,208
Daily New Riders					24,639
Daily User Benefits (hours)	12,378	4,577	681	-59	17,577
User Benefits per Project Boarding (mins)					15.7
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-30.6%	-58.0%	-64.4%	-41.8%	-39.3%

This alternative shows about 20 percent fewer boardings and user benefits than the LRT alternatives presented earlier in this section. This can be explained by the slower operating speed and the absence of direct connection to Union Station. Since a significant portion of the alignment operated on HOV lanes on freeways, which are congested in the peak period and also some portion of the off-peak period, the end-to-end runtime is a lot higher than the LRT alternatives. Also, transfers from the Union Station are not possible in this alternative.

The negative user benefits for Home Based University purpose are the result of the TSM specification rather than a modeling issue. Since this alternative doesn't connect to Union Station, some college trips in the corridor do not have the same level of service as that is in TSM to go to colleges/universities west of downtown, e.g., UCLA. Ideally, a separate TSM needs to be developed to evaluate this alternative but for the purpose of this study a generic TSM was used to evaluate all the alternatives.

3.4.6. Bus Rapid Transit – Street Running

This alternative is the second of the two Bus Rapid Transit options considered in this study. The segment in the north section of the project between L.A. Downtown and Green Line Metro Rail operates on arterials. Note that this alternative terminates at Union Station unlike the first BRT alternative.

This alternative is also coded as transitway in the model similar to the first BRT alternative. Key ridership results for this alternative are shown in Table 3.14. Boardings at individual stations and by mode are shown in Appendix A. User Benefits data are shown in table 3.15.

Table 3.14 - Key Ridership Results – BRT Alternative – Street Running

Daily Unlinked Trips (2035)	Project No Build	BRT Street Running
System-Wide	3,394,001	3,556,035
Metro Green Line	46,763	55,939
Metro Blue & Gold Line	161,257	163,918
Orange County Line	5,156	4,826
Inland Empire	8,285	8,980
91 Line	5,452	4,949
Project Boardings	-	57,339
Santa Ana Streetcar	15,290	15,772

Table 3.15 - User Benefits – BRT Alternative – Street Running

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					57,339
Daily New Riders					18,121
Daily User Benefits (hours)	10,250	2,856	-444	-57	12,606
User Benefits per Project Boarding (mins)					13.2
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-27.1%	-32.6%	-2.3%	22.6%	-29.5%

This alternative shows about 30-50 percent fewer boardings and user benefits than the LRT alternatives presented earlier in this section. Since a significant portion of the alignment operated on arterial streets the end-to-end runtime is a lot higher than the LRT alternatives and also higher than the first BRT alternative that operated on HOV lanes on freeways. The negative user benefits again are a result of the TSM specification.

3.5. Sensitivity Runs

This section presents the results from the additional model runs that are based on the LRT and Maglev West Bank Option 3 alternatives. A total of six additional alternatives were modeled to account for differences in mode, alignment, stations and other information. The additional LRT alternatives could be considered potential Minimal Operable Segments (MOS's) if the LRT West Bank 3 alternative is chosen as the Locally Preferred Alternative (LPA).

3.5.1. Streetcar Alternative – West Bank Option 3

This alternative shows the impact of streetcar operations for LRT West Bank Option 3 alignment. In addition to the mode difference, an extra stop at Magnolia was also added to the operating plan. Key ridership results for this alternative are shown in Table 3.16. Boardings at individual stations and by mode are shown in Appendix B. User Benefits data are shown in table 3.17.

Table 3.16 - Key Ridership Results – Streetcar Alternative West Bank Option 3

Daily Unlinked Trips (2035)	Project No Build	Streetcar
System-Wide	3,394,001	3,553,043
Metro Green Line	46,763	49,134
Metro Blue & Gold Line	161,257	156,612
Orange County Line	5,156	3,766
Inland Empire	8,285	9,182
91 Line	5,452	4,927
Project Boardings	-	79,601
Santa Ana Streetcar	15,290	9,876

Table 3.17 - User Benefits – Streetcar Alternative West Bank Option 3

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					79,601
Daily New Riders					28,945
Daily User Benefits (hours)	15,124	7,364	1,466	682	24,635
User Benefits per Project Boarding (mins)					18.6
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-15.1%	-33.4%	-39.4%	-8.3%	-21.8%

The results show that both the boardings and user benefits would reduce by about 10 percent because of the slower operating speed of Streetcar compared to LRT.

3.5.2. Light Rail Alternative – West Bank Option 3 – Completely Grade Separated

This alternative shows the impact of completely grade separating the LRT West Bank Option 3 alignment. Apart from the difference in run time, which reflects the complete grade separation, there is no other difference between this alternative and LRT West Bank Option 3. Key ridership results for this alternative are shown in Table 3.18. Boardings at individual stations and by mode are shown in Appendix B. User Benefits data are shown in table 3.19.

Table 3.18 - Key Ridership Results – LRT West Bank Option 3 – Completely Grade Separated

Daily Unlinked Trips (2035)	Project No Build	LRT West Bank 3, Grade Separated
System-Wide	3,394,001	3,569,397
Metro Green Line	46,763	49,861
Metro Blue & Gold Line	161,257	156,441
Orange County Line	5,156	4,161
Inland Empire	8,285	9,682
91 Line	5,452	4,098

Project Boardings	-	89,561
Santa Ana Streetcar	15,290	9,719

Table 3.19 - User Benefits – LRT West Bank Option 3 – Completely Grade Separated

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					89,561
Daily New Riders					34,317
Daily User Benefits (hours)	17,578	7,972	1,744	858	28,151
User Benefits per Project Boarding (mins)					18.9
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-19.4%	-40.1%	-44.8%	-9.0%	-26.5%

The results show that both the boardings and user benefits would increase slightly because of the minor increase in the operating speed of the LRT due to grade separation.

3.5.3. Maglev Alternative – West Bank Option 3 – With Private Fare

This alternative differs from the Maglev alternative only in the amount of fare charged for passengers. A revised fare assuming private operations was calculated and used in the model instead of the MTA fare. The revised private operations fare ($8.75) is $6.42 in 1999 dollars, which is the year dollars in the travel forecasting model. The MTA fare in comparison was 80 cents in 1999 dollars.

Key ridership results for this alternative are shown in Table 3.20. Boardings at individual stations and by mode are shown in Appendix A. An estimate of user benefits is shown in table 3.21. The user benefits for "private fare Maglev" is estimate using the benefits per rider from the "regular fare" Maglev alternative user because the high fare combined with cost coefficients in the mode choice model generated negative benefits in spite of the travel time savings.

Table 3.20 - Key Ridership Results – Maglev Alternative – West Bank Option 3 with Private Fare

Daily Unlinked Trips (2035)	Project No Build	Maglev West Bank 3 Private Fare
System-Wide	3,394,001	3,410,368
Metro Green Line	46,763	28,162
Metro Blue & Gold Line	161,257	108,338
Orange County Line	5,156	4,034
Inland Empire	8,285	6,703
91 Line	5,452	3,616
Project Boardings	-	8,255
Santa Ana Streetcar	15,290	10,384

Table 3.21 - User Benefits "Estimate" – Maglev Alternative – West Bank Option 3 with Private Fare

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					8,255
Daily New Riders					3,088
Daily User Benefits (hours)	1,604	754	158	90	2,606
User Benefits per Project Boarding (mins)					18.9
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-1.7%	-4.5%	-4.4%	-1.0%	-2.9%

The overall boardings on the project and user benefits are significantly lower than the Maglev alternative because of the extremely high fare. The results show that trips in the corridor found cheaper alternatives to the project in order to avoid paying the high fare.

3.5.4. Light Rail Alternative – West Bank Option 3 – MOS Option 1

This alternative is a segment of LRT West Bank Option 3 operating between LA Union Station and the new station added on the Green Line for the project. Key ridership results for this alternative are shown in Table 3.22. Boardings at individual stations and by mode are shown in Appendix B. User Benefits data are shown in table 3.23.

Table 3.22 - Key Ridership Results – LRT West Bank Option 3 – MOS 1

Daily Unlinked Trips (2035)	Project No Build	LRT MOS 1
System-Wide	3,394,001	3,502,355
Metro Green Line	46,763	48,903
Metro Blue & Gold Line	161,257	157,671
Orange County Line	5,156	5,113
Inland Empire	8,285	8,703
91 Line	5,452	5,457
Project Boardings	-	19,618
Santa Ana Streetcar	15,290	15,102

Table 3.23 - User Benefits – LRT West Bank Option 3 – MOS 1

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					19,618
Daily New Riders					1,852
Daily User Benefits (hours)	1,569	1,211	-473	23	2,330
User Benefits per Project Boarding (mins)					7.1
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-0.8%	-7.4%	-9.6%	-5.8%	-2.4%

The results show that both the boardings are on the low side compared to the full LRT West Bank Option 3, with only about 1,700 boarding per mile. The user benefits also show lower than expected results because of the TSM specification. The TSM bus from LA Union Station to Los Cerritos College operated parallel to the project LRT and hence was removed from the build alternative. However, the portion along the bus route between the new Green Line Station and Los Cerritos College was not serviced by the build alternative, leading to a lesser level of service in the build alternative. The decrease is evident in the user benefits results of Non-Home Based and Home-Based University purposes.

3.5.5. Light Rail Alternative – West Bank Option 3 – MOS Option 2

This alternative is another segment of LRT West Bank Option 3 operating between the new Green Line Station and Bloomfield station. Key ridership results for this alternative are shown in Table 3.24. Boardings at individual stations and by mode are shown in Appendix B. User Benefits data are shown in table 3.25.

Table 3.24 - Key Ridership Results – LRT West Bank Option 3 – MOS 2

Daily Unlinked Trips (2035)	Project No Build	LRT MOS 2
System-Wide	3,394,001	3,506,996
Metro Green Line	46,763	50,429
Metro Blue & Gold Line	161,257	162,758
Orange County Line	5,156	5,030
Inland Empire	8,285	8,752
91 Line	5,452	5,303
Project Boardings	-	11,059
Santa Ana Streetcar	15,290	14,816

Table 3.25 - User Benefits – LRT West Bank Option 3 – MOS 2

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					11,059
Daily New Riders					3,350
Daily User Benefits (hours)	1,490	1,402	-44	508	3,356
User Benefits per Project Boarding (mins)					18.2
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-3.5%	-1.9%	-94.5%	-0.5%	-0.4%

The boardings per mile are lower than LRT MOS 1 with only about 1,500 boardings per mile. The total length of MOS 2 is only about 7.6 miles and it does not connect to LA downtown. All trips going to downtown from the project corridor will need to transfer to other transit (Green Line or Silver Line for example), therefore, making this alternative less attractive than MOS 1. The user benefits, even though in the expected range, show negative values for NHB purpose. This is again because the same generic TSM was used instead of developing a separate one for this alternative.

3.5.6. Light Rail Alternative – West Bank Option 3 – MOS Option 3

This alternative is the last MOS alternative that was considered during this alternatives analysis. This MOS is a combination of both MOS 1 and MOS 2, operating between Union Station and Bloomfield station. Key ridership results for this alternative are shown in Table 3.26. Boardings at individual stations and by mode are shown in Appendix B. User Benefits data are shown in table 3.27.

Table 3.26 - Key Ridership Results – LRT West Bank Option 3 – MOS 3

Daily Unlinked Trips (2035)	Project No Build	LRT MOS 3
System-Wide	3,394,001	3,521,244
Metro Green Line	46,763	42,651
Metro Blue & Gold Line	161,257	155,974
Orange County Line	5,156	4,951
Inland Empire	8,285	8,688
91 Line	5,452	5,303
Project Boardings	-	38,788
Santa Ana Streetcar	15,290	14,816

Table 3.27 - User Benefits – LRT West Bank Option 3 – MOS 3

Statistic	HBW	HBO	NHB	HBU	Total
Daily Project Boardings					38,788
Daily New Riders					9,794
Daily User Benefits (hours)	5,719	3,417	236	571	9,943
User Benefits per Project Boarding (mins)					15.4
% of benefits that are coverage related	0.0%	0.0%	0.0%	0.0%	0.0%
% of benefits capped prices	-4.3%	-9.7%	-5.4%	-1.0%	-6.0%

The boardings per mile are higher than those of LRT MOS 1 and MOS 2, with about 1,950 boardings per mile. Since this MOS is a shortened LRT West Bank Option 3 and extended MOS 1, both project boardings and user benefits results fall in between MOS 1 and full LRT West Bank Option 3 results.

4. COST EFFECTIVENESS INDEX

Projects that utilize the FTA New Starts program to obtain federal funding are evaluated in a number of categories, including Cost Effectiveness, Transit Supportive Land Uses, Mobility Improvements, Environmental Benefits, Operating Efficiencies, Economic Development and Local Financial Commitment. An important category (which the ridership modeling process is a key component of) is cost effectiveness. This is a measure of the hours saved by the project compared to its annual cost. The Cost Effectiveness (CEI) is calculated for each Build Alternative by comparing its annual cost (combined annualized capital cost and annual operations and maintenance (O&M) cost) and annual hours saved (user benefits) to the TSM Alternative.

A "provisional" cost effectiveness index has been calculated for each Build Alternative and Operating Scenario when compared to the TSM Alternative. These are shown in Table 4.1 along with other measures of effectiveness (incremental cost per new rider and incremental cost per project boarding). . The LRT alternatives and Streetcar alternative have similar CEIs between $42 and $47. The Maglev alternative has the highest CEI of $76 and that is expected because of the huge capital investment required to build the project. The BRT alternatives have the best CEIs among all the build alternatives, as expected. But it should be noted that the travel time benefits associated with those alternatives are also lower compared to other build alternatives.

These cost effectiveness indices are considered provisional because the current TSM alternative will likely need to be revised to withstand FTA scrutiny if any project alternative from this alternatives analysis is to be considered for FTA New Starts Section 5309 funding. There were significant capped user benefits in all the build alternatives. This can be attributed to the TSM alternative in cases where the level and span of service provided in the TSM does not correspond to the Build alternative. Since this scope of this study was not to determine New Starts feasibility refinement of the TSM alternative was not explored. These refinements could be material and adversely affect the cost effectiveness indices presented in this study.

Table 4.1 – Provisional Cost Effectiveness Indices

	Project No Build	Baseline/ TSM (1)	LRT 1 – East Bank 1	LRT 3 – West Bank 2	LRT 4 - West Bank 3	Street Car Sensitivity Analysis - West Bank 3	Maglev (Metro Fare) - West Bank 3	BRT 1 - HOV-Running Alignment	BRT 2 - Street-Running Alignment
Total Capital Cost (2011$)		$245,849,000	$2,615,258,000	$2,562,405,000	$2,850,558,000	$2,626,214,000	$6,310,102,000	$1,089,740,000	$1,082,573,000
Annualized Capital Cost (2011$)		$25,072,000	$212,748,000	$209,335,000	$228,934,000	$213,145,000	$500,943,000	$92,286,000	$91,288,000
Annual Operating Cost (2011$)		$56,908,495	$232,565,071	$228,794,579	$220,468,489	$233,594,609	$160,562,774	$63,966,505	$54,210,412
Total Annual Cost (2011$)		$81,980,495	$445,313,071	$438,129,579	$449,402,489	$446,739,609	$661,505,774	$156,252,505	$145,498,412
Alternative Used As Comparison	NA	No Build	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline
Total Annual Incremental Cost	NA	$81,980,495	$363,332,576	$356,149,084	$367,421,994	$364,759,114	$579,525,279	$74,272,010	$63,517,917
Cost Effectiveness Index (2)									
Average Weekday User Benefits (hours)	NA	31,720	26,779	25,537	27,075	24,635	23,994	17,577	12,606
Average Annual User Benefits (hours)	NA	10,058,412	8,491,621	8,097,783	8,585,483	7,811,759	7,608,497	5,573,667	3,997,363
Cost Effectiveness Index	NA	**$8.15**	**$42.79**	**$43.98**	**$42.80**	**$46.69**	**$76.17**	**$13.33**	**$15.89**
Other Evaluation Measures									
Average Weekday New Riders	NA	NA	32,727	31,197	32,867	28,945	28,429	24,639	18,121
Average Annual New Riders	NA	NA	10,377,732	9,892,569	10,422,126	9,178,460	9,014,836	7,813,027	5,746,169
Incremental Cost Per New Rider	NA	NA	**$35.01**	**$36.00**	**$35.25**	**$39.74**	**$64.29**	**$9.51**	**$11.05**
Average Weekday Project Boardings	NA	NA	84,893	82,927	87,149	79,601	75,991	67,208	57,339
Average Annual Project Boardings	NA	NA	26,919,570	26,296,152	27,634,948	25,241,477	24,096,746	21,311,657	18,182,197
Incremental Cost Per Project Boarding	NA	NA	**$13.50**	**$13.54**	**$13.30**	**$14.45**	**$24.05**	**$3.49**	**$3.49**

(1) Assumes improvements in throughout the greater study area

(2) Transportation system user benefits for the build alternatives show high levels of capping by FTA guidelines. If any of these alternatives are being considered for FTA Section 5309 New Starts funding further refinements of the TSM and possibly the Build alternatives may be required. These refinements could be material and adversely affect the cost effectiveness indicies presented here.

Notes:

- Capital and operating costs prepared and reviewed by others. Capital costs and operating costs are project specific
- Documentation of annualization factor prepared and reviewed by others.

5. SUMMARY AND CONCLUSIONS

The initial ridership modeling activities using the Metro Transportation Analysis Model have yielded key insights into the viability of the TSM and Build Alternatives.

Key findings which arise from this report include the following:

- TSM Alternative – In case the selected project alternative from this alternatives analysis needs to be considered for FTA New Starts Section 5309 funding, the current TSM alternative will likely need to be revised to withstand FTA scrutiny. There were significant capped user benefits in all the build alternatives. This can be attributed to the TSM alternative in cases where the level and span of service provided in the TSM does not correspond to the Build alternative. Since this scope of this study was not to determine New Starts feasibility refinement of the TSM alternative was not explored. These refinements could be material and adversely affect the cost effectiveness indices presented in this study.
- Light Rail Alternatives – The Light Rail Alternatives perform well, projected to carry approximately 85,000 riders per day at their highest level of operations in 2035 depending on the alignment and station locations. The boardings per mile turned out to be around 2,400 boardings per mile. While it appears to be on the high side it is consistent with similar forecast LRT alternatives in the region. The selection of one LRT out of the three modeled alternatives ultimately depends on a combination of factors – cost of building the project and the choice of alignment, i.e., at-grade versus underground. The CEIs for the LRT alternatives reflect the same conclusion.
- Bus Rapid Transit Alternatives – Both the BRT alternatives carry significantly less number of riders than LRT. Due to their slow operating speeds the user benefits derived per project boarding are also significantly less than LRT. The biggest advantage of the BRT alternatives over LRT is the low amount of capital investment required to build the project. That is responsible for the CEIs to relatively low for the two BRT alternatives.
- Maglev Alternative – The ridership on the only Maglev alternative modeled was comparable to that of LRT. The low speed Maglev technology does not offer any significant savings to the end-to-end runtime of the project compared to LRT. Since the cost of building this project is significantly higher than LRT, this alternative may not be viable. As indicated earlier, the CEI for this alternative is the highest among all the build alternatives.
- Streetcar Alternative – Similar to Maglev the ridership for this alternative was comparable to that of LRT. The advantage of this alternative over LRT is additional flexibility in determining the stop spacing depending on the locality, i.e., more stops can be easily added to the alignment in densely populated areas unlike LRT, which requires relatively higher investment to build stations etc. The CEI for this alternative is comparable to the LRT alternatives because of their similar costs and user benefits results.

APPENDIX A. BUILD ALTERNATIVES – BOARDINGS BY STATION AND MODE OF ACCESS

Table A.1 - Station Boardings and Times – LRT East Bank Option 1

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	3.3	7.7	8,111	2,256	10,367	-	-	5,885	2,224	8,109	13,996	4,479	**18,475**
Soto/Olympic	2.4	3.6	628	168	796	3.3	7.7	569	296	865	1,197	464	**1,661**
Leonis/District	1.4	2.4	940	338	1,278	2.4	3.6	748	363	1,111	1,688	701	**2,389**
Gage	2.3	3.1	943	396	1,339	1.4	2.4	1,032	484	1,515	1,975	880	**2,854**
Firestone	2.5	3.2	1,473	504	1,977	2.3	3.1	1,428	589	2,017	2,901	1,093	**3,994**
Gardendale	0.9	1.8	552	191	743	2.5	3.2	352	199	551	904	390	**1,293**
Green Line (new)	0.7	1.7	2,077	802	2,879	0.9	1.8	1,654	598	2,252	3,731	1,400	**5,131**
Paramount/Rosecrans	2.4	3.2	1,071	509	1,580	0.7	1.7	510	248	758	1,581	757	**2,338**
Bellflower Blvd.	2.4	3.2	1,183	530	1,712	2.4	3.2	642	373	1,015	1,824	903	**2,727**
183Rd St/Gridley Rd.	0.7	1.7	1,241	489	1,729	2.4	3.2	794	426	1,220	2,035	914	**2,949**
Pioneer Blvd.	1.4	2.4	988	364	1,351	0.7	1.7	653	299	951	1,640	662	**2,302**
Bloomfield	2.7	3.5	905	350	1,255	1.4	2.4	607	316	923	1,512	665	**2,177**
Cypress College	1.1	2.0	1,866	683	2,548	2.7	3.5	1,495	620	2,115	3,361	1,303	**4,663**
Knott	1.2	2.1	1,162	506	1,668	1.1	2.0	973	395	1,367	2,135	900	**3,035**
Beach	2.5	3.3	1,570	570	2,140	1.2	2.1	1,564	590	2,154	3,134	1,160	**4,294**
Brookhurst	1.5	2.4	1,338	508	1,846	2.5	3.3	1,139	461	1,600	2,477	969	**3,446**
Euclid	1.3	2.2	992	356	1,347	1.5	2.4	924	323	1,246	1,915	678	**2,593**
Harbor Blvd.	1.0	1.9	2,957	980	3,937	1.3	2.2	1,594	485	2,079	4,551	1,465	**6,015**
Harbor/1St Street	1.0	2.2	320	205	525	1.0	1.9	304	161	464	623	366	**989**
1St Street/Fairview Street	1.2	2.1	547	260	807	1.0	2.2	345	158	503	892	418	**1,309**
1St Street/Bristol Street	2.0	5.9	943	691	1,634	1.2	2.1	440	231	671	1,383	922	**2,305**
SARTC	-	-	3,186	1,140	4,326	2.0	5.9	2,515	1,119	3,634	5,701	2,259	**7,959**
Total	**35.9**	**61.7**	**34,989**	**12,790**	**47,779**	**35.9**	**61.7**	**26,161**	**10,953**	**37,114**	**61,150**	**23,743**	**84,893**

Table A.2 – Station Boardings By Mode of Access – LRT East Bank Option 1

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	370	402	225	71	19,665	20,733	0	4,146	-	-	12,071	16,217	185	2,274	113	36	15,868	18,475
Soto/Olympic	729	122	0	66	0	917	1,587	817	-	-	0	2,404	1,158	470	0	33	0	1,661
Leonis/District	1,563	0	0	73	0	1,636	3,139	2	-	-	0	3,141	2,351	1	0	36	0	2,389
Gage	2,759	380	0	224	0	3,363	1,658	687	-	-	0	2,345	2,208	534	0	112	0	2,854
Firestone	2,405	1,607	968	199	0	5,179	549	2,260	-	-	0	2,809	1,477	1,933	484	100	0	3,994
Gardendale	882	0	0	123	0	1,005	1,581	0	-	-	0	1,581	1,232	0	0	61	0	1,293
Green Line (new)	1,250	0	1,109	229	3,863	6,451	185	29	-	-	3,597	3,810	717	14	554	115	3,730	5,131
Paramount/Rosecrans	1,278	497	0	168	0	1,943	1,089	1,643	-	-	0	2,732	1,184	1,070	0	84	0	2,338
Bellflower Blvd.	2,077	50	1,103	250	0	3,480	1,810	163	-	-	0	1,973	1,944	106	552	125	0	2,727
183Rd St/Gridley Rd.	756	475	733	120	0	2,084	1,755	2,058	-	-	0	3,813	1,255	1,267	366	60	0	2,949
Pioneer Blvd.	867	216	851	182	0	2,116	809	1,679	-	-	0	2,488	838	948	425	91	0	2,302
Bloomfield	1,067	225	1,199	215	0	2,706	695	953	-	-	0	1,648	881	589	599	107	0	2,177
Cypress College	1,080	1,056	1,564	196	0	3,896	2,548	2,882	-	-	0	5,430	1,814	1,969	782	98	0	4,663
Knott	1,768	415	0	247	0	2,430	2,251	1,388	-	-	0	3,639	2,009	902	0	124	0	3,035
Beach	1,476	1,206	1,894	282	0	4,859	1,975	1,754	-	-	0	3,729	1,726	1,480	947	141	0	4,294
Brookhurst	1,160	746	1,626	250	0	3,783	1,678	1,430	-	-	0	3,108	1,419	1,088	813	125	0	3,446
Euclid	976	621	1,385	223	0	3,206	504	1,476	-	-	0	1,980	740	1,049	693	112	0	2,593
Harbor Blvd.	511	1,857	1,564	161	219	4,312	1,174	6,543	-	-	1	7,718	843	4,200	782	81	110	6,015
Harbor/1St Street	556	186	0	196	0	938	862	177	-	-	0	1,039	709	182	0	98	0	989
1St Street/Fairview Street	840	152	0	167	0	1,159	656	803	-	-	0	1,459	748	478	0	84	0	1,309
1St Street/Bristol Street	670	414	0	346	0	1,430	1,190	1,989	-	-	0	3,179	930	1,201	0	173	0	2,305
SARTC	742	1,094	4,911	224	296	7,267	664	7,880	-	-	107	8,651	703	4,487	2,456	112	201	7,959
Total	**25,782**	**11,722**	**19,132**	**4,214**	**24,043**	**84,893**	**28,359**	**40,759**	**-**	**-**	**15,775**	**84,893**	**27,071**	**26,241**	**9,566**	**2,107**	**19,909**	**84,893**

Table A.3 - Station Boardings and Times – LRT West Bank Option 2

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	4.6	9.0	7,449	2,039	9,488	-	-	5,647	2,121	7,768	13,096	4,160	**17,256**
Pacific/Harbor Sub	1.5	3.2	502	228	730	4.6	9.0	584	283	867	1,086	511	**1,597**
Randolph/Pacific	1.4	2.6	974	378	1,352	1.5	3.2	961	490	1,451	1,935	867	**2,802**
Gage	2.5	3.6	876	512	1,388	1.4	2.6	882	546	1,428	1,758	1,058	**2,816**
Firestone	2.2	3.3	1,415	465	1,880	2.5	3.6	1,376	599	1,975	2,791	1,064	**3,854**
Gardendale	0.7	1.7	549	194	743	2.2	3.3	340	198	538	889	392	**1,281**
Green Line (new)	0.7	1.8	2,000	780	2,780	0.7	1.7	1,525	552	2,077	3,525	1,332	**4,857**
Paramount/Rosecrans	2.4	3.2	1,004	504	1,508	0.7	1.8	490	245	734	1,493	749	**2,242**
Bellflower Blvd.	2.4	3.2	1,175	524	1,699	2.4	3.2	619	371	990	1,794	894	**2,688**
183Rd St/Gridley Rd.	0.7	1.7	1,221	483	1,703	2.4	3.2	776	421	1,197	1,997	904	**2,900**
Pioneer Blvd.	1.4	2.4	965	360	1,324	0.7	1.7	641	299	940	1,606	659	**2,264**
Bloomfield	2.7	3.5	900	344	1,244	1.4	2.4	595	314	909	1,495	658	**2,153**
Cypress College	1.1	2.0	1,847	673	2,520	2.7	3.5	1,480	620	2,100	3,327	1,293	**4,620**
Knott	1.2	2.1	1,149	505	1,654	1.1	2.0	965	397	1,362	2,114	902	**3,015**
Beach	2.5	3.3	1,552	569	2,121	1.2	2.1	1,549	589	2,138	3,101	1,158	**4,259**
Brookhurst	1.5	2.4	1,334	503	1,836	2.5	3.3	1,123	459	1,582	2,457	962	**3,418**
Euclid	1.3	2.2	976	351	1,327	1.5	2.4	917	321	1,238	1,893	672	**2,565**
Harbor Blvd.	1.0	1.9	2,923	971	3,893	1.3	2.2	1,576	487	2,063	4,499	1,457	**5,956**
Harbor/1St Street	1.0	2.2	322	198	520	1.0	1.9	300	161	461	622	359	**981**
1St Street/Fairview Street	1.2	2.1	540	262	801	1.0	2.2	343	156	498	882	417	**1,299**
1St Street/Bristol Street	2.0	5.9	934	678	1,612	1.2	2.1	426	225	650	1,360	902	**2,262**
SARTC	-	-	3,137	1,123	4,260	2.0	5.9	2,473	1,116	3,588	5,610	2,238	**7,848**
Total	**36.0**	**63.4**	**33,740**	**12,638**	**46,378**	**36.0**	**63.4**	**25,586**	**10,963**	**36,549**	**59,326**	**23,601**	**82,927**

Table A.4 - Station Boardings By Mode of Access – LRT West Bank Option 2

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	323	376	222	62	17,993	18,976	0	4,060	-	-	11,475	15,535	162	2,218	111	31	14,734	17,256
Pacific/Harbor Sub	842	223	0	56	0	1,121	1,173	900	-	-	0	2,073	1,007	562	0	28	0	1,597
Randolph/Pacific	1,777	923	0	107	0	2,807	0	2,797	-	-	0	2,797	888	1,860	0	53	0	2,802
Gage	2,462	172	0	185	0	2,819	2,197	615	-	-	0	2,812	2,329	393	0	93	0	2,816
Firestone	2,356	1,537	931	179	0	5,003	516	2,189	-	-	0	2,705	1,436	1,863	465	90	0	3,854
Gardendale	871	0	0	118	0	989	1,572	0	-	-	0	1,572	1,222	0	0	59	0	1,281
Green Line (new)	1,211	0	1,066	222	3,597	6,096	192	31	-	-	3,395	3,618	701	16	533	111	3,496	4,857
Paramount/Rosecrans	1,253	487	0	164	0	1,903	1,086	1,494	-	-	0	2,580	1,170	990	0	82	0	2,242
Bellflower Blvd.	2,050	49	1,072	246	0	3,417	1,802	157	-	-	0	1,959	1,926	103	536	123	0	2,688
183Rd St/Gridley Rd.	748	469	715	118	0	2,050	1,728	2,022	-	-	0	3,750	1,238	1,245	358	59	0	2,900
Pioneer Blvd.	865	211	837	180	0	2,092	797	1,639	-	-	0	2,436	831	925	418	90	0	2,264
Bloomfield	1,064	222	1,181	212	0	2,678	689	938	-	-	0	1,627	876	580	591	106	0	2,153
Cypress College	1,072	1,046	1,550	194	0	3,861	2,525	2,853	-	-	0	5,378	1,798	1,949	775	97	0	4,620
Knott	1,763	411	0	243	0	2,418	2,235	1,377	-	-	0	3,612	1,999	894	0	122	0	3,015
Beach	1,470	1,194	1,880	280	0	4,824	1,957	1,736	-	-	0	3,693	1,714	1,465	940	140	0	4,259
Brookhurst	1,156	743	1,613	248	0	3,760	1,661	1,415	-	-	0	3,076	1,409	1,079	807	124	0	3,418
Euclid	973	616	1,376	222	0	3,188	501	1,440	-	-	0	1,941	737	1,028	688	111	0	2,565
Harbor Blvd.	508	1,844	1,552	160	216	4,280	1,169	6,460	-	-	1	7,631	839	4,152	776	80	108	5,956
Harbor/1St Street	553	186	0	196	0	935	850	176	-	-	0	1,026	701	181	0	98	0	981
1St Street/Fairview Street	838	149	0	172	0	1,159	648	791	-	-	0	1,439	743	470	0	86	0	1,299
1St Street/Bristol Street	673	413	0	289	0	1,375	1,187	1,961	-	-	0	3,148	930	1,187	0	144	0	2,262
SARTC	735	1,079	4,845	228	289	7,176	656	7,763	-	-	100	8,519	695	4,421	2,423	114	194	7,848
Total	**22,944**	**11,203**	**18,840**	**3,918**	**22,094**	**78,999**	**23,968**	**39,118**	**-**	**-**	**14,971**	**78,057**	**23,456**	**25,161**	**9,420**	**1,959**	**18,533**	**82,927**

Table A.5 - Station Boardings and Times – LRT West Bank Option 3

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	1.3	2.5	8,108	2,149	10,257	-	-	5,518	2,239	7,757	13,626	4,388	**18,014**
7th/Alameda	2.3	3.4	530	143	673	1.3	2.5	1,057	395	1,452	1,587	538	**2,125**
Pacific/Harbor	1.5	2.8	494	215	709	2.3	3.4	637	355	992	1,131	570	**1,701**
Randolph/Pacific	1.2	2.3	991	387	1,378	1.5	2.8	1,052	503	1,554	2,043	889	**2,932**
Gage	2.7	3.8	877	519	1,396	1.2	2.3	966	593	1,558	1,842	1,112	**2,954**
Firestone	2.2	3.3	1,411	466	1,877	2.7	3.8	1,464	631	2,095	2,875	1,097	**3,972**
Gardendale	0.7	1.7	551	197	748	2.2	3.3	354	209	563	905	406	**1,311**
Green Line (new)	0.7	1.8	2,223	796	3,018	0.7	1.7	1,555	576	2,131	3,778	1,371	**5,149**
Paramount/Rosecrans	2.4	3.2	1,010	506	1,516	0.7	1.8	511	251	762	1,521	756	**2,277**
Bellflower Blvd.	2.4	3.2	1,175	528	1,703	2.4	3.2	640	387	1,027	1,815	915	**2,730**
183Rd St/Gridley Rd.	0.7	1.7	1,228	483	1,711	2.4	3.2	802	434	1,236	2,030	916	**2,946**
Pioneer Blvd.	1.4	2.4	968	361	1,328	0.7	1.7	653	308	961	1,621	669	**2,289**
Bloomfield	2.7	3.5	904	352	1,256	1.4	2.4	608	321	929	1,512	673	**2,185**
Cypress College	1.1	2.0	1,853	678	2,531	2.7	3.5	1,506	629	2,135	3,359	1,307	**4,666**
Knott	1.2	2.1	1,153	504	1,656	1.1	2.0	976	399	1,375	2,129	903	**3,031**
Beach	2.5	3.3	1,558	569	2,127	1.2	2.1	1,571	597	2,167	3,129	1,166	**4,294**
Brookhurst	1.5	2.4	1,334	504	1,838	2.5	3.3	1,143	465	1,607	2,477	968	**3,445**
Euclid	1.3	2.2	981	353	1,334	1.5	2.4	926	324	1,250	1,907	676	**2,583**
Harbor Blvd.	1.0	1.9	2,926	973	3,899	1.3	2.2	1,600	489	2,089	4,526	1,462	**5,988**
Harbor/1St Street	1.0	2.2	321	207	528	1.0	1.9	302	161	463	623	368	**991**
1St Street/Fairview Street	1.2	2.1	544	260	804	1.0	2.2	345	158	503	889	418	**1,307**
1St Street/Bristol Street	2.0	5.9	931	684	1,615	1.2	2.1	431	227	657	1,361	911	**2,272**
SARTC	-	-	3,142	1,126	4,267	2.0	5.9	2,557	1,170	3,727	5,699	2,296	**7,994**
Total	**35.0**	**59.8**	**35,209**	**12,954**	**48,163**	**35.0**	**59.8**	**27,171**	**11,815**	**38,986**	**62,380**	**24,769**	**87,149**

Table A.6 - Station Boardings By Mode of Access – LRT West Bank Option 3

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	469	506	267	100	19,171	20,513	0	4,805	-	-	10,709	15,514	235	2,655	133	50	14,940	18,014
7th/Alameda	396	93	0	25	0	514	1,400	2,335	-	-	0	3,735	898	1,214	0	12	0	2,125
Pacific/Harbor	1,000	255	0	73	0	1,328	1,249	825	-	-	0	2,074	1,124	540	0	37	0	1,701
Randolph/Pacific	2,033	1,014	0	123	0	3,170	0	2,693	-	-	0	2,693	1,017	1,853	0	62	0	2,932
Gage	2,668	180	0	203	0	3,051	2,232	624	-	-	0	2,856	2,450	402	0	101	0	2,954
Firestone	2,496	1,628	971	197	0	5,291	530	2,122	-	-	0	2,652	1,513	1,875	485	99	0	3,972
Gardendale	919	0	0	124	0	1,043	1,578	0	-	-	0	1,578	1,248	0	0	62	0	1,311
Green Line (new)	1,260	0	1,090	232	3,658	6,240	217	30	-	-	3,810	4,057	739	15	545	116	3,734	5,149
Paramount/Rosecrans	1,284	496	0	170	0	1,950	1,098	1,506	-	-	0	2,604	1,191	1,001	0	85	0	2,277
Bellflower Blvd.	2,105	51	1,093	254	0	3,503	1,800	156	-	-	0	1,956	1,953	103	547	127	0	2,730
183Rd St/Gridley Rd.	779	479	734	124	0	2,116	1,740	2,036	-	-	0	3,776	1,259	1,258	367	62	0	2,946
Pioneer Blvd.	886	217	848	185	0	2,136	801	1,641	-	-	0	2,442	843	929	424	92	0	2,289
Bloomfield	1,082	226	1,197	217	0	2,722	699	948	-	-	0	1,647	890	587	599	109	0	2,185
Cypress College	1,101	1,065	1,569	201	0	3,936	2,531	2,865	-	-	0	5,396	1,816	1,965	784	100	0	4,666
Knott	1,781	417	0	249	0	2,447	2,236	1,379	-	-	0	3,615	2,008	898	0	124	0	3,031
Beach	1,484	1,214	1,897	284	0	4,879	1,969	1,740	-	-	0	3,709	1,726	1,477	949	142	0	4,294
Brookhurst	1,172	751	1,630	252	0	3,805	1,665	1,419	-	-	0	3,084	1,419	1,085	815	126	0	3,445
Euclid	986	623	1,387	223	0	3,219	503	1,444	-	-	0	1,947	744	1,033	694	112	0	2,583
Harbor Blvd.	513	1,873	1,566	162	221	4,335	1,168	6,470	-	-	1	7,640	841	4,172	783	81	111	5,988
Harbor/1St Street	557	188	0	199	0	943	860	178	-	-	0	1,038	708	183	0	99	0	991
1St Street/Fairview Street	843	151	0	173	0	1,167	650	796	-	-	0	1,446	746	473	0	87	0	1,307
1St Street/Bristol Street	676	417	0	294	0	1,387	1,192	1,964	-	-	0	3,156	934	1,190	0	147	0	2,272
SARTC	764	1,127	5,017	239	307	7,454	659	7,776	-	-	99	8,534	712	4,452	2,509	119	203	7,994
Total	**27,254**	**12,969**	**19,266**	**4,304**	**23,356**	**87,149**	**26,778**	**45,752**	**-**	**-**	**14,619**	**87,149**	**27,016**	**29,360**	**9,633**	**2,152**	**18,988**	**87,149**

Table A.7 - Station Boardings and Times – Maglev West Bank Option 3

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	1.3	3.5	8,092	2,009	10,101	-	-	5,206	2,098	7,304	13,298	4,107	**17,404**
7th/Alameda	2.2	2.9	523	147	670	1.3	3.5	1,154	421	1,574	1,676	568	**2,244**
Pacific/Harbor	1.0	1.7	488	223	711	2.2	2.9	635	359	993	1,123	581	**1,704**
Randolph/Pacific	1.6	2.4	1,014	388	1,402	1.0	1.7	1,080	515	1,595	2,094	902	**2,996**
Gage	2.4	3.0	907	533	1,440	1.6	2.4	975	608	1,583	1,882	1,141	**3,023**
Firestone	2.4	2.9	1,421	458	1,879	2.4	3.0	1,522	643	2,165	2,943	1,101	**4,044**
Gardendale St	0.7	1.4	494	203	696	2.4	2.9	346	216	562	840	418	**1,258**
Green Line	0.6	2.0	2,137	707	2,844	0.7	1.4	1,439	531	1,970	3,576	1,238	**4,813**
Paramount/Rosecrans	2.1	2.8	1,067	497	1,564	0.6	2.0	507	251	757	1,574	748	**2,321**
Bellflower Blvd	2.4	3.0	1,143	507	1,649	2.1	2.8	674	405	1,079	1,817	911	**2,728**
183Rd St/Gridley Rd	0.7	1.4	1,253	482	1,734	2.4	3.0	796	432	1,228	2,048	914	**2,962**
Pioneer Blvd	1.5	2.1	941	372	1,313	0.7	1.4	702	322	1,024	1,643	694	**2,336**
Bloomfield	2.7	3.2	880	345	1,225	1.5	2.1	652	327	979	1,532	672	**2,204**
Cypress College	2.3	2.7	2,237	816	3,052	2.7	3.2	1,687	693	2,379	3,923	1,508	**5,431**
Beach Blvd	2.5	3.0	1,623	586	2,208	2.3	2.7	1,854	707	2,560	3,476	1,292	**4,768**
Brookhurst St	1.4	2.1	1,337	471	1,807	2.5	3.0	1,141	468	1,609	2,478	938	**3,416**
Euclid St	1.6	2.9	911	289	1,200	1.4	2.1	933	342	1,275	1,844	631	**2,475**
Harbor Blvd	-	-	5,043	1,667	6,710	1.6	2.9	2,248	911	3,159	7,291	2,578	**9,869**
Total	**29.4**	**43.0**	**31,506**	**10,695**	**42,201**	**29.4**	**43.0**	**23,547**	**10,243**	**33,790**	**55,053**	**20,938**	**75,991**

Table A.8 - Station Boardings By Mode of Access – Maglev West Bank Option 3

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	425	342	182	81	19,171	20,201	0	3,745	-	-	10,862	14,607	213	2,043	91	40	15,017	17,404
7th/Alameda	410	80	0	27	0	517	1,751	2,219	-	-	0	3,970	1,081	1,149	0	14	0	2,244
Pacific/Harbor	1,041	189	0	71	0	1,300	1,388	719	-	-	0	2,107	1,214	454	0	35	0	1,704
Randolph/Pacific	2,219	955	0	120	0	3,294	39	2,659	-	-	0	2,698	1,129	1,807	0	60	0	2,996
Gage	2,772	148	0	178	0	3,099	2,530	416	-	-	0	2,946	2,651	282	0	89	0	3,023
Firestone	2,881	1,398	938	194	0	5,411	590	2,087	-	-	0	2,677	1,735	1,743	469	97	0	4,044
Gardendale St	975	3	0	109	0	1,087	1,428	0	-	-	0	1,428	1,202	2	0	54	0	1,258
Green Line	1,176	0	857	176	3,703	5,912	230	17	-	-	3,467	3,714	703	9	428	88	3,585	4,813
Paramount/Rosecrans	1,414	368	0	161	0	1,942	1,614	1,086	-	-	0	2,700	1,514	727	0	80	0	2,321
Bellflower Blvd	2,177	55	1,025	218	0	3,475	1,809	171	-	-	0	1,980	1,993	113	513	109	0	2,728
183Rd St/Gridley Rd	817	477	689	121	0	2,105	1,742	2,076	-	-	0	3,818	1,280	1,276	345	61	0	2,962
Pioneer Blvd	958	222	828	171	0	2,179	869	1,624	-	-	0	2,493	914	923	414	86	0	2,336
Bloomfield	1,188	222	1,123	214	0	2,746	738	923	-	-	0	1,661	963	572	561	107	0	2,204
Cypress College	1,326	1,055	1,577	205	0	4,163	2,849	3,850	-	-	0	6,699	2,087	2,453	788	103	0	5,431
Beach Blvd	2,315	1,076	1,941	308	0	5,640	1,958	1,938	-	-	0	3,896	2,137	1,507	970	154	0	4,768
Brookhurst St	1,198	573	1,558	244	0	3,574	1,793	1,464	-	-	0	3,257	1,496	1,018	779	122	0	3,416
Euclid St	974	475	1,358	221	0	3,029	552	1,368	-	-	0	1,920	763	922	679	111	0	2,475
Harbor Blvd	450	1,393	1,534	162	2,777	6,317	1,081	9,794	-	-	2,545	13,420	766	5,594	767	81	2,661	9,869
Total	**24,718**	**9,030**	**13,610**	**2,981**	**25,651**	**75,991**	**22,962**	**36,155**	**-**	**-**	**16,874**	**75,991**	**23,840**	**22,592**	**6,805**	**1,491**	**21,263**	**75,991**

Table A.9 - Station Boardings and Times – BRT HOV Running

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
7th/Metro Center	2.7	15.5	3,555	1,524	5,079	-	-	445	797	1,241	3,555	1,524	**6,320**
Harbor Fwy/Exposition	2.0	3.2	280	286	565	4.5	13.5	2,949	394	3,343	280	286	**3,908**
Harbor Fwy/Slauson	2.5	4.2	234	334	568	1.9	2.7	123	380	502	234	334	**1,070**
Harbor Fwy/Manchester	1.5	2.5	1,348	591	1,938	1.6	2.2	131	301	432	1,348	591	**2,370**
Harbor Fwy/Century Fwy	9.7	11.8	2,275	520	2,794	2.3	3.2	1,165	208	1,372	2,275	520	**4,166**
Green Line Lakewood	2.1	2.3	2,259	740	2,999	9.7	11.8	1,644	426	2,070	2,259	740	**5,069**
Lakewood Blvd	1.2	2.5	946	224	1,170	2.1	2.3	597	130	727	946	224	**1,896**
Bellflower Blvd	2.4	3.8	1,123	281	1,404	1.2	2.5	476	159	635	1,123	281	**2,038**
183Rd St/Gridley Rd	0.7	1.9	803	387	1,190	2.4	3.8	786	280	1,066	803	387	**2,256**
Pioneer Blvd	1.4	2.7	917	288	1,204	0.7	1.9	427	152	579	917	288	**1,783**
Bloomfield	2.7	4.1	1,137	323	1,460	1.4	2.7	519	176	695	1,137	323	**2,154**
Cypress College	1.1	2.4	2,376	772	3,147	2.7	4.1	1,131	414	1,545	2,376	772	**4,692**
Knott Ave	1.2	2.5	1,048	386	1,434	1.1	2.4	1,132	352	1,484	1,048	386	**2,917**
Beach Blvd	1.2	2.5	933	290	1,223	1.2	2.5	1,008	245	1,253	933	290	**2,476**
Magnolia St	1.2	2.5	496	177	673	1.2	2.5	306	131	436	496	177	**1,109**
Brookhurst St	1.5	2.8	725	236	960	1.2	2.5	620	221	841	725	236	**1,801**
Euclid St	1.3	2.6	998	272	1,270	1.5	2.8	399	156	554	998	272	**1,824**
Harbor Blvd	1.0	2.6	2,838	1,017	3,855	1.3	2.6	1,495	538	2,033	2,838	1,017	**5,887**
Harbor/1St Street	1.0	2.7	188	94	282	1.0	2.6	353	102	455	188	94	**737**
1St Street/Fairview St	1.2	2.6	503	237	740	1.0	2.7	124	72	196	503	237	**935**
1St Street/Bristol St	2.0	6.6	2,517	696	3,212	1.2	2.6	188	122	309	2,517	696	**3,521**
SARTC	-	-	5,785	1,217	7,002	2.0	6.6	932	351	1,283	5,785	1,217	**8,284**
Total	**41.6**	**84.3**	**33,279**	**10,884**	**44,163**	**43.2**	**80.5**	**16,944**	**6,101**	**23,045**	**33,279**	**10,884**	**67,208**

Table A.10 - Station Boardings By Mode of Access – BRT HOV Running

Station Name	By Access			By Egress			Boardings		
	Walk/Bus/Rail	Drive	Total	Walk/Bus/Rail	Drive	Total	Walk/Bus/Rail	Drive	Total
7th/Metro Center	2,445	7,712	10,157	2,482	-	2,482	2,463	3,856	6,320
Harbor Fwy/Exposition	117	1,017	1,134	6,681	-	6,681	3,399	508	3,908
Harbor Fwy/Slauson	435	683	1,118	1,022	-	1,022	728	342	1,070
Harbor Fwy/Manchester	1,507	2,537	4,044	695	-	695	1,101	1,268	2,370
Harbor Fwy/Century Fwy	2,846	2,651	5,497	2,835	-	2,835	2,841	1,325	4,166
Green Line Lakewood	4,406	2,425	6,831	3,306	-	3,306	3,856	1,213	5,069
Lakewood Blvd	1,240	600	1,840	1,952	-	1,952	1,596	300	1,896
Bellflower Blvd	1,146	1,904	3,050	1,026	-	1,026	1,086	952	2,038
183Rd St/Gridley Rd	900	1,137	2,037	2,475	-	2,475	1,687	569	2,256
Pioneer Blvd	698	896	1,594	1,971	-	1,971	1,334	448	1,783
Bloomfield	940	1,788	2,728	1,580	-	1,580	1,260	894	2,154
Cypress College	1,624	1,151	2,775	6,608	-	6,608	4,116	575	4,692
Knott Ave	1,142	1,912	3,054	2,780	-	2,780	1,961	956	2,917
Beach Blvd	945	1,626	2,571	2,380	-	2,380	1,662	813	2,476
Magnolia St	637	698	1,335	882	-	882	759	349	1,109
Brookhurst St	1,194	973	2,167	1,435	-	1,435	1,314	487	1,801
Euclid St	793	1,400	2,193	1,454	-	1,454	1,123	700	1,824
Harbor Blvd	2,118	1,285	3,403	8,371	-	8,371	5,244	643	5,887
Harbor/1St Street	255	753	1,008	465	-	465	360	377	737
1St Street/Fairview St	297	630	927	943	-	943	620	315	935
1St Street/Bristol St	441	4,739	5,180	1,862	-	1,862	1,152	2,369	3,521
SARTC	2,178	387	2,565	14,003	-	14,003	8,091	193	8,284
Total	**28,303**	**38,905**	**67,208**	**67,208**	**-**	**67,208**	**47,755**	**19,453**	**67,208**

NOTE: This line is modeled as Transitway. Since the mode choice model currently outputs only station access volumes for transitway mode, the egress data in the above summary were estimated using transit assignment data. Use the egress data with caution.

Table A.11 - Station Boardings and Times – BRT Street Running

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	2.1	11.1	1,214	78	1,292	-	-	899	128	1,027	2,113	206	**2,319**
Metro Gold Line Soto	0.7	3.5	472	40	511	2.1	11.1	607	50	656	1,078	89	**1,167**
Soto St/Whittier Blvd	0.8	8.4	444	90	533	0.7	3.5	193	53	246	636	143	**779**
Soto St/Olympic Blvd	1.1	9.8	371	31	402	0.8	8.4	186	41	227	557	72	**629**
Soto St/Vernon Ave	1.7	8.3	492	73	565	1.1	9.8	108	46	154	600	119	**718**
Pacific Blvd/Sauson Ave	1.0	3.6	323	106	428	1.7	8.3	613	49	661	935	154	**1,089**
Pacific Blvd/Florence Ave	1.3	4.9	735	192	927	1.0	3.6	275	159	434	1,010	351	**1,361**
Long Beach Blvd/Firestone Blvd	2.1	7.9	967	90	1,057	1.3	4.9	899	97	996	1,866	187	**2,053**
Firestone Blvd/Atlantic	3.6	14.6	513	159	671	2.1	7.9	384	86	470	897	244	**1,141**
Firestone Blvd/Lakewood	2.1	7.8	527	250	776	3.6	14.6	1,066	189	1,255	1,593	438	**2,031**
Green Line Lakewood	2.1	2.3	3,898	1,271	5,168	2.1	7.8	1,334	391	1,725	5,232	1,661	**6,893**
Lakewood Blvd	1.2	2.5	889	188	1,077	2.1	2.3	546	97	643	1,435	285	**1,719**
Bellflower Blvd	2.4	3.8	1,116	250	1,365	1.2	2.5	371	130	500	1,486	379	**1,865**
183Rd St/Gridley Rd	0.7	1.9	676	351	1,027	2.4	3.8	551	315	865	1,226	666	**1,892**
Pioneer Blvd	1.4	2.7	754	194	948	0.7	1.9	297	102	398	1,050	296	**1,346**
Bloomfield	2.7	4.1	1,086	273	1,359	1.4	2.7	306	126	432	1,392	398	**1,790**
Cypress College	1.1	2.4	2,129	561	2,689	2.7	4.1	884	303	1,187	3,013	863	**3,876**
Knott Ave	1.2	2.5	855	305	1,159	1.1	2.4	938	279	1,217	1,793	583	**2,376**
Beach Blvd	1.2	2.5	748	228	975	1.2	2.5	749	206	954	1,496	433	**1,929**
Magnolia St	1.2	2.5	442	136	578	1.2	2.5	238	98	335	680	233	**913**
Brookhurst St	1.5	2.8	615	199	814	1.2	2.5	468	171	639	1,082	370	**1,452**
Euclid St	1.3	2.6	930	238	1,168	1.5	2.8	332	123	454	1,262	360	**1,622**
Harbor Blvd	1.0	2.6	2,317	714	3,031	1.3	2.6	1,168	384	1,552	3,485	1,098	**4,583**
Harbor/1St Street	1.0	2.7	170	75	245	1.0	2.6	338	96	434	508	171	**679**
1St Street/Fairview St	1.2	2.6	511	206	716	1.0	2.7	110	57	167	621	263	**883**
1St Street/Bristol St	2.0	6.6	2,428	533	2,961	1.2	2.6	145	86	230	2,573	618	**3,191**
SARTC	-	-	5,176	916	6,091	2.0	6.6	752	209	961	5,928	1,124	**7,052**
Total	**39.7**	**127.0**	**30,789**	**7,739**	**38,528**	**39.7**	**127.0**	**14,750**	**4,061**	**18,811**	**45,539**	**11,800**	**57,339**

Table A.12 - Station Boardings By Mode of Access – BRT Street Running

Station Name	By Access			By Egress			Boardings		
	Walk/Bus/Rail	Drive	Total	Walk/Bus/Rail	Drive	Total	Walk/Bus/Rail	Drive	Total
Union Station	2,584	0	2,584	2,053	-	2,053	2,319	0	2,319
Metro Gold Line Soto	524	962	1,486	848	-	848	686	481	1,167
Soto St/Whittier Blvd	474	206	680	877	-	877	675	103	779
Soto St/Olympic Blvd	34	514	548	709	-	709	372	257	629
Soto St/Vernon Ave	22	688	710	726	-	726	374	344	718
Pacific Blvd/Sauson Ave	0	624	624	1,554	-	1,554	777	312	1,089
Pacific Blvd/Florence Ave	1,424	555	1,979	742	-	742	1,083	278	1,361
Long Beach Blvd/Firestone Blvd	0	1,858	1,858	2,247	-	2,247	1,124	929	2,053
Firestone Blvd/Atlantic	224	1,128	1,352	929	-	929	576	564	1,141
Firestone Blvd/Lakewood	865	1,557	2,422	1,639	-	1,639	1,252	779	2,031
Green Line Lakewood	9,799	997	10,796	2,989	-	2,989	6,394	498	6,893
Lakewood Blvd	1,003	794	1,797	1,641	-	1,641	1,322	397	1,719
Bellflower Blvd	1,897	1,093	2,990	740	-	740	1,318	547	1,865
183Rd St/Gridley Rd	932	229	1,161	2,622	-	2,622	1,777	115	1,892
Pioneer Blvd	571	757	1,328	1,363	-	1,363	967	379	1,346
Bloomfield	1,366	1,064	2,430	1,150	-	1,150	1,258	532	1,790
Cypress College	1,284	637	1,921	5,830	-	5,830	3,557	319	3,876
Knott Ave	1,454	1,074	2,528	2,223	-	2,223	1,839	537	2,376
Beach Blvd	1,066	898	1,964	1,894	-	1,894	1,480	449	1,929
Magnolia St	810	312	1,122	703	-	703	757	156	913
Brookhurst St	1,244	510	1,754	1,150	-	1,150	1,197	255	1,452
Euclid St	1,105	876	1,981	1,262	-	1,262	1,183	438	1,622
Harbor Blvd	2,093	339	2,432	6,733	-	6,733	4,413	170	4,583
Harbor/1St Street	361	598	959	398	-	398	380	299	679
1St Street/Fairview St	420	511	931	835	-	835	627	256	883
1St Street/Bristol St	3,602	1,479	5,081	1,300	-	1,300	2,451	739	3,191
SARTC	1,071	850	1,921	12,182	-	12,182	6,627	425	7,052
Total	**36,229**	**21,110**	**57,339**	**57,339**	**-**	**57,339**	**46,784**	**10,555**	**57,339**

NOTE: This line is modeled as Transitway. Since the mode choice model currently outputs only station access volumes for transitway mode, the egress data in the above summary were estimated using transit assignment data. Use the egress data with caution.

APPENDIX B. SENSITIVITY RUNS – BOARDINGS BY STATION AND MODE OF ACCESS

Table B.1 - Station Boardings and Times – Streetcar Alternative – West Bank Option 3

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	1.3	2.6	7,165	1,871	9,036	-	-	4,699	1,940	6,639	11,864	3,811	**15,674**
7th/Alameda	2.3	3.8	523	142	665	1.3	2.6	984	364	1,348	1,507	505	**2,012**
Pacific/Harbor	1.5	2.8	471	204	675	2.3	3.8	604	340	944	1,074	544	**1,618**
Randolph/Pacific	1.2	2.3	965	377	1,341	1.5	2.8	1,018	476	1,494	1,983	852	**2,835**
Gage	2.7	4.3	847	501	1,348	1.2	2.3	948	576	1,524	1,795	1,077	**2,871**
Firestone	2.2	3.7	1,341	431	1,772	2.7	4.3	1,382	598	1,980	2,722	1,029	**3,751**
Gardendale	0.7	1.7	538	195	733	2.2	3.7	338	199	537	876	394	**1,269**
Green Line (new)	0.7	1.9	1,803	698	2,501	0.7	1.7	1,383	520	1,903	3,186	1,218	**4,404**
Paramount/Rosecrans	2.4	3.9	936	482	1,417	0.7	1.9	478	240	718	1,414	721	**2,135**
Bellflower Blvd.	2.4	3.9	1,139	489	1,627	2.4	3.9	601	359	960	1,739	848	**2,587**
183Rd St/Gridley Rd.	0.7	1.7	1,150	440	1,590	2.4	3.9	767	406	1,172	1,917	845	**2,762**
Pioneer Blvd.	1.4	2.7	914	323	1,237	0.7	1.7	610	292	902	1,524	615	**2,139**
Bloomfield	2.7	4.4	849	322	1,170	1.4	2.7	606	296	901	1,454	617	**2,071**
Cypress College	1.1	2.2	1,742	629	2,370	2.7	4.4	1,401	570	1,971	3,142	1,199	**4,341**
Knott	1.2	2.3	967	426	1,393	1.1	2.2	879	360	1,239	1,845	786	**2,631**
Beach	1.2	2.3	1,259	455	1,714	1.2	2.3	1,474	603	2,077	2,733	1,058	**3,791**
Magnolia	1.2	2.4	428	221	649	1.2	2.3	422	193	615	850	414	**1,264**
Brookhurst	1.5	2.7	1,258	451	1,709	1.2	2.4	938	361	1,299	2,196	812	**3,007**
Euclid	1.3	2.5	971	341	1,312	1.5	2.7	793	256	1,049	1,764	597	**2,360**
Harbor Blvd.	1.0	2.4	2,685	880	3,565	1.3	2.5	1,452	438	1,890	4,137	1,318	**5,455**
Harbor/1St Street	1.0	2.3	312	168	479	1.0	2.4	288	146	434	600	314	**913**
1St Street/Fairview Street	1.2	2.3	501	241	741	1.0	2.3	320	139	458	820	379	**1,199**
1St Street/Bristol Street	2.0	6.2	754	589	1,343	1.2	2.3	396	203	598	1,149	792	**1,941**
SARTC	-	-	2,689	989	3,677	2.0	6.2	1,929	970	2,899	4,618	1,959	**6,576**
Total	**34.9**	**67.3**	**32,198**	**11,859**	**44,057**	**34.9**	**67.3**	**24,704**	**10,840**	**35,544**	**56,902**	**22,699**	**79,601**

Table B.2 - Station Boardings By Mode of Access – Streetcar Alternative – West Bank Option 3

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	369	302	165	72	17,163	18,071	0	3,393	-	-	9,884	13,277	185	1,847	83	36	13,524	15,674
7th/Alameda	375	81	0	23	0	479	1,675	1,870	-	-	0	3,545	1,025	976	0	12	0	2,012
Pacific/Harbor	955	248	0	62	0	1,265	1,336	635	-	-	0	1,971	1,145	442	0	31	0	1,618
Randolph/Pacific	2,073	874	0	110	0	3,057	37	2,575	-	-	0	2,612	1,055	1,725	0	55	0	2,835
Gage	2,654	137	0	166	0	2,958	2,407	377	-	-	0	2,784	2,530	257	0	83	0	2,871
Firestone	2,654	1,309	870	173	0	5,005	558	1,939	-	-	0	2,497	1,606	1,624	435	86	0	3,751
Gardendale	898	3	0	95	0	996	1,542	0	-	-	0	1,542	1,220	2	0	48	0	1,269
Green Line (new)	1,096	0	771	160	3,516	5,543	198	12	-	-	3,055	3,265	647	6	386	80	3,285	4,404
Paramount/Rosecrans	1,329	336	0	144	0	1,810	1,567	892	-	-	0	2,459	1,448	614	0	72	0	2,135
Bellflower Blvd.	2,056	52	943	200	0	3,251	1,773	149	-	-	0	1,922	1,915	100	471	100	0	2,587
183Rd St/Gridley Rd.	763	472	645	105	0	1,985	1,636	1,902	-	-	0	3,538	1,199	1,187	323	53	0	2,762
Pioneer Blvd.	909	172	778	157	0	2,015	810	1,452	-	-	0	2,262	859	812	389	78	0	2,139
Bloomfield	1,116	199	1,041	175	0	2,531	687	924	-	-	0	1,611	902	561	520	88	0	2,071
Cypress College	1,151	871	1,479	170	0	3,672	2,560	2,449	-	-	0	5,009	1,856	1,660	740	85	0	4,341
Knott	1,449	295	0	191	0	1,935	2,182	1,145	-	-	0	3,327	1,816	720	0	96	0	2,631
Beach	1,299	765	1,782	216	0	4,061	2,190	1,330	-	-	0	3,520	1,744	1,047	891	108	0	3,791
Magnolia	1,454	287	0	198	0	1,939	300	288	-	-	0	588	877	288	0	99	0	1,264
Brookhurst	985	495	1,481	198	0	3,159	1,774	1,081	-	-	0	2,855	1,379	788	741	99	0	3,007
Euclid	954	473	1,254	187	0	2,867	589	1,264	-	-	0	1,853	771	868	627	93	0	2,360
Harbor Blvd.	575	1,547	1,428	141	296	3,988	1,220	5,700	-	-	1	6,921	897	3,624	714	71	149	5,455
Harbor/1St Street	507	190	0	158	0	854	747	225	-	-	0	972	627	207	0	79	0	913
1St Street/Fairview Street	806	133	0	148	0	1,088	617	693	-	-	0	1,310	711	413	0	74	0	1,199
1St Street/Bristol Street	636	390	0	247	0	1,274	921	1,686	-	-	0	2,607	779	1,038	0	124	0	1,941
SARTC	551	710	4,098	169	270	5,798	1,369	5,859	-	-	126	7,354	960	3,285	2,049	84	198	6,576
Total	**27,613**	**10,343**	**16,735**	**3,666**	**21,245**	**79,601**	**28,696**	**37,839**	**-**	**-**	**13,066**	**79,601**	**28,155**	**24,091**	**8,367**	**1,833**	**17,156**	**79,601**

Table B.3 - Station Boardings and Times – LRT Alternative – West Bank Option 3 - All Grade Separated

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	1.3	2.4	8,389	2,258	10,647	-	-	5,788	2,374	8,162	14,177	4,632	**18,809**
7th/Alameda	2.3	3.0	539	147	685	1.3	2.4	1,117	407	1,523	1,655	553	**2,208**
Pacific/Harbor	1.5	2.7	508	217	725	2.3	3.0	649	362	1,011	1,157	579	**1,736**
Randolph/Pacific	1.2	2.1	1,011	396	1,407	1.5	2.7	1,067	527	1,594	2,078	923	**3,000**
Gage	2.7	3.5	893	530	1,423	1.2	2.1	993	607	1,600	1,886	1,137	**3,023**
Firestone	2.2	3.1	1,435	477	1,911	2.7	3.5	1,509	652	2,160	2,943	1,128	**4,071**
Gardendale	0.7	1.7	564	201	765	2.2	3.1	367	214	580	931	415	**1,345**
Green Line (new)	0.7	1.9	2,264	791	3,055	0.7	1.7	1,594	585	2,178	3,857	1,376	**5,233**
Paramount/Rosecrans	2.4	3.2	1,024	513	1,537	0.7	1.9	523	257	780	1,546	770	**2,316**
Bellflower Blvd.	2.4	3.2	1,186	529	1,714	2.4	3.2	658	400	1,058	1,844	928	**2,772**
183Rd St/Gridley Rd.	0.7	1.7	1,246	485	1,731	2.4	3.2	811	442	1,253	2,057	927	**2,984**
Pioneer Blvd.	1.4	2.3	981	370	1,351	0.7	1.7	665	311	976	1,646	681	**2,327**
Bloomfield	2.7	3.5	912	352	1,264	1.4	2.3	621	328	949	1,533	680	**2,213**
Cypress College	1.1	2.0	1,875	689	2,564	2.7	3.5	1,524	640	2,164	3,399	1,329	**4,728**
Knott	1.2	2.1	1,166	512	1,678	1.1	2.0	988	404	1,392	2,153	916	**3,069**
Beach	2.5	3.3	1,574	574	2,148	1.2	2.1	1,586	606	2,192	3,160	1,180	**4,340**
Brookhurst	1.5	2.4	1,353	518	1,870	2.5	3.3	1,158	469	1,627	2,511	987	**3,497**
Euclid	1.3	2.2	997	357	1,354	1.5	2.4	935	327	1,262	1,932	683	**2,615**
Harbor Blvd.	1.0	2.3	3,043	944	3,987	1.3	2.2	1,601	487	2,088	4,644	1,431	**6,075**
Harbor/1St Street	1.0	2.3	327	209	536	1.0	2.3	316	162	478	643	371	**1,014**
1St Street/Fairview Street	1.2	2.1	554	267	821	1.0	2.3	345	157	502	899	424	**1,323**
1St Street/Bristol Street	2.0	4.1	784	662	1,445	1.2	2.1	429	235	664	1,213	896	**2,109**
SARTC	-	-	3,435	1,313	4,748	2.0	4.1	2,744	1,268	4,012	6,179	2,581	**8,760**
	35.0	**57.2**	**36,054**	**13,307**	**49,361**	**35.0**	**57.2**	**27,984**	**12,216**	**40,200**	**64,038**	**25,523**	**89,561**

Table B.4 - Station Boardings By Mode of Access – LRT Alternative – West Bank Option 3 - All Grade Separated

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	417	340	186	81	20,270	21,294	0	3,978	-	-	12,345	16,323	209	2,159	93	41	16,308	18,809
7th/Alameda	416	88	0	27	0	531	1,792	2,093	-	-	0	3,885	1,104	1,091	0	14	0	2,208
Pacific/Harbor	1,034	265	0	69	0	1,367	1,397	707	-	-	0	2,104	1,215	486	0	34	0	1,736
Randolph/Pacific	2,207	930	0	118	0	3,255	38	2,707	-	-	0	2,745	1,122	1,819	0	59	0	3,000
Gage	2,799	148	0	178	0	3,124	2,520	402	-	-	0	2,922	2,659	275	0	89	0	3,023
Firestone	2,859	1,419	956	190	0	5,424	599	2,119	-	-	0	2,718	1,729	1,769	478	95	0	4,071
Gardendale	966	4	0	106	0	1,076	1,614	0	-	-	0	1,614	1,290	2	0	53	0	1,345
Green Line (new)	1,181	0	848	173	4,126	6,327	237	15	-	-	3,886	4,138	709	8	424	86	4,006	5,233
Paramount/Rosecrans	1,455	369	0	162	0	1,986	1,633	1,013	-	-	0	2,646	1,544	691	0	81	0	2,316
Bellflower Blvd.	2,234	56	1,060	222	0	3,572	1,808	163	-	-	0	1,971	2,021	110	530	111	0	2,772
183Rd St/Gridley Rd.	819	513	707	114	0	2,154	1,743	2,070	-	-	0	3,813	1,281	1,292	354	57	0	2,984
Pioneer Blvd.	972	202	834	169	0	2,177	865	1,611	-	-	0	2,476	918	906	417	85	0	2,327
Bloomfield	1,203	218	1,144	198	0	2,764	727	935	-	-	0	1,662	965	576	572	99	0	2,213
Cypress College	1,233	958	1,603	198	0	3,992	2,693	2,770	-	-	0	5,463	1,963	1,864	802	99	0	4,728
Knott	1,892	352	0	226	0	2,470	2,375	1,293	-	-	0	3,668	2,133	823	0	113	0	3,069
Beach	1,738	993	1,934	276	0	4,942	2,221	1,517	-	-	0	3,738	1,980	1,255	967	138	0	4,340
Brookhurst	1,359	614	1,647	243	0	3,863	1,914	1,217	-	-	0	3,131	1,636	915	824	121	0	3,497
Euclid	1,146	536	1,366	217	0	3,266	620	1,344	-	-	0	1,964	883	940	683	109	0	2,615
Harbor Blvd.	611	1,714	1,585	163	302	4,375	1,334	6,437	-	-	2	7,774	973	4,076	792	82	152	6,075
Harbor/1St Street	557	215	0	184	0	955	792	280	-	-	0	1,072	675	247	0	92	0	1,014
1St Street/Fairview Street	865	149	0	163	0	1,177	659	809	-	-	0	1,468	762	479	0	81	0	1,323
1St Street/Bristol Street	715	447	0	285	0	1,447	868	1,902	-	-	0	2,770	791	1,174	0	143	0	2,109
SARTC	735	962	5,621	232	474	8,023	1,685	7,636	-	-	176	9,496	1,210	4,299	2,810	116	325	8,760
Total	**29,412**	**11,491**	**19,493**	**3,993**	**25,172**	**89,561**	**30,135**	**43,017**	**-**	**-**	**16,409**	**89,561**	**29,773**	**27,254**	**9,746**	**1,997**	**20,790**	**89,561**

Table B.5 - Station Boardings and Times – Maglev Alternative – West Bank Option 3 with Private Fare

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	1.3	3.5	858	97	955	-	-	830	356	1,185	1,687	453	**2,140**
7th/Alameda	2.2	2.9	190	4	194	1.3	3.5	169	94	262	358	98	**456**
Pacific/Harbor	1.0	1.7	135	13	147	2.2	2.9	41	15	56	176	28	**203**
Randolph/Pacific	1.6	2.4	161	14	175	1.0	1.7	76	57	132	237	71	**307**
Gage	2.4	3.0	65	12	77	1.6	2.4	30	13	43	95	24	**119**
Firestone	2.4	2.9	146	29	175	2.4	3.0	92	47	139	237	76	**313**
Gardendale St	0.7	1.4	5	6	11	2.4	2.9	11	6	17	16	12	**27**
Green Line	0.6	2.0	62	24	86	0.7	1.4	147	38	184	209	61	**270**
Paramount/Rosecrans	2.1	2.8	69	14	82	0.6	2.0	45	17	62	114	30	**144**
Bellflower Blvd	2.4	3.0	122	34	156	2.1	2.8	29	20	49	151	53	**204**
183Rd St/Gridley Rd	0.7	1.4	102	24	125	2.4	3.0	85	46	131	187	70	**256**
Pioneer Blvd	1.5	2.1	100	27	126	0.7	1.4	73	32	104	172	58	**230**
Bloomfield	2.7	3.2	109	32	141	1.5	2.1	99	52	150	208	84	**291**
Cypress College	2.3	2.7	211	68	279	2.7	3.2	268	109	377	479	177	**656**
Beach Blvd	2.5	3.0	133	45	177	2.3	2.7	332	118	449	464	162	**626**
Brookhurst St	1.4	2.1	122	32	154	2.5	3.0	240	89	329	362	121	**483**
Euclid St	1.6	2.9	109	28	137	1.4	2.1	192	68	260	301	96	**397**
Harbor Blvd	-	-	376	151	527	1.6	2.9	407	203	610	783	354	**1,137**
	29.4	**43.0**	**3,070**	**650**	**3,720**	**29.4**	**43.0**	**3,162**	**1,373**	**4,535**	**6,232**	**2,023**	**8,255**

Table B.6 - Station Boardings By Mode of Access – Maglev Alternative – West Bank Option 3 with Private Fare

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	587	472	252	112	486	1,909	0	1,623	-	-	747	2,370	294	1,047	126	56	617	2,140
7th/Alameda	8	2	0	1	0	10	397	504	-	-	0	901	203	253	0	0	0	456
Pacific/Harbor	23	4	0	2	0	29	248	129	-	-	0	377	136	66	0	1	0	203
Randolph/Pacific	64	28	0	3	0	95	7	512	-	-	0	519	36	270	0	2	0	307
Gage	91	5	0	6	0	102	117	19	-	-	0	136	104	12	0	3	0	119
Firestone	169	82	55	11	0	317	68	241	-	-	0	309	118	161	27	6	0	313
Gardendale St	36	0	0	4	0	40	14	0	-	-	0	14	25	0	0	2	0	27
Green Line	98	0	72	15	5	190	114	8	-	-	226	349	106	4	36	7	116	270
Paramount/Rosecrans	60	16	0	7	0	83	122	82	-	-	0	204	91	49	0	3	0	144
Bellflower Blvd	164	4	77	16	0	261	134	13	-	-	0	147	149	8	39	8	0	204
183Rd St/Gridley Rd	87	51	73	13	0	223	132	157	-	-	0	289	109	104	37	6	0	256
Pioneer Blvd	113	26	98	20	0	257	71	132	-	-	0	203	92	79	49	10	0	230
Bloomfield	186	35	176	34	0	431	67	84	-	-	0	151	127	59	88	17	0	291
Cypress College	248	198	295	38	0	780	226	305	-	-	0	531	237	251	148	19	0	656
Beach Blvd	407	189	341	54	0	992	131	129	-	-	0	260	269	159	171	27	0	626
Brookhurst St	250	120	326	51	0	747	120	98	-	-	0	218	185	109	163	26	0	483
Euclid St	183	89	255	42	0	569	64	160	-	-	0	224	124	124	128	21	0	397
Harbor Blvd	135	418	460	48	159	1,220	104	940	-	-	10	1,053	119	679	230	24	84	1,137
Total	**2,911**	**1,737**	**2,480**	**477**	**650**	**8,255**	**2,137**	**5,135**	**-**	**-**	**983**	**8,255**	**2,524**	**3,436**	**1,240**	**238**	**816**	**8,255**

Table B.7 - Station Boardings and Times – LRT Alternative – MOS 1

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	1.3	2.5	2,660	401	3,060	-	-	1,759	628	2,387	4,419	1,029	**5,447**
7th/Alameda	2.3	3.4	476	116	592	1.3	2.5	543	270	812	1,018	386	**1,404**
Pacific/Harbor	1.5	2.8	422	176	597	2.3	3.4	519	289	808	940	465	**1,405**
Randolph/Pacific	1.2	2.3	835	314	1,149	1.5	2.8	940	394	1,334	1,775	708	**2,482**
Gage	2.7	3.8	740	438	1,177	1.2	2.3	902	516	1,418	1,642	953	**2,595**
Firestone	2.2	3.3	911	249	1,159	2.7	3.8	1,279	530	1,809	2,190	779	**2,968**
Gardendale	0.7	1.7	486	165	650	2.2	3.3	301	178	479	787	343	**1,129**
Green Line (new)	-	-	886	249	1,135	0.7	1.7	730	325	1,055	1,616	574	**2,190**
Total	**11.9**	**19.8**	**7,413**	**2,105**	**9,518**	**11.9**	**19.8**	**6,971**	**3,129**	**10,100**	**14,384**	**5,234**	**19,618**

Table B.8 - Station Boardings By Mode of Access – LRT Alternative – MOS 1

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	507	413	226	99	4,875	6,120	0	2,653	-	-	2,121	4,774	254	1,533	113	49	3,498	5,447
7th/Alameda	240	51	0	16	0	306	1,154	1,347	-	-	0	2,501	697	699	0	8	0	1,404
Pacific/Harbor	818	209	0	54	0	1,082	1,146	581	-	-	0	1,727	982	395	0	27	0	1,405
Randolph/Pacific	1,806	761	0	96	0	2,663	32	2,269	-	-	0	2,301	919	1,515	0	48	0	2,482
Gage	2,321	123	0	147	0	2,591	2,241	357	-	-	0	2,598	2,281	240	0	74	0	2,595
Firestone	2,028	1,007	678	135	0	3,848	461	1,627	-	-	0	2,088	1,244	1,317	339	67	0	2,968
Gardendale	807	3	0	88	0	899	1,359	0	-	-	0	1,359	1,083	2	0	44	0	1,129
Green Line (new)	926	0	665	135	382	2,109	520	33	-	-	1,717	2,270	723	17	333	68	1,050	2,190
Total	**9,454**	**2,567**	**1,570**	**771**	**5,257**	**19,618**	**6,912**	**8,868**	**-**	**-**	**3,838**	**19,618**	**8,183**	**5,718**	**785**	**385**	**4,547**	**19,618**

Table B.9 - Station Boardings and Times – LRT Alternative – MOS 2

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Green Line (new)	0.7	1.9	1,451	319	1,770	-	-	705	203	908	2,156	522	**2,678**
Paramount/Rosecrans	2.4	3.2	395	250	645	0.7	1.9	221	140	361	616	390	**1,005**
Bellflower Blvd.	2.4	3.2	697	277	973	2.4	3.2	327	169	496	1,024	446	**1,469**
183Rd St/Gridley Rd.	0.7	1.7	729	279	1,007	2.4	3.2	542	240	782	1,271	519	**1,789**
Pioneer Blvd.	1.4	2.3	623	203	825	0.7	1.7	417	180	597	1,039	383	**1,422**
Bloomfield	-	-	1,375	303	1,678	1.4	2.3	778	242	1,020	2,153	545	**2,697**
Total	**7.6**	**12.3**	**5,268**	**1,629**	**6,897**	**7.6**	**12.3**	**2,989**	**1,173**	**4,162**	**8,257**	**2,802**	**11,059**

Table B.10 - Station Boardings By Mode of Access – LRT Alternative – MOS 2

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Green Line (new)	868	0	623	127	1,922	3,540	177	11	-	-	1,627	1,815	522	6	312	63	1,775	2,678
Paramount/Rosecrans	696	176	0	78	0	950	654	406	-	-	0	1,060	675	291	0	39	0	1,005
Bellflower Blvd.	1,147	29	544	114	0	1,834	1,013	91	-	-	0	1,104	1,080	60	272	57	0	1,469
183Rd St/Gridley Rd.	492	308	425	69	0	1,294	1,044	1,240	-	-	0	2,284	768	774	212	34	0	1,789
Pioneer Blvd.	626	130	537	109	0	1,402	503	938	-	-	0	1,441	565	534	269	54	0	1,422
Bloomfield	888	161	844	146	0	2,039	1,468	1,887	-	-	0	3,355	1,178	1,024	422	73	0	2,697
Total	**4,717**	**804**	**2,974**	**642**	**1,922**	**11,059**	**4,859**	**4,573**	**-**	**-**	**1,627**	**11,059**	**4,788**	**2,688**	**1,487**	**321**	**1,775**	**11,059**

Table B.11 - Station Boardings and Times – LRT Alternative – MOS 3

Station Name	Southbound (Read Down)		Southbound Boardings			Northbound (Read Up)		Northbound Boardings			Total Boardings		
	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Dist (mi)	Time (min)	Peak	Off-Peak	Daily	Peak	Off-Peak	Daily
Union Station	1.3	2.5	5,014	1,030	6,043	-	-	3,077	1,143	4,220	8,091	2,173	**10,263**
7th/Alameda	2.3	3.4	505	127	632	1.3	2.5	715	308	1,023	1,220	435	**1,655**
Pacific/Harbor	1.5	2.8	444	192	636	2.3	3.4	569	310	878	1,012	502	**1,514**
Randolph/Pacific	1.2	2.3	927	346	1,273	1.5	2.8	1,012	443	1,455	1,939	789	**2,728**
Gage	2.7	3.8	807	471	1,278	1.2	2.3	916	542	1,457	1,723	1,012	**2,735**
Firestone	2.2	3.3	1,145	352	1,497	2.7	3.8	1,386	593	1,979	2,531	945	**3,476**
Gardendale	0.7	1.7	553	206	758	2.2	3.3	359	202	561	911	408	**1,319**
Green Line (new)	0.7	1.9	342	204	545	0.7	1.7	418	198	615	759	401	**1,160**
Paramount/Rosecrans	2.4	3.2	890	413	1,302	0.7	1.9	452	214	666	1,342	626	**1,968**
Bellflower Blvd.	2.4	3.2	904	361	1,265	2.4	3.2	652	346	998	1,556	707	**2,263**
183Rd St/Gridley Rd.	0.7	1.7	997	414	1,411	2.4	3.2	820	382	1,202	1,817	796	**2,613**
Pioneer Blvd.	1.4	2.3	938	312	1,250	0.7	1.7	632	291	923	1,570	603	**2,173**
Bloomfield	-	-	2,573	729	3,302	1.4	2.3	1,186	439	1,625	3,759	1,168	**4,926**
Total	**19.5**	**32.2**	**16,035**	**5,153**	**21,188**	**19.5**	**32.2**	**12,191**	**5,409**	**17,600**	**28,226**	**10,562**	**38,788**

Table B.12 - Station Boardings By Mode of Access – LRT Alternative – MOS 3

Station Name	By Access						By Egress						Boardings					
	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total	Walk	Bus	PNR	KNR	Rail	Total
Union Station	414	337	185	81	11,069	12,086	0	3,240	-	-	5,200	8,440	207	1,789	92	40	8,135	10,263
7th/Alameda	301	64	0	20	0	384	1,349	1,576	-	-	0	2,925	825	820	0	10	0	1,655
Pacific/Harbor	886	227	0	59	0	1,171	1,232	624	-	-	0	1,856	1,059	425	0	29	0	1,514
Randolph/Pacific	1,978	833	0	106	0	2,917	35	2,503	-	-	0	2,538	1,006	1,668	0	53	0	2,728
Gage	2,520	133	0	160	0	2,813	2,291	365	-	-	0	2,656	2,405	249	0	80	0	2,735
Firestone	2,413	1,198	807	160	0	4,578	523	1,850	-	-	0	2,373	1,468	1,524	403	80	0	3,476
Gardendale	993	4	0	109	0	1,106	1,531	0	-	-	0	1,531	1,262	2	0	54	0	1,319
Green Line (new)	1,030	0	739	151	0	1,920	376	24	-	-	0	400	703	12	370	75	0	1,160
Paramount/Rosecrans	1,070	271	0	119	0	1,460	1,528	947	-	-	0	2,475	1,299	609	0	60	0	1,968
Bellflower Blvd.	1,822	46	865	181	0	2,914	1,478	133	-	-	0	1,611	1,650	90	432	90	0	2,263
183Rd St/Gridley Rd.	808	506	698	113	0	2,125	1,417	1,683	-	-	0	3,100	1,113	1,095	349	56	0	2,613
Pioneer Blvd.	922	191	791	160	0	2,065	796	1,484	-	-	0	2,280	859	837	396	80	0	2,173
Bloomfield	1,415	256	1,345	233	0	3,249	2,890	3,713	-	-	0	6,603	2,152	1,984	673	117	0	4,926
Total	**16,571**	**4,067**	**5,430**	**1,650**	**11,069**	**38,788**	**15,446**	**18,142**	**0**	**0**	**5,200**	**38,788**	**16,009**	**11,104**	**2,715**	**825**	**8,135**	**38,788**

Appendix C: Air Quality and Climate Change Technical Results

Pacific Electric Right of Way (PEROW) Alternative's Analysis

Air Quality and Climate Change Technical Attachment -

Operational Impacts

Attachment 1: Annual Emissions Impacts

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\Harbor Green Line\060311\Air Quality\Emissions\Appendix B-2 Urbemis Modeling Files\No Build Alt Regional VMT\HGL No Build.urb924

Project Name: PEROW - No Build Alternative

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,634.32	28,158.93	291,874.86	994.96	171,236.69	33,145.18	100,679,564.47
TOTALS (tons/year, unmitigated)	25,634.32	28,158.93	291,874.86	994.96	171,236.69	33,145.18	100,679,564.47

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,488.70	54,393,018.94	543,930,189.36
					54,393,018.94	543,930,189.36

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_TSM Alt.urb924

Project Name: PEROW - TSM Alternative

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,598.68	28,119.78	291,469.09	993.57	170,998.64	33,099.10	100,539,600.11
TOTALS (tons/year, unmitigated)	25,598.68	28,119.78	291,469.09	993.57	170,998.64	33,099.10	100,539,600.11

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,481.07	54,317,401.96	543,174,019.58
					54,317,401.96	543,174,019.58

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_BRT HOV.urb924

Project Name: PEROW - BRT HOV

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,561.28	28,078.69	291,043.15	992.12	170,748.75	33,050.73	100,392,676.49
TOTALS (tons/year, unmitigated)	25,561.28	28,078.69	291,043.15	992.12	170,748.75	33,050.73	100,392,676.49

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,473.06	54,238,025.18	542,380,251.81
					54,238,025.18	542,380,251.81

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_BRT Street.urb924

Project Name: PEROW - BRT Street

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,577.20	28,096.19	291,224.50	992.74	170,855.14	33,071.32	100,455,229.19
TOTALS (tons/year, unmitigated)	25,577.20	28,096.19	291,224.50	992.74	170,855.14	33,071.32	100,455,229.19

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,476.47	54,271,819.83	542,718,198.29
					54,271,819.83	542,718,198.29

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_LRT East Bank.urb924

Project Name: PEROW - LRT East Bank

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,559.69	28,076.95	291,025.08	992.06	170,738.15	33,048.68	100,386,442.71
TOTALS (tons/year, unmitigated)	25,559.69	28,076.95	291,025.08	992.06	170,738.15	33,048.68	100,386,442.71

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,472.72	54,234,657.33	542,346,573.29
					54,234,657.33	542,346,573.29

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_LRT West Bank 2.urb924

Project Name: PEROW - LRT West Bank 2

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,562.16	28,079.67	291,053.25	992.16	170,754.68	33,051.87	100,396,160.59
TOTALS (tons/year, unmitigated)	25,562.16	28,079.67	291,053.25	992.16	170,754.68	33,051.87	100,396,160.59

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,473.25	54,239,907.50	542,399,075.00
					54,239,907.50	542,399,075.00

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

11/7/2011 9:52:02 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:53:03 AM

Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_LRT West Bank 3.urb924

Project Name: PEROW - LRT West Bank 3

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,560.30	28,077.61	291,031.99	992.08	170,742.20	33,049.46	100,388,825.16
TOTALS (tons/year, unmitigated)	25,560.30	28,077.61	291,031.99	992.08	170,742.20	33,049.46	100,388,825.16

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,472.85	54,235,944.47	542,359,444.68
					54,235,944.47	542,359,444.68

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_MagLev.urb924

Project Name: PEROW - MagLev West Bank 3

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,565.06	28,082.85	291,086.23	992.27	170,774.02	33,055.62	100,407,535.44
TOTALS (tons/year, unmitigated)	25,565.06	28,082.85	291,086.23	992.27	170,774.02	33,055.62	100,407,535.44

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,473.87	54,246,052.86	542,460,528.61
					54,246,052.86	542,460,528.61

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Annual Operational Unmitigated Emissions (Tons/Year)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_Street Car.urb924

Project Name: PEROW - Street Car West Bank 3

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	25,566.55	28,084.49	291,103.24	992.33	170,784.00	33,057.55	100,413,402.00
TOTALS (tons/year, unmitigated)	25,566.55	28,084.49	291,103.24	992.33	170,784.00	33,057.55	100,413,402.00

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,474.19	54,249,222.32	542,492,223.19
					54,249,222.32	542,492,223.19

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

Attachment 2: Daily Emissions Impacts

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Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\Harbor Green Line\060311\Air Quality\Emissions\Appendix B-2 Urbemis Modeling Files\No Build Alt Regional VMT\HGL No Build.urb924

Project Name: PEROW - No Build Alternative

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,788.75	144,697.65	1,634,870.21	5,770.04	938,283.25	181,617.40	569,880,302.48
TOTALS (lbs/day, unmitigated)	133,788.75	144,697.65	1,634,870.21	5,770.04	938,283.25	181,617.40	569,880,302.48

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,488.70	54,393,018.94	543,930,189.36
					54,393,018.94	543,930,189.36

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:44:43 AM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_TSM Alt.urb924

Project Name: PEROW - TSM Alternative

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,602.75	144,496.49	1,632,597.42	5,762.02	936,978.85	181,364.91	569,088,056.96
TOTALS (lbs/day, unmitigated)	133,602.75	144,496.49	1,632,597.42	5,762.02	936,978.85	181,364.91	569,088,056.96

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,481.07	54,317,401.96	543,174,019.58
					54,317,401.96	543,174,019.58

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Regional VMT				2.0	1.0	97.0

11/7/2011 9:44:43 AM

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:46:00 AM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_BRT HOV.urb924

Project Name: PEROW - BRT HOV

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,407.51	144,285.33	1,630,211.63	5,753.60	935,609.60	181,099.88	568,256,419.68
TOTALS (lbs/day, unmitigated)	133,407.51	144,285.33	1,630,211.63	5,753.60	935,609.60	181,099.88	568,256,419.68

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,473.06	54,238,025.18	542,380,251.81
					54,238,025.18	542,380,251.81

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0

11/7/2011 9:46:00 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Regional VMT				2.0	1.0	97.0

11/7/2011 9:46:00 AM

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:50:10 AM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_BRT Street.urb924

Project Name: PEROW - BRT Street

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,490.64	144,375.23	1,631,227.38	5,757.19	936,192.56	181,212.72	568,610,489.10
TOTALS (lbs/day, unmitigated)	133,490.64	144,375.23	1,631,227.38	5,757.19	936,192.56	181,212.72	568,610,489.10

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,476.47	54,271,819.83	542,718,198.29
					54,271,819.83	542,718,198.29

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

11/7/2011 9:50:10 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:51:47 AM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_LRT West Bank 2.urb924

Project Name: PEROW - LRT West Bank 2

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,412.14	144,290.33	1,630,268.20	5,753.80	935,642.07	181,106.16	568,276,140.90
TOTALS (lbs/day, unmitigated)	133,412.14	144,290.33	1,630,268.20	5,753.80	935,642.07	181,106.16	568,276,140.90

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,473.25	54,239,907.50	542,399,075.00
					54,239,907.50	542,399,075.00

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			

% of Trips - Commercial (by land use)

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:52:52 AM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_LRT West Bank 3.urb924

Project Name: PEROW - LRT West Bank 3

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,402.40	144,279.79	1,630,149.09	5,753.38	935,573.71	181,092.93	568,234,619.88
TOTALS (lbs/day, unmitigated)	133,402.40	144,279.79	1,630,149.09	5,753.38	935,573.71	181,092.93	568,234,619.88

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,472.85	54,235,944.47	542,359,444.68
					54,235,944.47	542,359,444.68

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

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Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_LRT East Bank.urb924

Project Name: PEROW - LRT East Bank

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,399.23	144,276.37	1,630,110.40	5,753.24	935,551.50	181,088.63	568,221,134.41
TOTALS (lbs/day, unmitigated)	133,399.23	144,276.37	1,630,110.40	5,753.24	935,551.50	181,088.63	568,221,134.41

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,472.72	54,234,657.33	542,346,573.29
					54,234,657.33	542,346,573.29

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0

11/7/2011 9:51:00 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						

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Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Regional VMT				2.0	1.0	97.0

Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:53:44 AM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_MagLev.urb924

Project Name: PEROW - MagLev West Bank 3

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,427.26	144,306.68	1,630,452.91	5,754.45	935,748.08	181,126.68	568,340,526.38
TOTALS (lbs/day, unmitigated)	133,427.26	144,306.68	1,630,452.91	5,754.45	935,748.08	181,126.68	568,340,526.38

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,473.87	54,246,052.86	542,460,528.61
					54,246,052.86	542,460,528.61

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0

11/7/2011 9:53:44 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Regional VMT				2.0	1.0	97.0

<u>Operational Changes to Defaults</u>

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

11/7/2011 9:54:32 AM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Operational Unmitigated Emissions (Pounds/Day)

File Name: C:\Users\sullivans\Documents\PE ROW West Santa Ana Branch Corridor 60180930.6001\URBEMIS Outputs\PEROW_Street Car.urb924

Project Name: PEROW - Street Car West Bank 3

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

OPERATIONAL EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Regional VMT	133,435.05	144,315.11	1,630,548.17	5,754.79	935,802.75	181,137.26	568,373,733.06
TOTALS (lbs/day, unmitigated)	133,435.05	144,315.11	1,630,548.17	5,754.79	935,802.75	181,137.26	568,373,733.06

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2035 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Regional VMT		9,910.00	1000 sq ft	5,474.19	54,249,222.32	542,492,223.19
					54,249,222.32	542,492,223.19

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	48.0	0.0	100.0	0.0
Light Truck < 3750 lbs	7.4	0.0	100.0	0.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Truck 3751-5750 lbs	24.4	0.0	100.0	0.0
Med Truck 5751-8500 lbs	11.8	0.0	100.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.9	0.0	78.9	21.1
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	66.7	33.3
Med-Heavy Truck 14,001-33,000 lbs	1.0	0.0	20.0	80.0
Heavy-Heavy Truck 33,001-60,000 lbs	0.7	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.5	32.0	68.0	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	1.4	0.0	92.9	7.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	10.0	10.0	10.0
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Regional VMT				2.0	1.0	97.0

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Operational Changes to Defaults

Commercial-based commute urban trip length changed from 13.3 miles to 10 miles

Commercial-based non-work urban trip length changed from 7.4 miles to 10 miles

Commercial-based customer urban trip length changed from 8.9 miles to 10 miles

Appendix D: Capital Cost Analysis

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB CORRIDOR AA

TSM LA Total

Today's Date	3/16/12
Yr of Base Year $	2010
Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**0.00**	0	0	**0**		**0%**	**0%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				#DIV/0!
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				#DIV/0!
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				#DIV/0!
10.04 Guideway: Aerial structure	0.00	0.00	0	0				#DIV/0!
10.05 Guideway: Built-up fill	0.00	0.00	0	0				#DIV/0!
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				#DIV/0!
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				#DIV/0!
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				#DIV/0!
10.09 Track: Direct fixation		0	0	0				#DIV/0!
10.10 Track: Embedded		0	0	0				#DIV/0!
10.11 Track: Ballasted		0	0	0				#DIV/0!
10.12 Track: Special (switches, turnouts)		0	0	0				#DIV/0!
10.13 Track: Vibration and noise dampening		0	0	0				#DIV/0!
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**0**	0	0	**0**		**0%**	**0%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				#DIV/0!
20.05 Joint development		0	0	0				#DIV/0!
20.06 Automobile parking multi-story structure		0	0	0				#DIV/0!
20.07 Elevators, escalators		0	0	0				#DIV/0!
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.00	0	0	**0**		**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	0.00	11,540	3,462	**15,002**		**100%**	**56%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		0	0	0				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		0	0	0				0
40.07 Automobile, bus, van accessways including roads, parking lots		11,540	3,462	15,002				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	0.00	0	0	**0**		**0%**	**0%**	**0**
50.01 Train control and signals		0	0	0				#DIV/0!
50.02 Traffic signals and crossing protection		0	0	0				#DIV/0!
50.03 Traction power supply: substations		0	0	0				#DIV/0!
50.04 Traction power distribution: catenary and third rail		0	0	0				#DIV/0!
50.05 Communications		0	0	0				#DIV/0!
50.06 Fare collection system and equipment		0	0	0				#DIV/0!
50.07 Central Control		0	0	0				#DIV/0!
Construction Subtotal (10 - 50)	0.00	11,540	3,462	**15,002**		**100%**	**56%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	0	0	**0**			**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**20**	9,000	450	**9,450**	**$ 473**		**35%**	**0**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	20	9,000	450	9,450	$ 473			0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	0	0	**0**		**0%**	**0%**	**0**
80.01 Preliminary Engineering				0				#DIV/0!
80.02 Final Design				0				#DIV/0!
80.03 Project Management for Design and Construction				0				#DIV/0!
80.04 Construction Administration & Management				0				#DIV/0!
80.05 Professional Liability and other Non-Construction Insurance				0				#DIV/0!
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.				0				#DIV/0!
80.07 Surveys, Testing, Investigation, Inspection				0				#DIV/0!
80.08 Start up				0				#DIV/0!
Subtotal (10 - 80)	0.00	20,540	3,912	**24,452**			**91%**	**0**
90 UNALLOCATED CONTINGENCY				**2,445**			**9%**	**0**
Subtotal (10 - 90)	0.00			**26,897**			**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	0.00			**26,897**			**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				19.05%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.90%				
Total Contingency as % of Base Yr Dollars w/o Contingency				30.95%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								#DIV/0!
YOE Total Project Cost per Mile Not Including Vehicles (X000)								#DIV/0!
YOE Total Project Cost per Mile (X000)								#DIV/0!

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB CORRIDOR AA

TSM Orange

Today's Date	3/16/12
Yr of Base Year $	2010
Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**0.00**	0	0	**0**		**0%**	**0%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				#DIV/0!
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				#DIV/0!
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				#DIV/0!
10.04 Guideway: Aerial structure	0.00	0.00	0	0				#DIV/0!
10.05 Guideway: Built-up fill	0.00	0.00	0	0				#DIV/0!
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				#DIV/0!
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				#DIV/0!
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				#DIV/0!
10.09 Track: Direct fixation		0	0	0				#DIV/0!
10.10 Track: Embedded		0	0	0				#DIV/0!
10.11 Track: Ballasted		0	0	0				#DIV/0!
10.12 Track: Special (switches, turnouts)		0	0	0				#DIV/0!
10.13 Track: Vibration and noise dampening		0	0	0				#DIV/0!
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**0**	0	0	**0**		**0%**	**0%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				#DIV/0!
20.05 Joint development		0	0	0				#DIV/0!
20.06 Automobile parking multi-story structure		0	0	0				#DIV/0!
20.07 Elevators, escalators		0	0	0				#DIV/0!
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.00	0	0	**0**		**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	0.00	119,730	35,919	**155,649**		**100%**	**70%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		0	0	0				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		0	0	0				0
40.07 Automobile, bus, van accessways including roads, parking lots		119,730	35,919	155,649				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	0.00	0	0	**0**		**0%**	**0%**	**0**
50.01 Train control and signals		0	0	0				#DIV/0!
50.02 Traffic signals and crossing protection		0	0	0				#DIV/0!
50.03 Traction power supply: substations		0	0	0				#DIV/0!
50.04 Traction power distribution: catenary and third rail		0	0	0				#DIV/0!
50.05 Communications		0	0	0				#DIV/0!
50.06 Fare collection system and equipment		0	0	0				#DIV/0!
50.07 Central Control		0	0	0				#DIV/0!
Construction Subtotal (10 - 50)	0.00	119,730	35,919	**155,649**		**100%**	**70%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	0	0	**0**			**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**98**	44,100	2,205	**46,305**	**$ 473**		**21%**	**0**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	98	44,100	2,205	46,305	$ 473			0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	0	0	**0**		**0%**	**0%**	**0**
80.01 Preliminary Engineering				0				#DIV/0!
80.02 Final Design				0				#DIV/0!
80.03 Project Management for Design and Construction				0				#DIV/0!
80.04 Construction Administration & Management				0				#DIV/0!
80.05 Professional Liability and other Non-Construction Insurance				0				#DIV/0!
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.				0				#DIV/0!
80.07 Surveys, Testing, Investigation, Inspection				0				#DIV/0!
80.08 Start up				0				#DIV/0!
Subtotal (10 - 80)	0.00	163,830	38,124	**201,954**			**91%**	**0**
90 UNALLOCATED CONTINGENCY				**20,195**			**9%**	**0**
Subtotal (10 - 90)	0.00			**222,149**			**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	0.00			**222,149**			**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				23.27%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.33%				
Total Contingency as % of Base Yr Dollars w/o Contingency				35.60%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								#DIV/0!
YOE Total Project Cost per Mile Not Including Vehicles (X000)								#DIV/0!
YOE Total Project Cost per Mile (X000)								#DIV/0!

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB CORRIDOR AA — Today's Date: **3/16/12**

BRT Alternative — Yr of Base Year $: 2010

Segment 1 Street Running — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**0.00**	0	0	**0**		**0%**	**0%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				#DIV/0!
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				#DIV/0!
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				#DIV/0!
10.04 Guideway: Aerial structure	0.00	0.00	0	0				#DIV/0!
10.05 Guideway: Built-up fill	0.00	0.00	0	0				#DIV/0!
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				#DIV/0!
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				#DIV/0!
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				#DIV/0!
10.09 Track: Direct fixation		0	0	0				#DIV/0!
10.10 Track: Embedded		0	0	0				#DIV/0!
10.11 Track: Ballasted		0	0	0				#DIV/0!
10.12 Track: Special (switches, turnouts)		0	0	0				#DIV/0!
10.13 Track: Vibration and noise dampening		0	0	0				#DIV/0!
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**0**	0	0	**0**		**0%**	**0%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				#DIV/0!
20.05 Joint development		0	0	0				#DIV/0!
20.06 Automobile parking multi-story structure		0	0	0				#DIV/0!
20.07 Elevators, escalators		0	0	0				#DIV/0!
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.00	160,000	24,000	**184,000**		**99%**	**67%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	0.00	1,917	575	**2,492**		**1%**	**1%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		0	0	0				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		0	0	0				0
40.07 Automobile, bus, van accessways including roads, parking lots		1,917	575	2,492				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	0.00	0	0	**0**		**0%**	**0%**	**0**
50.01 Train control and signals		0	0	0				#DIV/0!
50.02 Traffic signals and crossing protection		0	0	0				#DIV/0!
50.03 Traction power supply: substations		0	0	0				#DIV/0!
50.04 Traction power distribution: catenary and third rail		0	0	0				#DIV/0!
50.05 Communications		0	0	0				#DIV/0!
50.06 Fare collection system and equipment		0	0	0				#DIV/0!
50.07 Central Control		0	0	0				#DIV/0!
Construction Subtotal (10 - 50)	0.00	161,917	24,575	**186,492**		**100%**	**68%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	0	0	**0**			**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**19**	8,550	428	**8,978**	**$ 473**		**3%**	**0**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	19	8,550	428	8,978	$ 473			0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	48,575	6,784	**55,359**		**30%**	**20%**	**0**
80.01 Preliminary Engineering		4,858	729	5,586				0
80.02 Final Design		11,334	1,700	13,034				0
80.03 Project Management for Design and Construction		16,192	2,429	18,620				0
80.04 Construction Administration & Management		8,096	1,214	9,310				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		1,619	178	1,797				0
80.07 Surveys, Testing, Investigation, Inspection		3,238	486	3,724				0
80.08 Start up		3,238	49	3,287				0
Subtotal (10 - 80)	0.00	219,042	31,787	**250,829**			**91%**	**0**
90 UNALLOCATED CONTINGENCY				**25,083**			**9%**	**0**
Subtotal (10 - 90)	0.00			**275,912**			**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	0.00			**275,912**			**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				14.51%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.45%				
Total Contingency as % of Base Yr Dollars w/o Contingency				25.96%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								#DIV/0!
YOE Total Project Cost per Mile Not Including Vehicles (X000)								#DIV/0!
YOE Total Project Cost per Mile (X000)								#DIV/0!

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E (Rev.11, May 2, 2008)

PEROW/WSAB CORRIDOR AA — Today's Date: **3/16/12**

BRT Alternative — Yr of Base Year $: 2010

Segment 1 HOV — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**0.00**	0	0	**0**		**0%**	**0%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				#DIV/0!
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				#DIV/0!
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				#DIV/0!
10.04 Guideway: Aerial structure	0.00	0.00	0	0				#DIV/0!
10.05 Guideway: Built-up fill	0.00	0.00	0	0				#DIV/0!
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				#DIV/0!
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				#DIV/0!
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				#DIV/0!
10.09 Track: Direct fixation		0	0	0				#DIV/0!
10.10 Track: Embedded		0	0	0				#DIV/0!
10.11 Track: Ballasted		0	0	0				#DIV/0!
10.12 Track: Special (switches, turnouts)		0	0	0				#DIV/0!
10.13 Track: Vibration and noise dampening		0	0	0				#DIV/0!
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**0**	0	0	**0**		**0%**	**0%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				#DIV/0!
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				#DIV/0!
20.05 Joint development		0	0	0				#DIV/0!
20.06 Automobile parking multi-story structure		0	0	0				#DIV/0!
20.07 Elevators, escalators		0	0	0				#DIV/0!
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.00	160,000	24,000	**184,000**		**100%**	**65%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	0.00	0	0	**0**		**0%**	**0%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				#DIV/0!
40.02 Site Utilities, Utility Relocation		0	0	0				#DIV/0!
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				#DIV/0!
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				#DIV/0!
40.05 Site structures including retaining walls, sound walls		0	0	0				#DIV/0!
40.06 Pedestrian / bike access and accommodation, landscaping		0	0	0				#DIV/0!
40.07 Automobile, bus, van accessways including roads, parking lots				0				#DIV/0!
40.08 Temporary Facilities and other indirect costs during construction				0				#DIV/0!
50 SYSTEMS	0.00	0	0	**0**		**0%**	**0%**	**0**
50.01 Train control and signals		0	0	0				#DIV/0!
50.02 Traffic signals and crossing protection		0	0	0				#DIV/0!
50.03 Traction power supply: substations		0	0	0				#DIV/0!
50.04 Traction power distribution: catenary and third rail		0	0	0				#DIV/0!
50.05 Communications		0	0	0				#DIV/0!
50.06 Fare collection system and equipment		0	0	0				#DIV/0!
50.07 Central Control		0	0	0				#DIV/0!
Construction Subtotal (10 - 50)	0.00	160,000	24,000	**184,000**		**100%**	**65%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	0	0	**0**			**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**38**	17,100	855	**17,955**	**$ 473**		**6%**	**0**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	38	17,100	855	17,955	$ 473			0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	48,000	6,704	**54,704**		**30%**	**19%**	**0**
80.01 Preliminary Engineering		4,800	720	5,520				0
80.02 Final Design		11,200	1,680	12,880				0
80.03 Project Management for Design and Construction		16,000	2,400	18,400				0
80.04 Construction Administration & Management		8,000	1,200	9,200				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		1,600	176	1,776				0
80.07 Surveys, Testing, Investigation, Inspection		3,200	480	3,680				0
80.08 Start up		3,200	48	3,248				0
Subtotal (10 - 80)	0.00	225,100	31,559	**256,659**			**91%**	**0**
90 UNALLOCATED CONTINGENCY				**25,666**			**9%**	**0**
Subtotal (10 - 90)	0.00			**282,325**			**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	0.00			**282,325**			**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				14.02%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.40%				
Total Contingency as % of Base Yr Dollars w/o Contingency				25.42%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								#DIV/0!
YOE Total Project Cost per Mile Not Including Vehicles (X000)								#DIV/0!
YOE Total Project Cost per Mile (X000)								#DIV/0!

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB CORRIDOR AA	Today's Date	3/16/12
BRT Alternative	Yr of Base Year $	2010
Segment 2 Los Angeles County Portion	Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**5.90**	35,472	8,868	**44,340**	**$ 7,515**	**32%**	**23%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	5.56	16871.71	4,218	21,090	$ 3,796			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.34	18600.00	4,650	23,250	$ 67,636			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		0	0	0				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		0	0	0				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**5**	9,585	2,396	**11,981**	**$ 2,396**	**9%**	**6%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	5	9585	2,396	11,981	$ 2,396			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	5.90	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	5.90	23,100	6,930	**30,030**	**$ 5,090**	**22%**	**16%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		8,000	2,400	10,400				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		15,100	4,530	19,630				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	5.90	41,000	12,300	**53,300**	**$ 9,034**	**38%**	**28%**	**0**
50.01 Train control and signals		0	0	0				0
50.02 Traffic signals and crossing protection		7,300	2,190	9,490				0
50.03 Traction power supply: substations		0	0	0				0
50.04 Traction power distribution: catenary and third rail		0	0	0				0
50.05 Communications		22,700	6,810	29,510				0
50.06 Fare collection system and equipment		11,000	3,300	14,300				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	5.90	109,157	30,494	**139,651**	**$ 23,670**	**100%**	**73%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	5.90	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	5.90	29,733	4,153	**33,886**	**$ 5,743**	**24%**	**18%**	**0**
80.01 Preliminary Engineering		2,973	446	3,419				0
80.02 Final Design		6,938	1,041	7,978				0
80.03 Project Management for Design and Construction		9,911	1,487	11,398				0
80.04 Construction Administration & Management		4,955	743	5,699				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		991	109	1,100				0
80.07 Surveys, Testing, Investigation, Inspection		1,982	297	2,280				0
80.08 Start up		1,982	30	2,012				0
Subtotal (10 - 80)	5.90	138,890	34,647	**173,536**	**$ 29,413**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**17,354**			**9%**	**0**
Subtotal (10 - 90)	5.90			**190,890**	**$ 32,354**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	5.90			**190,890**	**$ 32,354**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				24.95%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.49%				
Total Contingency as % of Base Yr Dollars w/o Contingency				37.44%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E (Rev.11, May 2, 2008)

PEROW/WSAB CORRIDOR AA — Today's Date: **3/16/12**

BRT Alternative — Yr of Base Year $: 2010

Segment 2 Orange County Portion — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**9.79**	116,252	20,854	**137,106**	**$ 14,002**	**50%**	**35%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	8.84	29818.94	7,455	37,274	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.95	51500.00	12,875	64,375	$ 67,507			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		0	0	0				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		27,433	412	27,845				0
10.12 Track: Special (switches, turnouts)		7,500	113	7,613				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	11,502	2,876	**14,378**	**$ 2,396**	**5%**	**4%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	6	11502	2,876	14,378	$ 2,396			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	9.79	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	9.79	38,300	11,490	**49,790**	**$ 5,085**	**18%**	**13%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		13,200	3,960	17,160				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		25,100	7,530	32,630				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	9.79	57,000	17,100	**74,100**	**$ 7,568**	**27%**	**19%**	**0**
50.01 Train control and signals		0	0	0				0
50.02 Traffic signals and crossing protection		6,100	1,830	7,930				0
50.03 Traction power supply: substations		0	0	0				0
50.04 Traction power distribution: catenary and third rail		0	0	0				0
50.05 Communications		37,700	11,310	49,010				0
50.06 Fare collection system and equipment		13,200	3,960	17,160				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	9.79	223,054	52,319	**275,374**	**$ 28,123**	**100%**	**70%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	9.79	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	9.79	71,341	9,964	**81,305**	**$ 8,304**	**30%**	**21%**	**0**
80.01 Preliminary Engineering		7,134	1,070	8,204				0
80.02 Final Design		16,646	2,497	19,143				0
80.03 Project Management for Design and Construction		23,780	3,567	27,348				0
80.04 Construction Administration & Management		11,890	1,784	13,674				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		2,378	262	2,640				0
80.07 Surveys, Testing, Investigation, Inspection		4,756	713	5,470				0
80.08 Start up		4,756	71	4,827				0
Subtotal (10 - 80)	9.79	294,396	62,283	**356,679**	**$ 36,427**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**35,668**			**9%**	**0**
Subtotal (10 - 90)	9.79			**392,347**	**$ 40,069**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	9.79			**392,347**	**$ 40,069**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				21.16%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.12%				
Total Contingency as % of Base Yr Dollars w/o Contingency				33.27%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

MAIN WORKSHEET-BUILD ALTERNATIVE (Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date **3/16/12**

BRT Alternative — Yr of Base Year $ 2010

Segment 3 Option 1 (Harbor/1st/SARTC) — Yr of Revenue Ops 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**5.11**	48,559	12,140	**60,699**	**$ 11,870**	**39%**	**28%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	4.47	13559.13	3,390	16,949	$ 3,796			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.65	35000.00	8,750	43,750	$ 67,495			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		0	0	0				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		0	0	0				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**4**	29,434	7,359	**36,793**	**$ 9,198**	**24%**	**17%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	2	3834	959	4,793	$ 2,396			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	2	25600	6,400	32,000	$ 16,000			0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	5.11	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	5.11	20,000	6,000	**26,000**	**$ 5,085**	**17%**	**12%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		6,900	2,070	8,970				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		13,100	3,930	17,030				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	5.11	24,700	7,410	**32,110**	**$ 6,279**	**21%**	**15%**	**0**
50.01 Train control and signals		0	0	0				0
50.02 Traffic signals and crossing protection		2,300	690	2,990				0
50.03 Traction power supply: substations		0	0	0				0
50.04 Traction power distribution: catenary and third rail		0	0	0				0
50.05 Communications		11,400	3,420	14,820				0
50.06 Fare collection system and equipment		11,000	3,300	14,300				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	5.11	122,693	32,908	**155,601**	**$ 30,429**	**100%**	**72%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	5.11	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	5.11	35,791	4,999	**40,790**	**$ 7,977**	**26%**	**19%**	**0**
80.01 Preliminary Engineering		3,579	537	4,116				0
80.02 Final Design		8,351	1,253	9,604				0
80.03 Project Management for Design and Construction		11,930	1,790	13,720				0
80.04 Construction Administration & Management		5,965	895	6,860				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		1,193	131	1,324				0
80.07 Surveys, Testing, Investigation, Inspection		2,386	358	2,744				0
80.08 Start up		2,386	36	2,422				0
Subtotal (10 - 80)	5.11	158,484	37,907	**196,391**	**$ 38,406**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**19,639**			**9%**	**0**
Subtotal (10 - 90)	5.11			**216,031**	**$ 42,247**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	5.11			**216,031**	**$ 42,247**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				23.92%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.39%				
Total Contingency as % of Base Yr Dollars w/o Contingency				36.31%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E								(Rev.11, May 2, 2008)
PEROW/WSAB Corridor AA							Today's Date	**3/16/12**
Street Car Alternative							Yr of Base Year $	2010
East Bank Option 1							Yr of Revenue Ops	2010
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**12.53**	194,637	39,138	**233,775**	**$ 18,653**	**35%**	**17%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	9.48	25019.50	6,255	31,274	$ 3,300			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	3.06	129100.00	32,275	161,375	$ 52,812			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		11,600	174	11,774				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		23,018	345	23,363				0
10.12 Track: Special (switches, turnouts)		5,900	89	5,989				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	6,000	1,500	**7,500**	**$ 1,250**	**1%**	**1%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	6	6000	1,500	7,500	$ 1,250			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	12.53	160,000	24,000	**184,000**	**$ 14,682**	**27%**	**13%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	12.53	49,000	14,700	**63,700**	**$ 5,083**	**9%**	**5%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		16,900	5,070	21,970				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		32,100	9,630	41,730				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	12.53	141,200	42,360	**183,560**	**$ 14,646**	**27%**	**13%**	**0**
50.01 Train control and signals		38,100	11,430	49,530				0
50.02 Traffic signals and crossing protection		13,400	4,020	17,420				0
50.03 Traction power supply: substations		8,800	2,640	11,440				0
50.04 Traction power distribution: catenary and third rail		19,500	5,850	25,350				0
50.05 Communications		48,200	14,460	62,660				0
50.06 Fare collection system and equipment		13,200	3,960	17,160				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	12.53	550,837	121,698	**672,535**	**$ 53,662**	**100%**	**48%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	12.53	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**112**	392,000	19,600	**411,600**	**$ 3,675**		**29%**	**0**
70.01 Light Rail	112	392,000	19,600	411,600	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	12.53	163,562	22,844	**186,406**	**$ 14,873**	**28%**	**13%**	**0**
80.01 Preliminary Engineering		16,356	2,453	18,810				0
80.02 Final Design		38,164	5,725	43,889				0
80.03 Project Management for Design and Construction		54,521	8,178	62,699				0
80.04 Construction Administration & Management		27,260	4,089	31,349				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		5,452	600	6,052				0
80.07 Surveys, Testing, Investigation, Inspection		10,904	1,636	12,540				0
80.08 Start up		10,904	164	11,068				0
Subtotal (10 - 80)	12.53	1,106,399	164,142	**1,270,541**	**$ 101,378**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**127,054**			**9%**	**0**
Subtotal (10 - 90)	12.53			**1,397,595**	**$ 111,515**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	12.53			**1,397,595**	**$ 111,515**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				14.84%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.48%				
Total Contingency as % of Base Yr Dollars w/o Contingency				26.32%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date **3/16/12**

Street Car Alternative — Yr of Base Year $ 2010

Segment 1 West Bank Option 1 — Yr of Revenue Ops 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**12.52**	228,287	45,341	**273,629**	**$ 21,852**	**39%**	**19%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	9.83	33170.49	8,293	41,463	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	2.69	145200.00	36,300	181,500	$ 67,464			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		13,100	197	13,297				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		30,517	458	30,975				0
10.12 Track: Special (switches, turnouts)		6,300	95	6,395				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**5**	6,390	1,598	**7,988**	**$ 1,598**	**1%**	**1%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	5	6390	1,598	7,988	$ 1,598			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	12.52	160,000	24,000	**184,000**	**$ 14,694**	**26%**	**13%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	12.52	49,000	14,700	**63,700**	**$ 5,087**	**9%**	**4%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		16,900	5,070	21,970				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		32,100	9,630	41,730				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	12.52	138,800	41,640	**180,440**	**$ 14,410**	**25%**	**13%**	**0**
50.01 Train control and signals		38,000	11,400	49,400				0
50.02 Traffic signals and crossing protection		13,400	4,020	17,420				0
50.03 Traction power supply: substations		8,800	2,640	11,440				0
50.04 Traction power distribution: catenary and third rail		19,400	5,820	25,220				0
50.05 Communications		48,200	14,460	62,660				0
50.06 Fare collection system and equipment		11,000	3,300	14,300				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	12.52	582,477	127,279	**709,756**	**$ 56,682**	**100%**	**49%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	12.52	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**108**	378,000	18,900	**396,900**	**$ 3,675**		**28%**	**0**
70.01 Light Rail	108	378,000	18,900	396,900	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	12.52	172,742	24,126	**196,868**	**$ 15,722**	**28%**	**14%**	**0**
80.01 Preliminary Engineering		17,274	2,591	19,865				0
80.02 Final Design		40,306	6,046	46,352				0
80.03 Project Management for Design and Construction		57,581	8,637	66,218				0
80.04 Construction Administration & Management		28,790	4,319	33,109				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		5,758	633	6,391				0
80.07 Surveys, Testing, Investigation, Inspection		11,516	1,727	13,244				0
80.08 Start up		11,516	173	11,689				0
Subtotal (10 - 80)	12.52	1,133,219	170,305	**1,303,524**	**$ 104,101**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**130,352**			**9%**	**0**
Subtotal (10 - 90)	12.52			**1,433,877**	**$ 114,511**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	12.52			**1,433,877**	**$ 114,511**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				15.03%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.50%				
Total Contingency as % of Base Yr Dollars w/o Contingency				26.53%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date	3/16/12
Street Car Alternative	Yr of Base Year $	2010
Segment 1 West bank Option 2	Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**12.89**	192,681	36,217	**228,898**	**$ 17,763**	**34%**	**16%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	10.94	36916.95	9,229	46,146	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	1.94	104900.00	26,225	131,125	$ 67,449			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		9,400	141	9,541				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		33,964	509	34,473				0
10.12 Track: Special (switches, turnouts)		7,500	113	7,613				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	7,668	1,917	**9,585**	**$ 1,598**	**1%**	**1%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	6	7668	1,917	9,585	$ 1,598			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	12.89	160,000	24,000	**184,000**	**$ 14,279**	**27%**	**13%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	12.89	50,400	15,120	**65,520**	**$ 5,085**	**10%**	**5%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		17,400	5,220	22,620				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		33,000	9,900	42,900				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	12.89	144,300	43,290	**187,590**	**$ 14,558**	**28%**	**13%**	**0**
50.01 Train control and signals		39,100	11,730	50,830				0
50.02 Traffic signals and crossing protection		13,400	4,020	17,420				0
50.03 Traction power supply: substations		9,000	2,700	11,700				0
50.04 Traction power distribution: catenary and third rail		20,000	6,000	26,000				0
50.05 Communications		49,600	14,880	64,480				0
50.06 Fare collection system and equipment		13,200	3,960	17,160				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	12.89	555,049	120,544	**675,593**	**$ 52,429**	**100%**	**48%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	12.89	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**112**	392,000	19,600	**411,600**	**$ 3,675**		**29%**	**0**
70.01 Light Rail	112	392,000	19,600	411,600	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	12.89	168,516	23,536	**192,052**	**$ 14,904**	**28%**	**14%**	**0**
80.01 Preliminary Engineering		16,852	2,528	19,379				0
80.02 Final Design		39,320	5,898	45,218				0
80.03 Project Management for Design and Construction		56,172	8,426	64,598				0
80.04 Construction Administration & Management		28,086	4,213	32,299				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		5,617	618	6,235				0
80.07 Surveys, Testing, Investigation, Inspection		11,234	1,685	12,920				0
80.08 Start up		11,234	169	11,403				0
Subtotal (10 - 80)	12.89	1,115,564	163,680	**1,279,244**	**$ 99,274**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**127,924**			**9%**	**0**
Subtotal (10 - 90)	12.89			**1,407,169**	**$ 109,202**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	12.89			**1,407,169**	**$ 109,202**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				14.67%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.47%				
Total Contingency as % of Base Yr Dollars w/o Contingency				26.14%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date	**3/16/12**
Street Car Alternative	Yr of Base Year $	2010
Segment 1 West Bank Option 3	Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**11.81**	426,758	94,078	**520,836**	**$ 44,099**	**56%**	**30%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	7.14	24094.77	6,024	30,118	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	3.21	173300.00	43,325	216,625	$ 67,494			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	1.46	175696.20	43,924	219,620	$ 150,460			0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		22,700	341	23,041				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		22,167	333	22,500				0
10.12 Track: Special (switches, turnouts)		8,800	132	8,932				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**7**	8,946	2,237	**11,183**	**$ 1,598**	**1%**	**1%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	7	8946	2,237	11,183	$ 1,598			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	11.81	160,000	24,000	**184,000**	**$ 15,579**	**20%**	**11%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	11.81	40,500	12,150	**52,650**	**$ 4,458**	**6%**	**3%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		14,000	4,200	18,200				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		26,500	7,950	34,450				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	11.81	123,400	37,020	**160,420**	**$ 13,583**	**17%**	**9%**	**0**
50.01 Train control and signals		31,400	9,420	40,820				0
50.02 Traffic signals and crossing protection		13,400	4,020	17,420				0
50.03 Traction power supply: substations		7,300	2,190	9,490				0
50.04 Traction power distribution: catenary and third rail		16,100	4,830	20,930				0
50.05 Communications		39,800	11,940	51,740				0
50.06 Fare collection system and equipment		15,400	4,620	20,020				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	11.81	759,604	169,484	**929,088**	**$ 78,665**	**100%**	**53%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	11.81	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**108**	378,000	18,900	**396,900**	**$ 3,675**		**23%**	**0**
70.01 Light Rail	108	378,000	18,900	396,900	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	11.81	225,273	31,463	**256,736**	**$ 21,738**	**28%**	**15%**	**0**
80.01 Preliminary Engineering		22,527	3,379	25,906				0
80.02 Final Design		52,564	7,885	60,448				0
80.03 Project Management for Design and Construction		75,091	11,264	86,355				0
80.04 Construction Administration & Management		37,545	5,632	43,177				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		7,509	826	8,335				0
80.07 Surveys, Testing, Investigation, Inspection		15,018	2,253	17,271				0
80.08 Start up		15,018	225	15,243				0
Subtotal (10 - 80)	11.81	1,362,877	219,847	**1,582,724**	**$ 134,008**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**158,272**			**9%**	**0**
Subtotal (10 - 90)	11.81			**1,740,997**	**$ 147,409**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	11.81			**1,740,997**	**$ 147,409**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				16.13%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.61%				
Total Contingency as % of Base Yr Dollars w/o Contingency				27.74%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA		Today's Date	3/16/12
Street Car		Yr of Base Year $	2010
Segment 2 Los Angeles County Portion		Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**7.77**	74,675	11,375	**86,051**	**$ 11,082**	**33%**	**24%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	7.42	25039.22	6,260	31,299	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.34	18600.00	4,650	23,250	$ 67,636			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		1,700	26	1,726				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		23,036	346	23,382				0
10.12 Track: Special (switches, turnouts)		6,300	95	6,395				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**5**	12,780	3,195	**15,975**	**$ 3,195**	**6%**	**4%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	5	12780	3,195	15,975	$ 3,195			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	7.77	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	7.77	30,400	9,120	**39,520**	**$ 5,089**	**15%**	**11%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		10,500	3,150	13,650				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		19,900	5,970	25,870				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	7.77	91,000	27,300	**118,300**	**$ 15,235**	**46%**	**33%**	**0**
50.01 Train control and signals		23,600	7,080	30,680				0
50.02 Traffic signals and crossing protection		7,300	2,190	9,490				0
50.03 Traction power supply: substations		2,700	810	3,510				0
50.04 Traction power distribution: catenary and third rail		12,100	3,630	15,730				0
50.05 Communications		29,900	8,970	38,870				0
50.06 Fare collection system and equipment		15,400	4,620	20,020				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	7.77	208,855	50,990	**259,846**	**$ 33,463**	**100%**	**72%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	7.77	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	7.77	58,924	8,230	**67,154**	**$ 8,648**	**26%**	**19%**	**0**
80.01 Preliminary Engineering		5,892	884	6,776				0
80.02 Final Design		13,749	2,062	15,811				0
80.03 Project Management for Design and Construction		19,641	2,946	22,587				0
80.04 Construction Administration & Management		9,821	1,473	11,294				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		1,964	216	2,180				0
80.07 Surveys, Testing, Investigation, Inspection		3,928	589	4,517				0
80.08 Start up		3,928	59	3,987				0
Subtotal (10 - 80)	7.77	267,779	59,220	**326,999**	**$ 42,111**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**32,700**			**9%**	**0**
Subtotal (10 - 90)	7.77			**359,699**	**$ 46,322**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	7.77			**359,699**	**$ 46,322**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				22.12%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.21%				
Total Contingency as % of Base Yr Dollars w/o Contingency				34.33%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date: **3/16/12**

Street Car — Yr of Base Year $: 2010

Segment 2 Orange County Portion — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**9.79**	122,152	20,942	**143,095**	**$ 14,614**	**39%**	**28%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	8.84	29818.94	7,455	37,274	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.95	51500.00	12,875	64,375	$ 67,507			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		4,600	69	4,669				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		27,433	412	27,845				0
10.12 Track: Special (switches, turnouts)		8,800	132	8,932				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**7**	17,892	4,473	**22,365**	**$ 3,195**	**6%**	**4%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	7	17892	4,473	22,365	$ 3,195			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	9.79	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	9.79	38,300	11,490	**49,790**	**$ 5,085**	**13%**	**10%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		13,200	3,960	17,160				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		25,100	7,530	32,630				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	9.79	119,700	35,910	**155,610**	**$ 15,892**	**42%**	**30%**	**0**
50.01 Train control and signals		29,700	8,910	38,610				0
50.02 Traffic signals and crossing protection		7,300	2,190	9,490				0
50.03 Traction power supply: substations		3,400	1,020	4,420				0
50.04 Traction power distribution: catenary and third rail		15,200	4,560	19,760				0
50.05 Communications		37,700	11,310	49,010				0
50.06 Fare collection system and equipment		26,400	7,920	34,320				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	9.79	298,044	72,815	**370,860**	**$ 37,875**	**100%**	**72%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	9.79	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	9.79	84,005	11,733	**95,738**	**$ 9,778**	**26%**	**19%**	**0**
80.01 Preliminary Engineering		8,401	1,260	9,661				0
80.02 Final Design		19,601	2,940	22,541				0
80.03 Project Management for Design and Construction		28,002	4,200	32,202				0
80.04 Construction Administration & Management		14,001	2,100	16,101				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		2,800	308	3,108				0
80.07 Surveys, Testing, Investigation, Inspection		5,600	840	6,440				0
80.08 Start up		5,600	84	5,684				0
Subtotal (10 - 80)	9.79	382,050	84,548	**466,598**	**$ 47,653**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**46,660**			**9%**	**0**
Subtotal (10 - 90)	9.79			**513,257**	**$ 52,418**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	9.79			**513,257**	**$ 52,418**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				22.13%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.21%				
Total Contingency as % of Base Yr Dollars w/o Contingency				34.34%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date: **3/16/12**

Street Car Alternative — Yr of Base Year $: 2010

Segment 3 Option (Harbor/1st/SARTC) — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**5.11**	72,026	12,846	**84,872**	**$ 16,597**	**39%**	**28%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	4.47	15065.70	3,766	18,832	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.65	35000.00	8,750	43,750	$ 67,495			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		3,100	47	3,147				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		13,860	208	14,068				0
10.12 Track: Special (switches, turnouts)		5,000	75	5,075				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	23,512	5,878	**29,390**	**$ 4,898**	**13%**	**10%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	4	5112	1,278	6,390	$ 1,598			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	2	18400	4,600	23,000	$ 11,500			0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	5.11	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	5.11	20,000	6,000	**26,000**	**$ 5,085**	**12%**	**9%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		6,900	2,070	8,970				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		13,100	3,930	17,030				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	5.11	60,000	18,000	**78,000**	**$ 15,254**	**36%**	**26%**	**0**
50.01 Train control and signals		15,500	4,650	20,150				0
50.02 Traffic signals and crossing protection		2,300	690	2,990				0
50.03 Traction power supply: substations		3,600	1,080	4,680				0
50.04 Traction power distribution: catenary and third rail		7,900	2,370	10,270				0
50.05 Communications		19,700	5,910	25,610				0
50.06 Fare collection system and equipment		11,000	3,300	14,300				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	5.11	175,538	42,724	**218,262**	**$ 42,683**	**100%**	**72%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	5.11	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	5.11	51,122	7,140	**58,262**	**$ 11,394**	**27%**	**19%**	**0**
80.01 Preliminary Engineering		5,112	767	5,879				0
80.02 Final Design		11,928	1,789	13,718				0
80.03 Project Management for Design and Construction		17,041	2,556	19,597				0
80.04 Construction Administration & Management		8,520	1,278	9,798				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		1,704	187	1,891				0
80.07 Surveys, Testing, Investigation, Inspection		3,408	511	3,919				0
80.08 Start up		3,408	51	3,459				0
Subtotal (10 - 80)	5.11	226,660	49,864	**276,523**	**$ 54,077**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**27,652**			**9%**	**0**
Subtotal (10 - 90)	5.11			**304,176**	**$ 59,484**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	5.11			**304,176**	**$ 59,484**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				22.00%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.20%				
Total Contingency as % of Base Yr Dollars w/o Contingency				34.20%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date: **3/16/12**

LRT Alternative — Yr of Base Year $: 2010

Segment 1 East Bank Option — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**12.53**	248,692	50,019	**298,711**	**$ 23,834**	**36%**	**19%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	9.48	31974.92	7,994	39,969	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	3.06	165000.00	41,250	206,250	$ 67,497			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		14,800	222	15,022				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		29,417	441	29,858				0
10.12 Track: Special (switches, turnouts)		7,500	113	7,613				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	34,506	8,627	**43,133**	**$ 7,189**	**5%**	**3%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	6	34506	8,627	43,133	$ 7,189			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	12.53	160,000	24,000	**184,000**	**$ 14,682**	**22%**	**12%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	12.53	49,000	14,700	**63,700**	**$ 5,083**	**8%**	**4%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		16,900	5,070	21,970				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		32,100	9,630	41,730				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	12.53	181,500	50,430	**231,930**	**$ 18,506**	**28%**	**15%**	**0**
50.01 Train control and signals		38,100	11,430	49,530				0
50.02 Traffic signals and crossing protection		13,400		13,400				0
50.03 Traction power supply: substations		33,800	10,140	43,940				0
50.04 Traction power distribution: catenary and third rail		34,800	10,440	45,240				0
50.05 Communications		48,200	14,460	62,660				0
50.06 Fare collection system and equipment		13,200	3,960	17,160				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	12.53	673,698	147,776	**821,474**	**$ 65,546**	**100%**	**53%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	12.53	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**101**	353,500	17,675	**371,175**	**$ 3,675**		**24%**	**0**
70.01 Light Rail	101	353,500	17,675	371,175	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	12.53	191,860	26,796	**218,657**	**$ 17,447**	**27%**	**14%**	**0**
80.01 Preliminary Engineering		19,186	2,878	22,064				0
80.02 Final Design		44,767	6,715	51,483				0
80.03 Project Management for Design and Construction		63,953	9,593	73,546				0
80.04 Construction Administration & Management		31,977	4,797	36,773				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		6,395	703	7,099				0
80.07 Surveys, Testing, Investigation, Inspection		12,791	1,919	14,709				0
80.08 Start up		12,791	192	12,983				0
Subtotal (10 - 80)	12.53	1,219,058	192,247	**1,411,306**	**$ 112,609**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**141,131**			**9%**	**0**
Subtotal (10 - 90)	12.53			**1,552,436**	**$ 123,870**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	12.53			**1,552,436**	**$ 123,870**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				15.77%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.58%				
Total Contingency as % of Base Yr Dollars w/o Contingency				27.35%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date	3/16/12
Light Rail Alternative	Yr of Base Year $	2010
Segment 1 West Bank Option 1	Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**12.52**	228,287	45,341	**273,629**	**$ 21,852**	**35%**	**18%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	9.83	33170.49	8,293	41,463	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	2.69	145200.00	36,300	181,500	$ 67,464			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		13,100	197	13,297				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		30,517	458	30,975				0
10.12 Track: Special (switches, turnouts)		6,300	95	6,395				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**5**	28,755	7,189	**35,944**	**$ 7,189**	**5%**	**2%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	5	28755	7,189	35,944	$ 7,189			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	12.52	160,000	24,000	**184,000**	**$ 14,694**	**23%**	**12%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	12.52	49,000	14,700	**63,700**	**$ 5,087**	**8%**	**4%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		16,900	5,070	21,970				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		32,100	9,630	41,730				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	12.52	179,200	53,760	**232,960**	**$ 18,604**	**29%**	**16%**	**0**
50.01 Train control and signals		38,000	11,400	49,400				0
50.02 Traffic signals and crossing protection		13,400	4,020	17,420				0
50.03 Traction power supply: substations		33,800	10,140	43,940				0
50.04 Traction power distribution: catenary and third rail		34,800	10,440	45,240				0
50.05 Communications		48,200	14,460	62,660				0
50.06 Fare collection system and equipment		11,000	3,300	14,300				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	12.52	645,242	144,990	**790,232**	**$ 63,109**	**100%**	**53%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	12.52	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**97**	339,500	16,975	**356,475**	**$ 3,675**		**24%**	**0**
70.01 Light Rail	97	339,500	16,975	356,475	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	12.52	184,869	25,820	**210,689**	**$ 16,826**	**27%**	**14%**	**0**
80.01 Preliminary Engineering		18,487	2,773	21,260				0
80.02 Final Design		43,136	6,470	49,606				0
80.03 Project Management for Design and Construction		61,623	9,243	70,866				0
80.04 Construction Administration & Management		30,811	4,622	35,433				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		6,162	678	6,840				0
80.07 Surveys, Testing, Investigation, Inspection		12,325	1,849	14,173				0
80.08 Start up		12,325	185	12,509				0
Subtotal (10 - 80)	12.52	1,169,611	187,785	**1,357,396**	**$ 108,403**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**135,740**			**9%**	**0**
Subtotal (10 - 90)	12.52			**1,493,136**	**$ 119,243**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	12.52			**1,493,136**	**$ 119,243**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				16.06%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.61%				
Total Contingency as % of Base Yr Dollars w/o Contingency				27.66%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date	**3/16/12**
LRT Alternative	Yr of Base Year $	2010
Segment 1 West Bank Option 2	Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**12.89**	192,681	36,217	**228,898**	**$ 17,763**	**30%**	**15%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	10.94	36916.95	9,229	46,146	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	1.94	104900.00	26,225	131,125	$ 67,449			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		9,400	141	9,541				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		33,964	509	34,473				0
10.12 Track: Special (switches, turnouts)		7,500	113	7,613				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	34,506	8,627	**43,133**	**$ 7,189**	**6%**	**3%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	6	34506	8,627	43,133	$ 7,189			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	12.89	160,000	24,000	**184,000**	**$ 14,279**	**24%**	**12%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	12.89	50,400	15,120	**65,520**	**$ 5,085**	**9%**	**4%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		17,400	5,220	22,620				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		33,000	9,900	42,900				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	12.89	185,900	55,770	**241,670**	**$ 18,755**	**32%**	**16%**	**0**
50.01 Train control and signals		39,100	11,730	50,830				0
50.02 Traffic signals and crossing protection		13,400	4,020	17,420				0
50.03 Traction power supply: substations		34,800	10,440	45,240				0
50.04 Traction power distribution: catenary and third rail		35,800	10,740	46,540				0
50.05 Communications		49,600	14,880	64,480				0
50.06 Fare collection system and equipment		13,200	3,960	17,160				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	12.89	623,487	139,734	**763,220**	**$ 59,229**	**100%**	**52%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	12.89	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**104**	364,000	18,200	**382,200**	**$ 3,675**		**26%**	**0**
70.01 Light Rail	104	364,000	18,200	382,200	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	12.89	176,800	24,693	**201,493**	**$ 15,637**	**26%**	**14%**	**0**
80.01 Preliminary Engineering		17,680	2,652	20,332				0
80.02 Final Design		41,253	6,188	47,441				0
80.03 Project Management for Design and Construction		58,933	8,840	67,773				0
80.04 Construction Administration & Management		29,467	4,420	33,887				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		5,893	648	6,542				0
80.07 Surveys, Testing, Investigation, Inspection		11,787	1,768	13,555				0
80.08 Start up		11,787	177	11,963				0
Subtotal (10 - 80)	12.89	1,164,287	182,627	**1,346,914**	**$ 104,526**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**134,691**			**9%**	**0**
Subtotal (10 - 90)	12.89			**1,481,605**	**$ 114,978**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	12.89			**1,481,605**	**$ 114,978**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				15.69%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.57%				
Total Contingency as % of Base Yr Dollars w/o Contingency				27.25%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date: **3/16/12**

LRT Alternative — Yr of Base Year $: 2010

Segment 1 West Bank Option 3 — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**11.81**	426,758	94,078	**520,836**	**$ 44,099**	**51%**	**29%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	7.14	24094.77	6,024	30,118	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	3.21	173300.00	43,325	216,625	$ 67,494			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	1.46	175696.20	43,924	219,620	$ 150,460			0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		22,700	341	23,041				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		22,167	333	22,500				0
10.12 Track: Special (switches, turnouts)		8,800	132	8,932				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**7**	40,257	10,064	**50,321**	**$ 7,189**	**5%**	**3%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	7	40257	10,064	50,321	$ 7,189			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	11.81	160,000	24,000	**184,000**	**$ 15,579**	**18%**	**10%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				0
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	11.81	40,500	12,150	**52,650**	**$ 4,458**	**5%**	**3%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		14,000	4,200	18,200				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		26,500	7,950	34,450				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	11.81	156,700	47,010	**203,710**	**$ 17,248**	**20%**	**11%**	**0**
50.01 Train control and signals		31,400	9,420	40,820				0
50.02 Traffic signals and crossing protection		13,400	4,020	17,420				0
50.03 Traction power supply: substations		27,900	8,370	36,270				0
50.04 Traction power distribution: catenary and third rail		28,800	8,640	37,440				0
50.05 Communications		39,800	11,940	51,740				0
50.06 Fare collection system and equipment		15,400	4,620	20,020				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	11.81	824,215	187,302	**1,011,517**	**$ 85,644**	**100%**	**56%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	11.81	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**97**	339,500	16,975	**356,475**	**$ 3,675**		**20%**	**0**
70.01 Light Rail	97	339,500	16,975	356,475	$ 3,675			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other				0				0
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	11.81	235,272	32,860	**268,132**	**$ 22,702**	**27%**	**15%**	**0**
80.01 Preliminary Engineering		23,527	3,529	27,056				0
80.02 Final Design		54,897	8,235	63,131				0
80.03 Project Management for Design and Construction		78,424	11,764	90,188				0
80.04 Construction Administration & Management		39,212	5,882	45,094				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		7,842	863	8,705				0
80.07 Surveys, Testing, Investigation, Inspection		15,685	2,353	18,038				0
80.08 Start up		15,685	235	15,920				0
Subtotal (10 - 80)	11.81	1,398,987	237,137	**1,636,124**	**$ 138,529**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**163,612**			**9%**	**0**
Subtotal (10 - 90)	11.81			**1,799,736**	**$ 152,382**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	11.81			**1,799,736**	**$ 152,382**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				16.95%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.70%				
Total Contingency as % of Base Yr Dollars w/o Contingency				28.65%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date **3/16/12**
LRT Alternative	Yr of Base Year $ 2010
Segment 2 LA	Yr of Revenue Ops 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**7.77**	74,684	11,377	**86,060**	**$ 11,081**	**27%**	**20%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	7.42	25043.69	6,261	31,305	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.34	18600.00	4,650	23,250	$ 67,636			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		1,700	26	1,726				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		23,040	346	23,386				0
10.12 Track: Special (switches, turnouts)		6,300	95	6,395				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**5**	28,755	7,189	**35,944**	**$ 7,189**	**11%**	**8%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	5	28755	7,189	35,944	$ 7,189			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	7.77	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	7.77	30,400	9,120	**39,520**	**$ 5,089**	**13%**	**9%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		10,500	3,150	13,650				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		19,900	5,970	25,870				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	7.77	118,800	35,640	**154,440**	**$ 19,885**	**49%**	**36%**	**0**
50.01 Train control and signals		23,600	7,080	30,680				0
50.02 Traffic signals and crossing protection		7,300	2,190	9,490				0
50.03 Traction power supply: substations		21,000	6,300	27,300				0
50.04 Traction power distribution: catenary and third rail		21,600	6,480	28,080				0
50.05 Communications		29,900	8,970	38,870				0
50.06 Fare collection system and equipment		15,400	4,620	20,020				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	7.77	252,639	63,325	**315,964**	**$ 40,683**	**100%**	**73%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	7.77	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	7.77	67,269	9,395	**76,664**	**$ 9,871**	**24%**	**18%**	**0**
80.01 Preliminary Engineering		6,727	1,009	7,736				0
80.02 Final Design		15,696	2,354	18,050				0
80.03 Project Management for Design and Construction		22,423	3,363	25,786				0
80.04 Construction Administration & Management		11,211	1,682	12,893				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		2,242	247	2,489				0
80.07 Surveys, Testing, Investigation, Inspection		4,485	673	5,157				0
80.08 Start up		4,485	67	4,552				0
Subtotal (10 - 80)	7.77	319,908	72,720	**392,628**	**$ 50,554**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**39,263**			**9%**	**0**
Subtotal (10 - 90)	7.77			**431,891**	**$ 55,610**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	7.77			**431,891**	**$ 55,610**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				22.73%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.27%				
Total Contingency as % of Base Yr Dollars w/o Contingency				35.00%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date: **3/16/12**
LRT Alternative	Yr of Base Year $: 2010
Segment 2 Orange	Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**9.79**	122,152	20,942	**143,095**	**$ 14,614**	**32%**	**24%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	8.84	29818.94	7,455	37,274	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.95	51500.00	12,875	64,375	$ 67,507			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		4,600	69	4,669				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		27,433	412	27,845				0
10.12 Track: Special (switches, turnouts)		8,800	132	8,932				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**7**	40,257	10,064	**50,321**	**$ 7,189**	**11%**	**8%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	7	40257	10,064	50,321	$ 7,189			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	9.79	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	9.79	38,300	11,490	**49,790**	**$ 5,085**	**11%**	**8%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		13,200	3,960	17,160				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		25,100	7,530	32,630				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	9.79	154,700	46,410	**201,110**	**$ 20,539**	**45%**	**33%**	**0**
50.01 Train control and signals		29,700	8,910	38,610				0
50.02 Traffic signals and crossing protection		7,300	2,190	9,490				0
50.03 Traction power supply: substations		26,400	7,920	34,320				0
50.04 Traction power distribution: catenary and third rail		27,200	8,160	35,360				0
50.05 Communications		37,700	11,310	49,010				0
50.06 Fare collection system and equipment		26,400	7,920	34,320				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	9.79	355,409	88,906	**444,316**	**$ 45,377**	**100%**	**73%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	9.79	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	9.79	94,512	13,200	**107,712**	**$ 11,000**	**24%**	**18%**	**0**
80.01 Preliminary Engineering		9,451	1,418	10,869				0
80.02 Final Design		22,053	3,308	25,361				0
80.03 Project Management for Design and Construction		31,504	4,726	36,230				0
80.04 Construction Administration & Management		15,752	2,363	18,115				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		3,150	347	3,497				0
80.07 Surveys, Testing, Investigation, Inspection		6,301	945	7,246				0
80.08 Start up		6,301	95	6,395				0
Subtotal (10 - 80)	9.79	449,921	102,107	**552,028**	**$ 56,377**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**55,203**			**9%**	**0**
Subtotal (10 - 90)	9.79			**607,231**	**$ 62,015**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	9.79			**607,231**	**$ 62,015**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				22.69%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.27%				
Total Contingency as % of Base Yr Dollars w/o Contingency				34.96%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date: 3/16/12

LRT Alternative — Yr of Base Year $: 2010

Segment 3 Option (Harbor/1st/SARTC) — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**5.11**	72,026	12,846	**84,872**	**$ 16,597**	**31%**	**22%**	**0**
10.01 Guideway: At-grade exclusive right-of-way	4.47	15065.70	3,766	18,832	$ 4,217			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	0.65	35000.00	8,750	43,750	$ 67,495			0
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		3,100	47	3,147				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		13,860	208	14,068				0
10.12 Track: Special (switches, turnouts)		5,000	75	5,075				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**4**	49,802	12,451	**62,253**	**$ 15,563**	**23%**	**16%**	**0**
20.01 At-grade station, stop, shelter, mall, terminal, platform	2	11502	2,876	14,378	$ 7,189			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	2	38300	9,575	47,875	$ 23,938			0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	5.11	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	5.11	20,000	6,000	**26,000**	**$ 5,085**	**10%**	**7%**	**0**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		6,900	2,070	8,970				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		13,100	3,930	17,030				0
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	5.11	76,500	22,950	**99,450**	**$ 19,448**	**36%**	**26%**	**0**
50.01 Train control and signals		15,500	4,650	20,150				0
50.02 Traffic signals and crossing protection		2,300	690	2,990				0
50.03 Traction power supply: substations		13,800	4,140	17,940				0
50.04 Traction power distribution: catenary and third rail		14,200	4,260	18,460				0
50.05 Communications		19,700	5,910	25,610				0
50.06 Fare collection system and equipment		11,000	3,300	14,300				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	5.11	218,328	54,246	**272,574**	**$ 53,304**	**100%**	**72%**	**0**
60 ROW, LAND, EXISTING IMPROVEMENTS	5.11	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other				0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	5.11	62,043	8,665	**70,709**	**$ 13,828**	**26%**	**19%**	**0**
80.01 Preliminary Engineering		6,204	931	7,135				0
80.02 Final Design		14,477	2,172	16,648				0
80.03 Project Management for Design and Construction		20,681	3,102	23,783				0
80.04 Construction Administration & Management		10,341	1,551	11,892				0
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		2,068	227	2,296				0
80.07 Surveys, Testing, Investigation, Inspection		4,136	620	4,757				0
80.08 Start up		4,136	62	4,198				0
Subtotal (10 - 80)	5.11	280,372	62,912	**343,283**	**$ 67,132**		**91%**	**0**
90 UNALLOCATED CONTINGENCY				**34,328**			**9%**	**0**
Subtotal (10 - 90)	5.11			**377,612**	**$ 73,845**		**100%**	**0**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	5.11			**377,612**	**$ 73,845**		**100%**	**0**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				22.44%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.24%				
Total Contingency as % of Base Yr Dollars w/o Contingency				34.68%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$0
YOE Total Project Cost per Mile (X000)								$0

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E								(Rev.11, May 2, 2008)
PEROW/WSAB Corridor AA							Today's Date	3/16/12
Low Speed Maglev Alternative							Yr of Base Year $	2010
Segment 1 East Bank Option							Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**11.98**	654,400	165,475	**819,875**	**$ 68,419**	**45%**	**29%**	**1,058,932**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	11.98	646900.00	161,725	808,625	$ 67,480			1,044,402
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		0	0	0				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		7,500	3,750	11,250				14,530
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	120,800	30,200	**151,000**	**$ 25,167**	**8%**	**5%**	**195,028**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	6	115000	28,750	143,750	$ 23,958			185,664
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		5,800	1,450	7,250				9,364
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	11.98	160,000	24,000	**184,000**	**$ 15,355**	**10%**	**6%**	**237,650**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				237,650
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	11.98	32,400	9,720	**42,120**	**$ 3,515**	**2%**	**1%**	**54,401**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		16,200	4,860	21,060				27,201
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		16,200	4,860	21,060				27,201
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	11.98	421,500	189,510	**611,010**	**$ 50,989**	**34%**	**21%**	**789,167**
50.01 Train control and signals		46,900	14,070	60,970				78,747
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		88,900	44,450	133,350				172,232
50.04 Traction power distribution: catenary and third rail		226,400	113,200	339,600				438,620
50.05 Communications		46,100	13,830	59,930				77,404
50.06 Fare collection system and equipment		13,200	3,960	17,160				22,163
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	11.98	1,389,100	418,905	**1,808,005**	**$ 150,879**	**100%**	**63%**	**2,335,179**
60 ROW, LAND, EXISTING IMPROVEMENTS	11.98	68,900	27,560	**96,460**	**$ 8,050**		**3%**	**124,586**
60.01 Purchase or lease of real estate		68,900	27,560	96,460				124,586
60.02 Relocation of existing households and businesses				0				0
70 VEHICLES (number)	**72**	360,000	180,000	**540,000**	**$ 7,500**		**19%**	**697,452**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	72	360,000	180,000	540,000	$ 7,500			697,452
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	11.98	126,740	17,701	**144,442**	**$ 12,054**	**8%**	**5%**	**186,557**
80.01 Preliminary Engineering		12,674	1,901	14,575				18,825
80.02 Final Design		29,573	4,436	34,009				43,925
80.03 Project Management for Design and Construction		42,247	6,337	48,584				62,750
80.04 Construction Administration & Management		21,123	3,169	24,292				31,375
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		4,225	465	4,689				6,057
80.07 Surveys, Testing, Investigation, Inspection		8,449	1,267	9,717				12,550
80.08 Start up		8,449	127	8,576				11,077
Subtotal (10 - 80)	11.98	1,944,740	644,166	**2,588,907**	**$ 216,046**		**91%**	**3,343,774**
90 UNALLOCATED CONTINGENCY				**258,891**			**9%**	**0**
Subtotal (10 - 90)	11.98			**2,847,797**	**$ 237,650**		**100%**	**3,343,774**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	11.98			**2,847,797**	**$ 237,650**		**100%**	**3,343,774**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				33.12%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				13.31%				
Total Contingency as % of Base Yr Dollars w/o Contingency				46.44%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$194,872
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$220,837
YOE Total Project Cost per Mile (X000)								$279,040

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date	3/16/12
Low Speed Maglev Alternative	Yr of Base Year $	2010
Segment 1 West Bank Option 1	Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**11.94**	652,100	164,900	**817,000**	**$ 68,422**	**45%**	**29%**	**1,055,219**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	11.94	644600.00	161,150	805,750	$ 67,480			1,040,689
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		0	0	0				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		7,500	3,750	11,250				14,530
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**6**	120,800	30,200	**151,000**	**$ 25,167**	**8%**	**5%**	**195,028**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	6	115000	28,750	143,750	$ 23,958			185,664
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		5,800	1,450	7,250				9,364
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	11.94	160,000	24,000	**184,000**	**$ 15,410**	**10%**	**6%**	**237,650**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				237,650
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	11.94	32,200	9,660	**41,860**	**$ 3,506**	**2%**	**1%**	**54,065**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		16,100	4,830	20,930				27,033
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		16,100	4,830	20,930				27,033
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	11.94	420,000	188,840	**608,840**	**$ 50,989**	**34%**	**21%**	**786,364**
50.01 Train control and signals		46,700	14,010	60,710				78,412
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		88,600	44,300	132,900				171,651
50.04 Traction power distribution: catenary and third rail		225,600	112,800	338,400				437,070
50.05 Communications		45,900	13,770	59,670				77,068
50.06 Fare collection system and equipment		13,200	3,960	17,160				22,163
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	11.94	1,385,100	417,600	**1,802,700**	**$ 150,973**	**100%**	**63%**	**2,328,327**
60 ROW, LAND, EXISTING IMPROVEMENTS	11.94	68,900	27,560	**96,460**	**$ 8,078**		**3%**	**124,586**
60.01 Purchase or lease of real estate		68,900	27,560	96,460				124,586
60.02 Relocation of existing households and businesses				0				0
70 VEHICLES (number)	**72**	360,000	180,000	**540,000**	**$ 7,500**		**19%**	**697,452**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	72	360,000	180,000	540,000	$ 7,500			697,452
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	11.94	126,290	17,638	**143,928**	**$ 12,054**	**8%**	**5%**	**185,894**
80.01 Preliminary Engineering		12,629	1,894	14,523				18,758
80.02 Final Design		29,468	4,420	33,888				43,769
80.03 Project Management for Design and Construction		42,097	6,314	48,411				62,527
80.04 Construction Administration & Management		21,048	3,157	24,205				31,263
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		4,210	463	4,673				6,035
80.07 Surveys, Testing, Investigation, Inspection		8,419	1,263	9,682				12,505
80.08 Start up		8,419	126	8,546				11,037
Subtotal (10 - 80)	11.94	1,940,290	642,798	**2,583,088**	**$ 216,329**		**91%**	**3,336,258**
90 UNALLOCATED CONTINGENCY				**258,309**			**9%**	**0**
Subtotal (10 - 90)	11.94			**2,841,397**	**$ 237,962**		**100%**	**3,336,258**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	11.94			**2,841,397**	**$ 237,962**		**100%**	**3,336,258**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				33.13%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				13.31%				
Total Contingency as % of Base Yr Dollars w/o Contingency				46.44%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$194,994
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$220,996
YOE Total Project Cost per Mile (X000)								$279,406

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date: **3/16/12**
	Yr of Base Year $: 2010
Segment 1 West Bank Option 2	Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**12.23**	669,200	169,500	**838,700**	**$ 68,562**	**45%**	**25%**	**1,083,246**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	12.23	660400.00	165,100	825,500	$ 67,483			1,066,197
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		0	0	0				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		8,800	4,400	13,200				17,049
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**7**	121,700	30,425	**152,125**	**$ 21,732**	**8%**	**4%**	**196,481**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	7	115000	28,750	143,750	$ 20,536			185,664
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		6,700	1,675	8,375				10,817
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	12.23	160,000	24,000	**184,000**	**$ 15,042**	**10%**	**5%**	**237,650**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				237,650
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	12.23	33,000	9,900	**42,900**	**$ 3,507**	**2%**	**1%**	**55,409**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		16,500	4,950	21,450				27,704
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		16,500	4,950	21,450				27,704
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	12.23	435,600	195,060	**630,660**	**$ 51,555**	**34%**	**19%**	**814,546**
50.01 Train control and signals		47,900	14,370	62,270				80,427
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		90,800	45,400	136,200				175,913
50.04 Traction power distribution: catenary and third rail		231,100	115,550	346,650				447,725
50.05 Communications		47,100	14,130	61,230				79,083
50.06 Fare collection system and equipment		18,700	5,610	24,310				31,398
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	12.23	1,419,500	428,885	**1,848,385**	**$ 151,101**	**100%**	**54%**	**2,387,333**
60 ROW, LAND, EXISTING IMPROVEMENTS	12.23	382,000	152,800	**534,800**	**$ 43,719**		**16%**	**690,736**
60.01 Purchase or lease of real estate		382,000	152,800	534,800				690,736
60.02 Relocation of existing households and businesses				0				0
70 VEHICLES (number)	**75**	375,000	187,500	**562,500**	**$ 7,500**		**17%**	**726,512**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	75	375,000	187,500	562,500	$ 7,500			726,512
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	12.23	130,975	18,293	**149,268**	**$ 12,202**	**8%**	**4%**	**192,791**
80.01 Preliminary Engineering		13,098	1,965	15,062				19,454
80.02 Final Design		30,561	4,584	35,145				45,392
80.03 Project Management for Design and Construction		43,658	6,549	50,207				64,846
80.04 Construction Administration & Management		21,829	3,274	25,104				32,423
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		4,366	480	4,846				6,259
80.07 Surveys, Testing, Investigation, Inspection		8,732	1,310	10,041				12,969
80.08 Start up		8,732	131	8,863				11,447
Subtotal (10 - 80)	12.23	2,307,475	787,478	**3,094,953**	**$ 253,005**		**91%**	**3,997,372**
90 UNALLOCATED CONTINGENCY				**309,495**			**9%**	**0**
Subtotal (10 - 90)	12.23			**3,404,448**	**$ 278,306**		**100%**	**3,997,372**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	12.23			**3,404,448**	**$ 278,306**		**100%**	**3,997,372**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				34.13%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				13.41%				
Total Contingency as % of Base Yr Dollars w/o Contingency				47.54%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$195,159
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$267,385
YOE Total Project Cost per Mile (X000)								$326,776

M A I N   W O R K S H E E T - B U I L D   A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA	Today's Date	3/16/12
Low Speed Maglev Alternative	Yr of Base Year $	2010
Segment 1 West Bank Option 3	Yr of Revenue Ops	2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**11.55**	633,700	160,925	**794,625**	**$ 68,781**	**39%**	**21%**	**1,026,320**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	11.55	623700.00	155,925	779,625	$ 67,482			1,006,946
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		0	0	0				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		10,000	5,000	15,000				19,374
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**8**	167,800	41,950	**209,750**	**$ 26,219**	**10%**	**6%**	**270,908**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	8	153400	38,350	191,750	$ 23,969			247,660
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		14,400	3,600	18,000				23,248
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	11.55	160,000	24,000	**184,000**	**$ 15,927**	**9%**	**5%**	**237,650**
30.01 Administration Building: Office, sales, storage, revenue counting				0				0
30.02 Light Maintenance Facility				0				0
30.03 Heavy Maintenance Facility		160,000	24,000	184,000				237,650
30.04 Storage or Maintenance of Way Building				0				0
30.05 Yard and Yard Track				0				0
40 SITEWORK & SPECIAL CONDITIONS	11.55	184,600	55,380	**239,980**	**$ 20,772**	**12%**	**6%**	**309,953**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		169,000	50,700	219,700				283,760
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		15,600	4,680	20,280				26,193
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	11.55	411,300	184,210	**595,510**	**$ 51,546**	**29%**	**16%**	**769,147**
50.01 Train control and signals		45,200	13,560	58,760				75,893
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		85,800	42,900	128,700				166,226
50.04 Traction power distribution: catenary and third rail		218,300	109,150	327,450				422,927
50.05 Communications		44,400	13,320	57,720				74,550
50.06 Fare collection system and equipment		17,600	5,280	22,880				29,551
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	11.55	1,557,400	466,465	**2,023,865**	**$ 175,180**	**100%**	**55%**	**2,613,979**
60 ROW, LAND, EXISTING IMPROVEMENTS	11.55	473,000	189,200	**662,200**	**$ 57,318**		**18%**	**855,283**
60.01 Purchase or lease of real estate		473,000	189,200	662,200				855,283
60.02 Relocation of existing households and businesses				0				0
70 VEHICLES (number)	**72**	360,000	180,000	**540,000**	**$ 7,500**		**15%**	**697,452**
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail		0	0	0	#VALUE!			0
70.04 Bus	0	0	0	0				0
70.05 Other	72	360,000	180,000	540,000	$ 7,500			697,452
70.06 Non-revenue vehicles				0				0
70.07 Spare parts				0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	11.55	123,734	17,282	**141,015**	**$ 12,206**	**7%**	**4%**	**182,132**
80.01 Preliminary Engineering		12,373	1,856	14,229				18,378
80.02 Final Design		28,871	4,331	33,202				42,883
80.03 Project Management for Design and Construction		41,245	6,187	47,431				61,261
80.04 Construction Administration & Management		20,622	3,093	23,716				30,631
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		4,124	454	4,578				5,913
80.07 Surveys, Testing, Investigation, Inspection		8,249	1,237	9,486				12,252
80.08 Start up		8,249	124	8,373				10,814
Subtotal (10 - 80)	11.55	2,514,134	852,947	**3,367,080**	**$ 291,446**		**91%**	**4,348,845**
90 UNALLOCATED CONTINGENCY				**336,708**			**9%**	**0**
Subtotal (10 - 90)	11.55			**3,703,788**	**$ 320,590**		**100%**	**4,348,845**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	11.55			**3,703,788**	**$ 320,590**		**100%**	**4,348,845**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				33.93%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				13.39%				
Total Contingency as % of Base Yr Dollars w/o Contingency				47.32%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$226,259
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$316,055
YOE Total Project Cost per Mile (X000)								$376,425

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date: **3/16/12**

Low Speed Maglev Alternative — Yr of Base Year $: 2010

Segment 2 Los Angeles County Portion — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**7.77**	793,800	206,395	**1,000,195**	**$ 128,806**	**64%**	**55%**	**1,291,829**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	7.77	749800.00	187,450	937,250	$ 120,700			1,210,531
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		37,700	18,850	56,550				73,039
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		6,300	95	6,395				8,259
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**5**	100,700	25,175	**125,875**	**$ 25,175**	**8%**	**7%**	**162,577**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	5	95900	23,975	119,875	$ 23,975			154,828
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		4,800	1,200	6,000				7,749
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	7.77	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	7.77	21,000	6,300	**27,300**	**$ 3,516**	**2%**	**2%**	**35,260**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		10,500	3,150	13,650				17,630
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		10,500	3,150	13,650				17,630
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	7.77	277,100	123,990	**401,090**	**$ 51,653**	**26%**	**22%**	**518,039**
50.01 Train control and signals		30,400	9,120	39,520				51,043
50.02 Traffic signals and crossing protection		1,500	450	1,950				2,519
50.03 Traction power supply: substations		57,600	28,800	86,400				111,592
50.04 Traction power distribution: catenary and third rail		146,700	73,350	220,050				284,212
50.05 Communications		29,900	8,970	38,870				50,204
50.06 Fare collection system and equipment		11,000	3,300	14,300				18,470
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	7.77	1,192,600	361,860	**1,554,460**	**$ 200,184**	100%	**86%**	**2,007,705**
60 ROW, LAND, EXISTING IMPROVEMENTS	7.77	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other	0	0	0	0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	7.77	83,405	11,649	**95,054**	**$ 12,241**	**6%**	**5%**	**122,769**
80.01 Preliminary Engineering		8,340	1,251	9,592				12,388
80.02 Final Design		19,461	2,919	22,380				28,906
80.03 Project Management for Design and Construction		27,802	4,170	31,972				41,294
80.04 Construction Administration & Management		13,901	2,085	15,986				20,647
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		2,780	306	3,086				3,986
80.07 Surveys, Testing, Investigation, Inspection		5,560	834	6,394				8,259
80.08 Start up		5,560	83	5,644				7,289
Subtotal (10 - 80)	7.77	1,276,005	373,508	**1,649,513**	**$ 212,425**		**91%**	**2,130,474**
90 UNALLOCATED CONTINGENCY				**164,951**			**9%**	**0**
Subtotal (10 - 90)	7.77			**1,814,464**	**$ 233,668**		**100%**	**2,130,474**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	7.77			**1,814,464**	**$ 233,668**		**100%**	**2,130,474**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				29.27%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.93%				
Total Contingency as % of Base Yr Dollars w/o Contingency				42.20%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$258,553
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$274,363
YOE Total Project Cost per Mile (X000)								$274,363

M A I N W O R K S H E E T - B U I L D A L T E R N A T I V E

(Rev.11, May 2, 2008)

PEROW/WSAB Corridor AA — Today's Date: **11/11/11**

Low Speed Maglev Alternative — Yr of Base Year $: 2010

Segment 2 Orange County Portion — Yr of Revenue Ops: 2010

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**9.79**	806,200	188,296	**994,496**	**$ 101,566**	**60%**	**51%**	**1,284,469**
10.01 Guideway: At-grade exclusive right-of-way	0.00	0.00	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0.00	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0.00	0	0				0
10.04 Guideway: Aerial structure	9.79	749800.00	187,450	937,250	$ 95,719			1,210,531
10.05 Guideway: Built-up fill	0.00	0.00	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0.00	0	0				0
10.07 Guideway: Underground tunnel	0.00	0.00	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0.00	0	0				0
10.09 Track: Direct fixation		47,600	714	48,314				62,401
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		8,800	132	8,932				11,536
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**7**	140,900	35,225	**176,125**	**$ 25,161**	**11%**	**9%**	**227,479**
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	7	134200	33,550	167,750	$ 23,964			216,662
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		6,700	1,675	8,375				10,817
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	9.79	0	0	**0**	**$ -**	**0%**	**0%**	**0**
30.01 Administration Building: Office, sales, storage, revenue counting				0				#DIV/0!
30.02 Light Maintenance Facility				0				#DIV/0!
30.03 Heavy Maintenance Facility		0	0	0				#DIV/0!
30.04 Storage or Maintenance of Way Building				0				#DIV/0!
30.05 Yard and Yard Track				0				#DIV/0!
40 SITEWORK & SPECIAL CONDITIONS	9.79	26,400	7,920	**34,320**	**$ 3,505**	**2%**	**2%**	**44,327**
40.01 Demolition, Clearing, Earthwork		0	0	0				0
40.02 Site Utilities, Utility Relocation		13,200	3,960	17,160				22,163
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		0	0	0				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		13,200	3,960	17,160				22,163
40.07 Automobile, bus, van accessways including roads, parking lots				0				0
40.08 Temporary Facilities and other indirect costs during construction				0				0
50 SYSTEMS	9.79	350,300	105,090	**455,390**	**$ 46,508**	**27%**	**23%**	**588,171**
50.01 Train control and signals		38,300	11,490	49,790				64,308
50.02 Traffic signals and crossing protection		1,200	360	1,560				2,015
50.03 Traction power supply: substations		72,700	21,810	94,510				122,067
50.04 Traction power distribution: catenary and third rail		185,000	55,500	240,500				310,624
50.05 Communications		37,700	11,310	49,010				63,300
50.06 Fare collection system and equipment		15,400	4,620	20,020				25,857
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	9.79	1,323,800	336,531	**1,660,331**	**$ 169,566**	**100%**	**85%**	**2,144,446**
60 ROW, LAND, EXISTING IMPROVEMENTS	9.79	0	0	**0**	**$ -**		**0%**	**0**
60.01 Purchase or lease of real estate		0	0	0				#DIV/0!
60.02 Relocation of existing households and businesses				0				#DIV/0!
70 VEHICLES (number)	**0**	0	0	**0**			**0%**	**0**
70.01 Light Rail	0	0	0	0				#DIV/0!
70.02 Heavy Rail	0	0	0	0				#DIV/0!
70.03 Commuter Rail	0	0	0	0				#DIV/0!
70.04 Bus	0	0	0	0				#DIV/0!
70.05 Other	0	0	0	0				#DIV/0!
70.06 Non-revenue vehicles				0				#DIV/0!
70.07 Spare parts				0				#DIV/0!
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	9.79	105,382	14,718	**120,100**	**$ 12,266**	**7%**	**6%**	**155,119**
80.01 Preliminary Engineering		10,538	1,581	12,119				15,653
80.02 Final Design		24,589	3,688	28,278				36,523
80.03 Project Management for Design and Construction		35,127	5,269	40,396				52,175
80.04 Construction Administration & Management		17,564	2,635	20,198				26,088
80.05 Professional Liability and other Non-Construction Insurance				0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		3,513	386	3,899				5,036
80.07 Surveys, Testing, Investigation, Inspection		7,025	1,054	8,079				10,435
80.08 Start up		7,025	105	7,131				9,210
Subtotal (10 - 80)	9.79	1,429,182	351,249	**1,780,431**	**$ 181,831**		**91%**	**2,299,565**
90 UNALLOCATED CONTINGENCY				**178,043**			**9%**	**0**
Subtotal (10 - 90)	9.79			**1,958,474**	**$ 200,014**		**100%**	**2,299,565**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	9.79			**1,958,474**	**$ 200,014**		**100%**	**2,299,565**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				24.58%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.46%				
Total Contingency as % of Base Yr Dollars w/o Contingency				37.03%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								$219,007
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$234,849
YOE Total Project Cost per Mile (X000)								$234,849

Appendix E: Operating and Cost Estimate and Financial Analysis

Southern California
Association of Governments

Pacific Electric Right-of-Way / West Santa Ana Branch Corridor Alternatives Analysis

Financial Analysis

Prepared by
AECOM

March 2012

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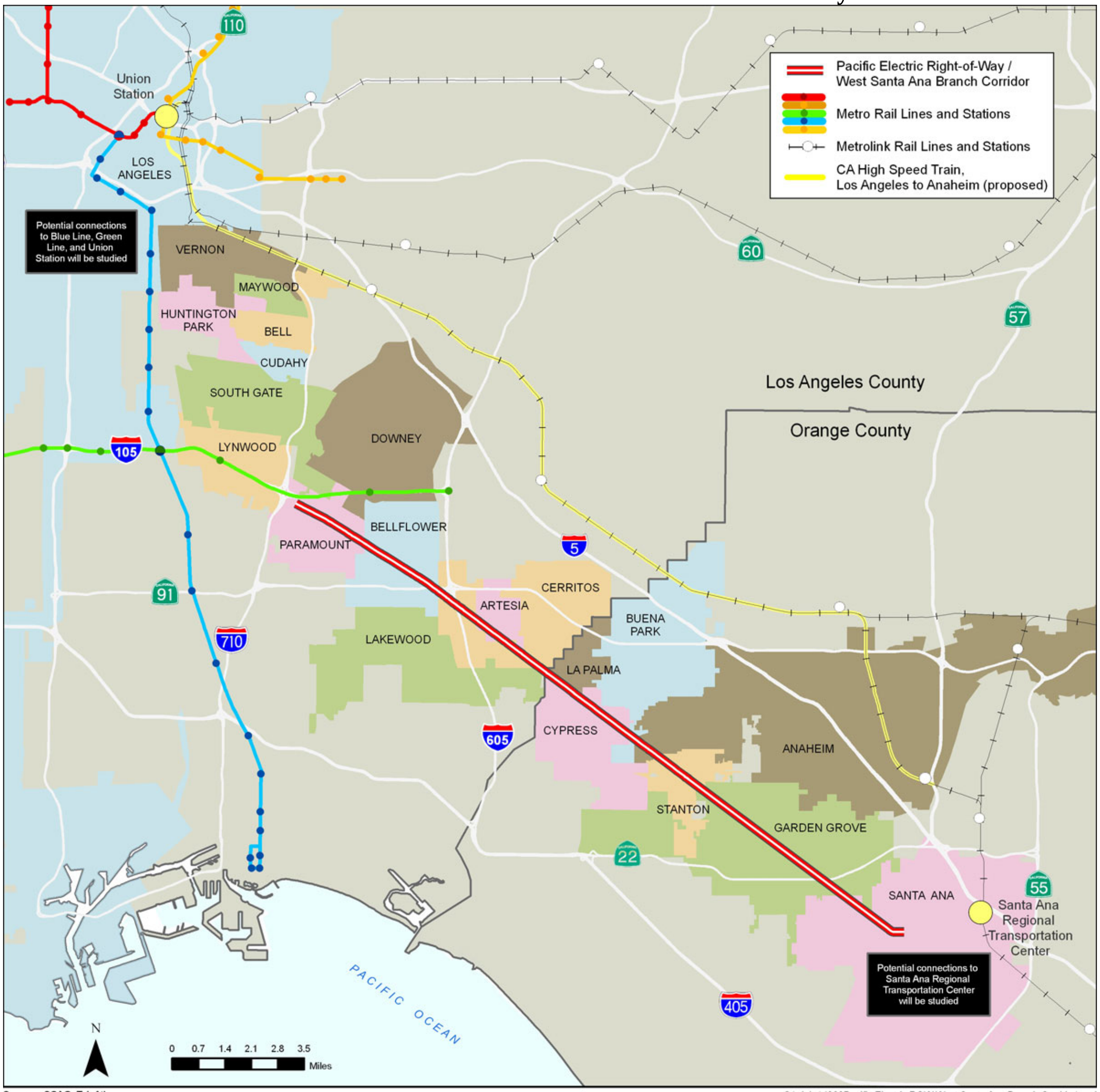
FINANCIAL ANALYSIS

This analysis examines the funding required to construct and operate the Pacific Electric Right-of-Way Project (PE ROW) / West Santa Ana Branch Corridor project. The PE ROW project is a railroad right-of-way that extends for approximately 20 miles between the City of Paramount in Los Angeles County and the City of Santa Ana in Orange County. The railroad corridor was once part of the Pacific Electric Railway, or Red Car, system that provided mass transit service to Southern California from 1901 to 1961. Much of the corridor has been abandoned and is not currently used for mass transit purposes.

The Southern California Association of Governments (SCAG), in coordination with the Los Angeles County Metropolitan Transportation Authority (Metro) and the Orange County Transportation Authority (OCTA), is conducting a transit Alternatives Analysis (AA) for the PE ROW / West Santa Ana Branch. The AA will examine potential transit service along the corridor that can provide additional travel options between Los Angeles and Orange Counties, reduce congestion on nearby streets and freeways, and provide adjacent communities with access to the regional transit network. Exhibit 1 maps PE ROW project study area.

Exhibit 1. PE ROW / West Santa Ana Branch Corridor Study Area



Sources: SCAG, TeleAtlas

O:\=jobs\4293Pacific Electric ROW West Santa Ana Branch Corridor\mxd

All references to fiscal year (FY) in this analysis refer to the Los Angeles County Metropolitan Transportation Authority and the Orange County Transportation Authority fiscal year, which begins on July 1 and ends on June 30. For example, FY 2011 refers to the period July 1, 2010 through June 30, 2011.

This document begins with a discussion of the sources and uses of fund analysis, which addresses both capital and operating revenues and expenses. The following section addresses funding requirements, including the revenue required to fund the gap between projected sources and uses of funds for project capital and operating and maintenance (O&M) costs. The final section presents the cash flow analysis for selected PE ROW project alternatives.

1. Sources and Uses of Funds Analysis

1.1 Capital Uses of Funds

The construction period of the PE ROW project is from FY2015 to FY2026, with an exception of the TSM component which is assumed to be completed within 5 years from FY2022 to fY2026. **Exhibit 2** summarizes the capital expenses in base year (FY2011) dollars from FY2015 and FY2026 and **Exhibit 3** in year-of-expenditure (inflated) dollars.

Costs estimates were first developed in FY2010 dollars and escalated to FY2011 dollars and then to year-of-expenditure dollars by applying the inflation rate of 3.33% per year, which is the annualized growth rate of the R.S Means Construction Cost index for San Jose, CA from FY2011 to FY2035. This projection was the most detailed and recent projection available; it was prepared for the Santa Clara Valley Transportation Authority by Moody's Economy.com in June 2010. This inflation forecast is summarized in Appendix A.

The financial analysis also projected the costs to rehabilitate, replace, and maintain capital assets in a state of good repair. Rehabilitation and replacement costs are incurred beginning 12 years after the initial costs to construct the PE ROW project, and are based on the useful life of capital assets.

Exhibit 2. PE ROW Construction Costs – FY15-FY26
Millions of Base Year (2011) Dollars

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
TSM								27.09	36.12	54.18	36.12	27.09	**180.6**
BRT Alternatives													
Street Running	241.69	162.62	238.90	162.62	124.47	7.01	4.75	4.75	6.21	4.75	4.75	3.30	**965.83**
HOV Lane-Running	238.55	160.51	235.80	160.51	122.86	10.85	7.36	7.36	9.62	7.36	7.36	5.11	**973.27**
Street Car Alternatives													
East Bank 1	113.35	76.26	112.04	76.26	58.38	334.44	226.91	226.91	296.45	226.91	226.91	157.38	**2,132.21**
West Bank 1	114.02	76.72	112.71	76.72	58.72	327.36	222.12	222.12	290.18	222.12	222.12	154.05	**2,098.94**
West Bank 2	114.79	77.23	113.46	77.23	59.12	319.61	216.85	216.85	283.30	216.85	216.85	150.40	**2,062.57**
West Bank 3	109.04	73.36	107.78	73.36	56.16	387.59	262.98	262.98	343.56	262.98	262.98	182.40	**2,385.17**
LRT Alternatives													
East Bank 1	126.79	85.31	125.33	85.31	65.30	344.34	233.64	233.64	305.23	233.64	233.64	162.04	**2,234.20**
West Bank 1	128.13	86.21	126.65	86.21	65.99	332.14	225.36	225.36	294.41	225.36	225.36	156.30	**2,177.47**
West Bank 2	128.01	86.13	126.53	86.13	65.93	333.21	226.08	226.08	295.36	226.08	226.08	156.80	**2,182.43**
West Bank 3	121.76	81.93	120.36	81.93	62.71	398.96	270.69	270.69	353.64	270.69	270.69	187.75	**2,491.80**
Maglev Alternatives													
East Bank 1	548.03	368.73	541.70	368.73	282.24	644.36	437.20	437.20	571.17	437.20	437.20	303.23	**5,376.98**
West Bank 1	529.31	356.13	523.20	356.13	272.60	620.90	421.28	421.28	550.37	421.28	421.28	292.19	**5,185.93**
West Bank 2	507.33	341.34	501.47	341.34	261.28	747.86	507.42	507.42	662.91	507.42	507.42	351.93	**5,745.15**
West Bank 3	498.45	335.37	492.69	335.37	256.71	809.51	549.25	549.25	717.56	549.25	549.25	380.95	**6,023.62**

Exhibit 3. PE ROW Construction Costs – FY15-FY26
Millions of Year-of-Expenditure (Inflated) Dollars

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
TSM								38.84	53.51	82.94	57.14	44.28	**276.72**
BRT Alternatives													
Street Running	275.53	191.56	290.79	204.53	161.77	9.41	6.60	6.82	9.20	7.28	7.52	5.39	**1,176.37**
HOV Lane-Running	271.95	189.07	287.01	201.87	159.67	14.58	10.22	10.56	14.25	11.27	11.65	8.35	**1,190.46**
Street Car Alternatives													
East Bank 1	129.22	89.84	136.37	95.92	75.87	449.11	314.87	325.35	439.20	347.38	358.95	257.25	**3,019.32**
West Bank 1	129.99	90.37	137.18	96.49	76.32	439.61	308.21	318.47	429.91	340.03	351.36	251.81	**2,969.75**
West Bank 2	130.86	90.98	138.11	97.14	76.83	429.20	300.91	310.93	419.73	331.98	343.03	245.84	**2,915.53**
West Bank 3	124.30	86.42	131.19	92.27	72.98	520.49	364.91	377.06	509.01	402.59	416.00	298.13	**3,395.35**
LRT Alternatives													
East Bank 1	144.55	100.49	152.55	107.30	84.87	462.41	324.19	334.99	452.21	357.67	369.58	264.87	**3,155.67**
West Bank 1	146.07	101.55	154.16	108.43	85.76	446.03	312.71	323.12	436.19	345.00	356.49	255.48	**3,070.97**
West Bank 2	145.93	101.46	154.01	108.33	85.68	447.46	313.71	324.16	437.59	346.11	357.63	256.30	**3,078.38**
West Bank 3	138.81	96.51	146.50	103.04	81.50	535.76	375.61	388.12	523.94	414.40	428.20	306.88	**3,539.26**
Maglev Alternatives													
East Bank 1	624.76	434.35	659.36	463.76	366.80	865.30	606.66	626.86	846.21	669.30	691.59	495.64	**7,350.58**
West Bank 1	603.41	419.51	636.83	447.92	354.27	833.79	584.56	604.03	815.40	644.93	666.40	477.59	**7,088.65**
West Bank 2	578.36	402.09	610.39	429.32	339.56	1,004.28	704.10	727.54	982.13	776.80	802.67	575.25	**7,932.49**
West Bank 3	568.23	395.05	599.70	421.80	333.62	1,087.08	762.15	787.52	1,063.10	840.85	868.85	622.68	**8,350.63**

1.2 Operating Uses of Funds

Operating and maintenance (O&M) costs were projected based on level of service and unit costs for each alternative. Project level of service was estimated based on the operating plans prepared for each alternative. **Exhibit 4** summarizes the projected level of service and ridership (ridership was estimated for only some of the build alternative alignments).

Exhibit 4. PE ROW Operating Level of Service and Ridership

Alternatives	Route Miles	Annual Bus- or Train-Hours	Annual Vehicle-Miles	Annual Unlinked Trips	Weekday Unlinked Trips
TSM					
Los Angeles County Segment		55,925	1,617,135	8,413,331	26,331
Orange County Segment		339,915	6,355,110	18,928,796	59,241
BRT Alternatives					
Street-Running	40.5	69,320	2,121,192	18,321,065	57,339
HOV Lane-Running	36.9	124,538	3,910,478	21,474,427	67,208
Street Car Alternatives					
East Bank	35.2	139,780	12,746,715		
West Bank 1	31.8	137,505	12,829,218		
West Bank 2	43.8	139,780	12,706,032		
West Bank 3	42.7	137,505	12,664,210	25,434,261	79,601
LRT Alternatives					
East Bank	35.2	128,415	13,136,856	27,125,171	84,893
West Bank 1	31.8	130,690	12,532,068		
West Bank 2	43.8	119,175	13,251,966	26,496,991	82,927
West Bank 3	42.7	119,695	12,298,860	27,846,012	87,149
Low Speed Maglev	No tracks in SA				
East Bank	29.3	86,665	10,903,846		
West Bank 1	29.7	82,130	11,323,344		
West Bank 2	30	88,940	10,877,823		
West Bank 3	29.7	82,450	10,981,917	24,280,787	75,991

The O&M unit cost estimates were based on existing bus and rail service unit costs from Metro and OCTA as well as from other peer transit operators after adjustment to reflect the operating conditions (i.e., labor costs) in Los Angeles and Orange counties. For each of the alternatives, four sets of O&M unit costs were estimated. The scenarios in the two columns represent the costs if the alternative was to be operated by either Metro or OCTA (and are based on the labor costs for those two agencies). The scenarios in the two rows represent the costs reflecting the low- and high-cost technologies or peer agencies for each mode (e.g., Miami Metromover and TransLink for MagLev); a low-high range was not estimated for the TSM alternative. The detailed O&M methodology is documented in Appendix B. **Exhibit 5** summarizes the O&M unit cost estimates for each mode by agency.

Exhibit 5. PE ROW Operating Unit Costs
Base Year (FY2011) Dollars

Unit Costs (in 2011 dollar)	Route Miles	Bus- or Train-Hours (Annual)	Vehicle-Miles	Annual Ridership
TSM UNIT COSTS				
LA County Cost Structure	$ -	$ 87.23	$ 3.67	$ 0.13
Orange County Cost Structure	$ -	$ 96.74	$ 1.91	$ -
BRT UNIT COSTS				
LA County Cost Structure				
Low	$ 15,133	$ 91.83	$ 3.33	$ -
High	$ 200,526	$ 66.28	$ 2.45	$ 1.30
Orange County Cost Structure				
Low	$ -	$ 96.74	$ 1.91	$ -
High	$ 2,395	$ 86.07	$ 2.82	$ -
STREETCAR AND LRT UNIT COSTS				
LA County Cost Structure				
Low	$ 753,360	$ 115.57	$ 2.92	$ 0.92
High	$ 219,268	$ 540.71	$ 10.60	$ -
Orange County Cost Structure				
Low	$ 37,619	$ 137.43	$ 4.65	$ -
High	$ 34,553	$ 458.31	$ 9.04	$ -
MAG-LEV UNIT COSTS				
LA County Cost Structure				
Low	$ 191,547	$ 244.81	$ 1.47	$ -
High	$ 678,241	$ 355.36	$ 9.56	$ -
Orange County Cost Structure				
Low	$ 30,315	$ 218.89	$ 1.25	$ -
High	$ 107,340	$ 339.62	$ 8.11	$ -

These estimates of unit costs were then applied to the projected design year level of service in Exhibit 5 to project the design year O&M costs. Costs were escalated from FY11 to year-of-expenditure dollars by applying the forecast rate of California San Jose CPI projected by Moody's Economy.com in June 2010 (documented in Appendix A). **Exhibit 6** summarizes O&M costs in base year (FY2011) dollars of TSM, BRT and Street Car alternatives. **Exhibit 7** summarizes O&M costs in base year (FY2011) dollars of LRT and Maglev alternatives. In both of the these exhibits,

Exhibit 6. PE ROW Operating and Maintenance Costs
TSM-BRT-Street Car Alternatives
Base Year (2011) Dollars

Mode	LA County Cost Structure	Orange County Cost Structure
TSM O&M Cost		
Medium	$ 11.89	$ 45.02
BRT O&M Cost		
Street-Running		
Low	$ 13.77	$ 10.76
High	$ 41.65	$ 12.00
HOV Lane-Running		
Low	$ 24.52	$ 19.52
High	$ 53.06	$ 21.76
STREETCAR O&M COSTS		
East Bank 1		
Low	79.87	80.11
High	217.92	193.13
West Bank 1		
Low	77.29	80.05
High	216.83	192.49
West Bank 2		
Low	86.23	80.25
High	219.37	193.06
West Bank 3		
Low	108.43	79.70
High	217.47	191.39

**Exhibit 7. PE ROW Operating and Maintenance Costs
LRT and Maglev Alternatives
Base Year (2011) Dollars**

Mode	LA County Cost Structure	Orange County Cost Structure
LRT O&M COSTS		
East Bank 1		
Low	$ 104.66	$ 80.34
High	$ 215.95	$ 190.36
West Bank 1		
Low	$ 75.63	$ 77.72
High	$ 210.02	$ 186.05
West Bank 2		
Low	$ 109.83	$ 79.90
High	$ 214.10	$ 186.59
West Bank 3		
Low	$ 107.52	$ 75.51
High	$ 204.03	$ 178.26
MAG-LEV O&M COSTS		
East Bank 1		
Low	42.56	33.44
High	152.28	119.01
West Bank 1		
Low	42.17	32.98
High	155.09	121.02
West Bank 2		
Low	43.21	33.92
High	153.25	119.60
West Bank 3		
Low	41.74	32.63
High	151.93	118.35

For each of the alternatives in Exhibits 6 and 7, four operating scenarios are presented. The scenarios in the two columns represent the costs if the alternative was to be operated by either Metro or OCTA (and are based on the labor costs for those two agencies). The scenarios in the two rows represent the costs reflecting the low- and high-cost technologies or peer agencies for each mode (e.g., Miami Metromover and TransLink for MagLev). The cash flow analyses in Section 3 examined the Metro cost structure/high cost scenario (i.e., the highest O&M cost scenario) for each alternative.

1.3 Capital Sources of Funds

This section describes the funding sources that were assumed available to support construction of the PE ROW project.

Measure R
Measure R is a sales tax initiative approved by Los Angeles County voters in 2008. A half-cent sales tax effective July 1, 2010, ending in 2039, is used for public transportation purposes. $240 million from Measure R bond proceeds is allocated to PE ROW project from FY2020 to FY2025 in the Los Angeles County Metropolitan Transportation Authority (LACMTA) Long Range Transportation Plan.

Prop A 35% Bond
Proposition A is a half-cent sales tax, passed by Los Angeles County voters in 1980, to be used to improve public transit throughout Los Angeles County. 35% of the revenues are dedicated to rail development and operations. $124.4 million from Prop A 35% bond proceeds is allocated to PE ROW project from FY2025 to FY2028 in the LACMTA Long Range Transportation Plan.

Prop C 25%
Proposition C is a half-cent sales tax, passed by Los Angeles County voters in 1990, to be used for public transit purposes in Los Angeles County. 25% of the revenues are dedicated to transit-related highway funds. $500,000 from Prop C 25% program is allocated to PE ROW project in FY2011 and FY2012 in the LACMTA Long Range Transportation Plan.

Local Agency Contribution
The LACMTA Long Range Transportation Plan also identified a total of $19.5 million funding as local agency contribution available to PE ROW project in FY2022 and FY2025.

Section 5309 Fixed Guideway Modernization Grants
These are discretionary Federal funds derived by formula as specified in The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and published in the *Federal Register*. The formula is a function of transit vehicle-revenue miles and route-miles, which are summarized in Exhibit 4. Funds are available seven years after each segment of a new fixed guideway transit project enters revenue service.

1.4 Operating Sources of Funds
This section describes the funding sources that were assumed available to support operation and maintenance of the PE ROW project.

Passenger Revenues
Passenger revenues were based on a projection of average fare paid per rider and projected riders for each alternative. The average fare paid per rider was sized to cover the unmet requirements of operating fund except for the TSM component in the financial analysis. The operating funding requirements of the TSM component of each of the build alternatives was addressed in Section 2 of in the context of the funding requirements of the TSM alternative. Ridership projections were based on the average weekday travel demand forecast prepared for each alternative; an annualization factor of 319.5 average weekdays per year was applied, based on recent Metro and OCTA experience. Growth in ridership from the opening year to the design year takes into consideration the following factors:

- Demographic growth. Ridership was projected to grow between the opening year and the design year based on projected population growth in the PE ROW project study area.

- Fare increases. The average fare per rider was projected to grow with inflation, adjusted every other year. The impacts of these fare increases on projected ridership were taken into account by assuming a fare elasticity of -0.3 percent; that is, for each real fare increase (net of CPI inflation) of one percent ridership would be expected to fall by 0.3 percent. In years that fares do not change, ridership **increases** marginally because fare are declining in real terms.

Advertising Revenues
Advertising revenues were projected based on recent Metro and OCTA revenue per rider and projected ridership. Advertising revenue per rider was derived from Metro and OCTA 2009 National Transportation Database Reports. The ridership projection was based on the travel demand forecast for each alternative. Advertising revenue per rider was projected to grow by the projected rate of California San Jose CPI projected by Moody's Economy.com in June 2010.

Section 5307 Large Urban Cities Grants
These discretionary funds were derived by a formula specified in SAFETEA-LU and published annually in the *Federal Register*. The apportionment of these funds is based primarily on service level and ridership variables. The annual allocation of funds to the Urbanized Area is based on the service operated two years prior. SAFETEA-LU limits the application of these funds to capital expenditures for areas greater than 200,000 population, but preventative maintenance expenses in the operating budget may be considered as "capital." One percent of these funds must be applied to "enhancements," which include the new initiative capital projects.

Incentive tier funding in this grant program (associated with population and population times density) are not assumed available to the PE ROW project, but will be applied to the existing bus operators in the urbanized area. The estimated funding applied in the financial analysis was based on level of service projection of each alternative.

2. Additional Capital and Operating Funding Requirements

2.1 Additional Capital Funding Requirements

The financial analysis revealed that the projected capital revenue sources described in Section 1.3 would not be sufficient to cover PE ROW project capital costs. **Exhibit 8** presents the funding requirement on cash basis by subtracting capital expenditures from the projected funding revenues in year-of-expenditure dollars. The negative numbers are unmet capital funding requirements and positive numbers are funding surplus. TSM capital expenditures were assumed to be shared by the Los Angeles County and the Orange County, therefore no unmet funding requirement of TSM was projected.

The unmet capital funding requirements are addressed in the cash flow analysis in Section 3 through the assumption of an incremental rate of taxation on retail sales in Los Angeles and Orange Counties.

2.2 Additional Operating Funding Requirements

Passenger revenues were assumed to cover the difference between O&M cost and advertising plus 5307 grant funding except for the TSM component. **Exhibit 9** presents the unmet operating funding requirement of TSM component.

Exhibit 8. PE ROW Capital Funding Requirements – FY11 to FY40
Millions of Year-of-Expenditure (Inflated) Dollars

ALTERNATIVES	FY2011-FY2015	FY2016-FY2020	FY2021-FY2025	FY2026-FY2030	FY2031-FY2035	FY2036-FY2040	TOTAL
Bus Rapid Transit							
Street-Running	(275.03)	(850.64)	232.19	39.94	(136.19)	(129.03)	(1,118.76)
HOV Lane-Running	(271.45)	(844.80)	211.64	37.78	(136.03)	(132.10)	(1,134.96)
Street Car							-
East Bank 1	(128.72)	(839.70)	(1,516.15)	(179.22)	(77.95)	(115.29)	(2,857.03)
West Bank 1	(129.49)	(832.57)	(1,478.39)	(173.95)	(76.34)	(109.58)	(2,800.31)
West Bank 2	(130.36)	(824.85)	(1,436.98)	(168.19)	(73.44)	(100.28)	(2,734.09)
West Bank 3	(123.80)	(895.95)	(1,799.97)	(219.01)	(89.99)	(157.03)	(3,285.76)
Light Rail							-
East Bank 1	(144.05)	(900.22)	(1,569.04)	(190.27)	(86.21)	(124.80)	(3,014.58)
West Bank 1	(145.57)	(888.52)	(1,503.90)	(181.22)	(87.73)	(127.16)	(2,934.10)
West Bank 2	(145.43)	(889.54)	(1,509.60)	(182.02)	(81.67)	(110.11)	(2,918.37)
West Bank 3	(138.31)	(955.90)	(1,860.68)	(231.00)	(102.89)	(180.73)	(3,469.50)
Low Speed Maglev							-
East Bank 1	(624.26)	(2,782.17)	(3,171.02)	(528.35)	(431.66)	(671.56)	(8,209.01)
West Bank 1	(602.91)	(2,684.92)	(3,045.73)	(505.53)	(411.42)	(632.77)	(7,883.27)
West Bank 2	(577.86)	(2,778.24)	(3,723.65)	(597.59)	(437.68)	(737.69)	(8,852.71)
West Bank 3	(567.73)	(2,829.85)	(4,052.87)	(642.76)	(449.58)	(784.23)	(9,327.02)

Exhibit 9. PE ROW TSM Operation Funding Requirement FY27 – FY40
Millions of Year-of-Expenditure (Inflated) Dollars

OPERATING SOURCES OF FUNDS	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2011 - 2040
Fare Revenue	$25.26	$26.71	$27.19	$28.71	$29.21	$30.83	$31.36	$33.05	$33.61	$35.39	$35.98	$37.84	$38.45	$40.40	$453.99
FTA Sec 5307 Preventative Maintenance	$0.00	$0.00	$0.02	$0.02	$0.02	$0.02	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.17
Advertising Income	$2.16	$2.22	$2.32	$2.39	$2.50	$2.57	$2.68	$2.75	$2.87	$2.95	$3.07	$3.15	$3.28	$3.36	$38.26
TOTAL OPERATING SOURCES OF FUNDS	**$27.42**	**$28.94**	**$29.53**	**$31.12**	**$31.72**	**$33.41**	**$34.05**	**$35.82**	**$36.49**	**$38.35**	**$39.06**	**$41.00**	**$41.74**	**$43.78**	**$492.42**
OPERATING USES OF FUNDS	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2011 - 2040**
TSM Operating and Maintenance Cost	**$91.03**	**$93.46**	**$95.96**	**$98.48**	**$101.07**	**$103.69**	**$106.37**	**$109.07**	**$111.84**	**$114.62**	**$117.46**	**$120.31**	**$123.21**	**$126.15**	**$1,512.73**
Unmet Funding Requirement	**($63.61)**	**($64.53)**	**($66.43)**	**($67.36)**	**($69.35)**	**($70.28)**	**($72.33)**	**($73.25)**	**($75.35)**	**($76.27)**	**($78.41)**	**($79.31)**	**($81.48)**	**($82.38)**	**($1,020.31)**

3. Cash Flow Analysis

Additional sales tax was assumed in the cash flow analysis to close the gap in capital funding identified in Exhibit 8. The additional sales tax revenues from the Los Angeles County and the Orange County were sized proportionally to the capital costs breakdown between the two counties for each alternative of PE ROW project. The sales tax base amount in each county was provided by the Southern California Government of Association in October 2011.

Bridge financing was applied to address the working capital needs during peak years of construction. The short-term debt was retired after 5 years. The interest and debt management expenses were repaid by sales tax revenue streams. The interest rate applied in this analysis was based on a June 2010 projection of tax-exempt commercial paper interest rates developed by Moody's Economy.com, which is summarized in Appendix A. The bonds were assumed to incorporate the costs of the first year's debt service payment,

the debt issuance expense (equal to 0.6 percent of the gross amount of debt issued). The coverage ratio of the short-term debt was maintained above 2.0 during the entire analysis period.
The average fare paid per rider was adjusted to size the passenger revenue to close the operating funding gap except for TSM component. The Metro High unit costs described in Section 1.2 were applied in calculating the O&M costs of PE ROW alternatives.

The cash flow analysis derived the incremental sales tax rate in each county necessary to generate sufficient sales tax revenues to close capital funding gap of each alternative and maintain sufficiently high debt service coverage. The incremental sales tax was assumed to be implemented in 2015 and continue through 2029 for the BRT alternative and through the end of the 30-year analysis period for the Streetcar, LRT, and mag-lev alternatives. It should be noted that for the Streetcar, LRT, and mag-lev alternatives, further refinement of the cash flow analyses could include lowering the incremental tax rate in the last 5 to 10 years of the 30-year analysis period, thereby avoiding large 2040 year-end cash balances.

Exhibit 10 summarizes the results of selected alternatives (for which ridership projections were prepared).

Exhibit 10. Summary of Cash Flow Analysis Results

		Incremental Sales Tax			
		Tax Rate		Implementation Period	
	Avg Fare per Unlinked Trip	Los Angeles County	Orange County	Los Angeles County	Orange County
BRT Alternatives					
Street Running	$2.42	0.006%	0.032%	2015	2029
HOV Lane-Running	$2.64	0.006%	0.032%	2015	2029
Street Car Alternatives					
East Bank 1					
West Bank 1					
West Bank 2					
West Bank 3	$9.60	0.038%	0.036%	2015	2040
LRT Alternatives					
East Bank 1	$8.93	0.034%	0.041%	2015	2040
West Bank 1					
West Bank 2	$9.06	0.033%	0.040%	2015	2040
West Bank 3	$8.23	0.039%	0.041%	2015	2040
Low Speed Maglev Alternatives					
East Bank 1					
West Bank 1					
West Bank 2					
West Bank 3	$7.12	0.101%	0.110%	2015	2040

Exhibits 11 – 17 summarize capital and operating sources and uses of funds with debt financing for the following alternatives (for which travel demand forecasts were prepared):

1. BRT Street-Running Alternative
2. BRT HOV Lane-Running Alternative
3. Street Car West Bank 3 Alternative

4. LRT East Bank 1 Alternative
5. LRT West Bank 2 Alternative
6. LRT West Bank 3 Alternative
7. Maglev West Bank 3 Alternative

Exhibit 11. Capital and Operating Sources and Uses of Funds
BRT Street-Running Alternative
Year-of-Expenditure Dollars in Millions

Southern California Association of Government / Pacific Electric Right-of-Way Alternative Analysis
Scenario: BRT Street Running Alternative
11/14/2011

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CAPITAL SOURCES OF FUNDS															
Transfer from Operation	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Capital Funds															
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7.40	$11.80	$125.10	$80.10	$1.40	$14.20
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Prop A 35% Bond	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$17.50
Prop C 25%	$0.10	$0.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$11.60	$0.00	$0.00	$7.90
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$0.00	$0.02	$0.02	$0.02	$1.56	$1.09	$1.66	$1.17	$0.93	$0.01	$0.00	$0.00	$0.00	$0.03
TSM Los Angeles County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.21	$8.56	$13.27	$9.14
TSM Orange County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32.63	$44.95	$69.67	$48.00
Additional Sales Tax from Los Angeles County	$0.00	$0.00	$0.00	$0.00	$22.52	$23.92	$25.26	$26.64	$28.10	$29.62	$31.23	$32.93	$34.66	$36.39	$38.13
Additional Sales Tax from Orange County	$0.00	$0.00	$0.00	$0.00	$38.35	$40.73	$43.01	$45.36	$47.85	$50.43	$53.18	$56.06	$59.02	$61.96	$64.92
Subtotal Capital Funds	*$0.10*	*$0.40*	*$0.02*	*$0.02*	*$60.90*	*$66.21*	*$69.35*	*$73.66*	*$77.12*	*$88.37*	*$96.22*	*$264.53*	*$227.29*	*$182.70*	*$199.82*
Financing Program															
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$267.37	$130.32	$265.85	$154.66	$120.67	$205.88	$76.16	$75.47	$11.84	$47.51	$83.59
Subtotal Financing Program	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$267.37*	*$130.32*	*$265.85*	*$154.66*	*$120.67*	*$205.88*	*$76.16*	*$75.47*	*$11.84*	*$47.51*	*$83.59*
TOTAL CAPITAL SOURCES OF FUNDS	**$0.10**	**$0.40**	**$0.02**	**$0.02**	**$328.27**	**$196.54**	**$335.20**	**$228.32**	**$197.79**	**$294.25**	**$172.39**	**$340.00**	**$239.13**	**$230.21**	**$283.41**
CAPITAL USES OF FUNDS															
Project Expenses															
BRT Street Running Alternative	$0.00	$0.00	$0.00	$0.00	$275.53	$191.56	$290.79	$204.53	$161.77	$9.41	$6.60	$6.82	$9.20	$7.28	$7.52
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TSM	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$38.84	$53.51	$82.94	$57.14
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Financing Program															
Retired Bridge Financing Debt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$267.37	$130.32	$265.85	$154.66	$120.67	$205.88
Interest	$0.00	$0.00	$0.00	$0.00	$10.35	$15.19	$25.55	$31.83	$36.80	$34.57	$30.05	$23.10	$17.89	$15.22	$10.75
Debt Management Expenses	$0.00	$0.00	$0.00	$0.00	$1.60	$2.39	$3.98	$4.91	$5.63	$6.87	$5.72	$5.39	$3.87	$3.23	$3.00
TOTAL CAPITAL USES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$287.48**	**$209.13**	**$320.31**	**$241.26**	**$204.20**	**$318.22**	**$172.69**	**$340.00**	**$239.13**	**$229.33**	**$284.29**
NET CAPITAL CASH FLOW	**$0.10**	**$0.40**	**$0.02**	**$0.02**	**$40.79**	**($12.60)**	**$14.88**	**($12.94)**	**($6.41)**	**($23.96)**	**($0.30)**	**$0.00**	**$0.00**	**$0.88**	**($0.88)**
OPERATING SOURCES OF FUNDS															
Fare Revenue	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
FTA Sec 5307 Preventative Maintenance	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Advertising Income	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
TOTAL OPERATING SOURCES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
OPERATING USES OF FUNDS															
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TOTAL OPERATING USES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
NET OPERATING CASH FLOW	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
CASH BALANCES															
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.															
Beginning Cash Balance	$0.00	$0.10	$0.50	$0.52	$0.54	$41.33	$28.73	$43.62	$30.68	$24.26	$0.30	($0.00)	($0.00)	($0.00)	$0.88
Additions (Deletions) to Cash	$0.10	$0.40	$0.02	$0.02	$40.79	($12.60)	$14.88	($12.94)	($6.41)	($23.96)	($0.30)	$0.00	$0.00	$0.88	($0.88)
Ending Cash Balance	**$0.10**	**$0.50**	**$0.52**	**$0.54**	**$41.33**	**$28.73**	**$43.62**	**$30.68**	**$24.26**	**$0.30**	**($0.00)**	**($0.00)**	**($0.00)**	**$0.88**	**($0.00)**
DEBT SERVICE COVERAGE RATIOS															
All Dedicated Revenues / All Debt Issues															
Gross Coverage (Dedicated Tax Revenues / Debt Service)					5.88	4.26	2.67	2.26	2.06	2.32	2.81	3.85	5.24	6.46	9.58
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)					5.88	4.26	2.67	2.26	2.06	2.32	2.81	3.85	5.24	6.46	9.58
REVENUE HOURS OF SERVICE (in millions)															
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(Year of Expenditure Dollars in Millions) Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
CAPITAL SOURCES OF FUNDS																
Transfer from Operation	*$0.00*	*$0.19*	*$2.04*	*$1.63*	*$3.56*	*$2.32*	*$4.38*	*$3.09*	*$5.28*	*$3.94*	*$6.26*	*$4.89*	*$7.33*	*$5.92*	*$8.49*	*$59.33*
Capital Funds																
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$240.00
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.12	$3.22	$3.32	$3.42	$3.53	$3.64	$3.64	$23.90
Prop A 35% Bond	$28.60	$66.60	$11.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124.40
Prop C 25%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.50
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.50
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$1.62	$4.93	$8.80	$11.11	$12.41	$11.96	$11.56	$11.11	$10.84	$10.52	$10.27	$9.98	$9.81	$9.42	$140.85
TSM Los Angeles County Share	$7.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.37	$0.70	$0.93	$1.11	$1.11	$1.11	$49.75
TSM Orange County Share	$37.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.82	$1.94	$3.68	$4.88	$5.81	$5.81	$5.81	$261.19
Additional Sales Tax from Los Angeles County	$39.90	$41.70	$43.59	$45.55	$47.58	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$547.71
Additional Sales Tax from Orange County	$67.93	$71.00	$74.21	$77.55	$81.02	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$932.59
Subtotal Capital Funds	*$180.71*	*$180.91*	*$134.43*	*$131.90*	*$139.72*	*$12.41*	*$11.96*	*$11.56*	*$15.21*	*$16.36*	*$18.22*	*$19.50*	*$20.43*	*$20.37*	*$19.98*	*$2,340.40*
Financing Program																
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,439.32
Subtotal Financing Program	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$1,439.32*
TOTAL CAPITAL SOURCES OF FUNDS	**$180.71**	**$181.10**	**$136.47**	**$133.54**	**$143.28**	**$14.73**	**$16.34**	**$14.65**	**$20.49**	**$20.31**	**$24.49**	**$24.39**	**$27.76**	**$26.29**	**$28.47**	**$3,839.05**
CAPITAL USES OF FUNDS																
Project Expenses																
BRT Street Running Alternative	$5.39	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,176.37
Rehabilitation & Replacement	$0.00	$6.89	$11.68	$18.95	$24.06	$28.10	$28.34	$28.50	$28.67	$28.90	$29.09	$29.27	$29.41	$29.41	$29.41	$350.69
TSM	$44.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$276.72
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.97	$2.31	$4.38	$5.81	$6.92	$6.92	$6.92	$34.23
Financing Program																
Retired Bridge Financing Debt	$76.16	$75.47	$11.84	$47.51	$83.59	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,439.32
Interest	$7.99	$5.25	$4.82	$3.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$272.43
Debt Management Expenses	$1.77	$1.31	$0.86	$0.79	$0.50	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$51.82
TOTAL CAPITAL USES OF FUNDS	**$135.59**	**$88.91**	**$29.20**	**$70.33**	**$108.16**	**$28.10**	**$28.34**	**$28.50**	**$29.65**	**$31.21**	**$33.47**	**$35.09**	**$36.33**	**$36.33**	**$36.33**	**$3,601.57**
NET CAPITAL CASH FLOW	**$45.12**	**$92.19**	**$107.27**	**$63.21**	**$35.12**	**($13.37)**	**($12.00)**	**($13.86)**	**($9.16)**	**($10.91)**	**($8.98)**	**($10.70)**	**($8.57)**	**($10.04)**	**($7.85)**	**$237.48**
OPERATING SOURCES OF FUNDS																
Fare Revenue	*$0.00*	*$63.09*	*$66.71*	*$67.90*	*$71.71*	*$72.96*	*$76.99*	*$78.31*	*$82.55*	*$83.94*	*$88.39*	*$89.85*	*$94.50*	*$96.02*	*$100.90*	*$1,133.79*
FTA Sec 5307 Preventative Maintenance	*$0.00*	*$0.00*	*$0.00*	*$0.76*	*$0.73*	*$0.71*	*$0.69*	*$0.67*	*$0.64*	*$0.62*	*$0.60*	*$0.59*	*$0.57*	*$0.55*	*$0.53*	*$7.66*
Advertising Income	*$0.00*	*$1.45*	*$1.49*	*$1.56*	*$1.60*	*$1.67*	*$1.72*	*$1.79*	*$1.84*	*$1.92*	*$1.97*	*$2.06*	*$2.11*	*$2.20*	*$2.25*	*$25.64*
TOTAL OPERATING SOURCES OF FUNDS	**$0.00**	**$64.53**	**$68.20**	**$70.21**	**$74.04**	**$75.34**	**$79.40**	**$80.77**	**$85.04**	**$86.48**	**$90.97**	**$92.49**	**$97.18**	**$98.76**	**$103.68**	**$1,167.09**
OPERATING USES OF FUNDS																
Bus Rapid Transit	$0.00	$64.35	$66.16	$68.58	$70.48	$73.02	$75.02	$77.68	$79.76	$82.54	$84.71	$87.60	$89.84	$92.84	$95.19	$1,107.76
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TOTAL OPERATING USES OF FUNDS	**$0.00**	**$64.35**	**$66.16**	**$68.58**	**$70.48**	**$73.02**	**$75.02**	**$77.68**	**$79.76**	**$82.54**	**$84.71**	**$87.60**	**$89.84**	**$92.84**	**$95.19**	**$1,107.76**
NET OPERATING CASH FLOW	**$0.00**	**$0.19**	**$2.04**	**$1.63**	**$3.56**	**$2.32**	**$4.38**	**$3.09**	**$5.28**	**$3.94**	**$6.26**	**$4.89**	**$7.33**	**$5.92**	**$8.49**	**$59.33**
CASH BALANCES																
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.																
Beginning Cash Balance	($0.00)	$45.12	$137.30	$244.57	$307.78	$342.90	$329.53	$317.54	$303.68	$294.52	$283.61	$274.63	$263.94	$255.37	$245.33	
Additions (Deletions) to Cash	$45.12	$92.19	$107.27	$63.21	$35.12	($13.37)	($12.00)	($13.86)	($9.16)	($10.91)	($8.98)	($10.70)	($8.57)	($10.04)	($7.85)	$237.48
Ending Cash Balance	**$45.12**	**$137.30**	**$244.57**	**$307.78**	**$342.90**	**$329.53**	**$317.54**	**$303.68**	**$294.52**	**$283.61**	**$274.63**	**$263.94**	**$255.37**	**$245.33**	**$237.48**	
DEBT SERVICE COVERAGE RATIOS																
All Dedicated Revenues / All Debt Issues																
Gross Coverage (Dedicated Tax Revenues / Debt Service)	13.49	21.48	24.42	39.91												
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)	13.49	21.52	24.84	40.44												
REVENUE HOURS OF SERVICE (in millions)																
Bus/BRT Hours	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Exhibit 12. Capital and Operating Sources and Uses of Funds
BRT HOV Lane-Running Alternative
Year-of-Expenditure Dollars in Millions

Southern California Association of Government / Pacific Electric Right-of-Way Alternative Analysis
Scenario: BRT HOV Lane-Running Alternative
11/14/2011

CAPITAL SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Transfer from Operation	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Capital Funds															
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7.40	$11.80	$125.10	$80.10	$1.40	$14.20
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Prop A 35% Bond	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$17.50
Prop C 25%	$0.10	$0.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$11.60	$0.00	$0.00	$7.90
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$0.00	$0.02	$0.02	$0.02	$1.54	$1.07	$1.64	$1.16	$0.92	$0.04	$0.00	$0.00	$0.00	$0.05
TSM Los Angeles County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.21	$8.56	$13.27	$9.14
TSM Orange County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32.63	$44.95	$69.67	$48.00
Additional Sales Tax from Los Angeles County	$0.00	$0.00	$0.00	$0.00	$22.52	$23.92	$25.26	$26.64	$28.10	$29.62	$31.23	$32.93	$34.66	$36.39	$38.13
Additional Sales Tax from Orange County	$0.00	$0.00	$0.00	$0.00	$38.35	$40.73	$43.01	$45.36	$47.85	$50.43	$53.18	$56.06	$59.02	$61.96	$64.92
Subtotal Capital Funds	*$0.10*	*$0.40*	*$0.02*	*$0.02*	*$60.90*	*$66.19*	*$69.34*	*$73.64*	*$77.11*	*$88.36*	*$96.25*	*$264.53*	*$227.29*	*$182.70*	*$199.84*
Financing Program															
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$263.07	$127.71	$261.39	$151.54	$117.89	$207.29	$75.97	$74.48	$13.73	$49.49	$88.86
Subtotal Financing Program	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$263.07*	*$127.71*	*$261.39*	*$151.54*	*$117.89*	*$207.29*	*$75.97*	*$74.48*	*$13.73*	*$49.49*	*$88.86*
TOTAL CAPITAL SOURCES OF FUNDS	**$0.10**	**$0.40**	**$0.02**	**$0.02**	**$323.96**	**$193.91**	**$330.73**	**$225.19**	**$194.99**	**$295.66**	**$172.22**	**$339.01**	**$241.02**	**$232.18**	**$288.70**

(Year of Expenditure Dollars in Millions) Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Transfer from Operation	*$0.00*	*$0.15*	*$2.53*	*$1.80*	*$4.29*	*$2.78*	*$5.43*	*$3.87*	*$6.69*	*$5.08*	*$8.07*	*$6.41*	*$9.56*	*$7.86*	*$11.18*	*$75.70*
Capital Funds																
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$240.00
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.84	$2.93	$3.02	$3.12	$3.22	$3.32	$3.32	$21.77
Prop A 35% Bond	$28.60	$66.60	$11.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124.40
Prop C 25%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.50
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.50
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$1.50	$4.84	$8.65	$10.89	$12.03	$11.59	$11.22	$10.79	$10.55	$10.25	$10.03	$9.76	$9.64	$9.30	$137.52
TSM Los Angeles County Share	$7.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.37	$0.70	$0.93	$1.11	$1.11	$1.11	$49.75
TSM Orange County Share	$37.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.82	$1.94	$3.68	$4.88	$5.81	$5.81	$5.81	$261.19
Additional Sales Tax from Los Angeles County	$39.90	$41.70	$43.59	$45.55	$47.58	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$547.71
Additional Sales Tax from Orange County	$67.93	$71.00	$74.21	$77.55	$81.02	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$932.59
Subtotal Capital Funds	*$180.71*	*$180.80*	*$134.34*	*$131.75*	*$139.49*	*$12.03*	*$11.59*	*$11.22*	*$14.61*	*$15.79*	*$17.65*	*$18.96*	*$19.90*	*$19.88*	*$19.54*	*$2,334.94*
Financing Program																
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,431.43
Subtotal Financing Program	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$1,431.43*
TOTAL CAPITAL SOURCES OF FUNDS	**$180.71**	**$180.95**	**$136.87**	**$133.55**	**$143.78**	**$14.81**	**$17.02**	**$15.09**	**$21.30**	**$20.87**	**$25.72**	**$25.37**	**$29.46**	**$27.74**	**$30.72**	**$3,842.07**

CAPITAL USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project Expenses															
BRT HOV Lane-Running Alternative	$0.00	$0.00	$0.00	$0.00	$271.95	$189.07	$287.01	$201.87	$159.67	$14.58	$10.22	$10.56	$14.25	$11.27	$11.65
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TSM	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$38.84	$53.51	$82.94	$57.14
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Financing Program															
Retired Bridge Financing Debt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$263.07	$127.71	$261.39	$151.54	$117.89	$207.29
Interest	$0.00	$0.00	$0.00	$0.00	$10.18	$14.93	$25.11	$31.26	$36.13	$34.11	$29.71	$22.89	$17.86	$15.37	$11.04
Debt Management Expenses	$0.00	$0.00	$0.00	$0.00	$1.58	$2.34	$3.91	$4.82	$5.53	$6.77	$5.65	$5.33	$3.85	$3.23	$3.06
TOTAL CAPITAL USES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$283.71**	**$206.34**	**$316.03**	**$237.96**	**$201.32**	**$318.53**	**$173.30**	**$339.01**	**$241.02**	**$230.70**	**$290.18**
NET CAPITAL CASH FLOW	**$0.10**	**$0.40**	**$0.02**	**$0.02**	**$40.25**	**($12.43)**	**$14.69**	**($12.77)**	**($6.33)**	**($22.87)**	**($1.08)**	**$0.00**	**$0.00**	**$1.48**	**($1.48)**

(Year of Expenditure Dollars in Millions) Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Project Expenses																
BRT HOV Lane-Running Alternative	$8.35	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,190.46
Rehabilitation & Replacement	$0.00	$6.80	$11.53	$18.70	$23.75	$27.74	$28.10	$28.36	$28.62	$28.98	$29.26	$29.55	$29.76	$29.76	$29.76	$350.68
TSM	$44.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$276.72
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.97	$2.31	$4.38	$5.81	$6.92	$6.92	$6.92	$34.23
Financing Program																
Retired Bridge Financing Debt	$75.97	$74.48	$13.73	$49.49	$88.86	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,431.43
Interest	$8.29	$5.58	$5.09	$3.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$270.84
Debt Management Expenses	$1.82	$1.36	$0.91	$0.83	$0.53	($0.00)	($0.00)	($0.00)	($0.00)	($0.00)	($0.00)	($0.00)	($0.00)	($0.00)	($0.00)	$51.53
TOTAL CAPITAL USES OF FUNDS	**$138.71**	**$88.22**	**$31.26**	**$72.30**	**$113.15**	**$27.74**	**$28.10**	**$28.36**	**$29.59**	**$31.29**	**$33.64**	**$35.36**	**$36.68**	**$36.68**	**$36.68**	**$3,605.88**
NET CAPITAL CASH FLOW	**$42.00**	**$92.73**	**$105.61**	**$61.26**	**$30.63**	**($12.93)**	**($11.08)**	**($13.27)**	**($8.29)**	**($10.42)**	**($7.92)**	**($9.99)**	**($7.22)**	**($8.94)**	**($5.96)**	**$236.19**

OPERATING SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Fare Revenue	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
FTA Sec 5307 Preventative Maintenance	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Advertising Income	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
TOTAL OPERATING SOURCES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**

(Year of Expenditure Dollars in Millions) Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Fare Revenue	*$0.00*	*$80.67*	*$85.30*	*$86.82*	*$91.69*	*$93.29*	*$98.44*	*$100.13*	*$105.55*	*$107.33*	*$113.02*	*$114.88*	*$120.83*	*$122.78*	*$129.01*	*$1,449.75*
FTA Sec 5307 Preventative Maintenance	*$0.00*	*$0.00*	*$0.00*	*$0.70*	*$0.67*	*$0.65*	*$0.63*	*$0.61*	*$0.59*	*$0.57*	*$0.55*	*$0.54*	*$0.52*	*$0.50*	*$0.49*	*$7.02*
Advertising Income	*$0.00*	*$1.70*	*$1.75*	*$1.82*	*$1.88*	*$1.96*	*$2.02*	*$2.10*	*$2.16*	*$2.25*	*$2.31*	*$2.41*	*$2.47*	*$2.57*	*$2.64*	*$30.05*
TOTAL OPERATING SOURCES OF FUNDS	**$0.00**	**$82.36**	**$87.05**	**$89.34**	**$94.24**	**$95.90**	**$101.09**	**$102.84**	**$108.31**	**$110.15**	**$115.89**	**$117.83**	**$123.83**	**$125.85**	**$132.14**	**$1,486.82**

OPERATING USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TOTAL OPERATING USES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
NET OPERATING CASH FLOW	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**

(Year of Expenditure Dollars in Millions) Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Bus Rapid Transit	$0.00	$82.21	$84.52	$87.54	$89.95	$93.12	$95.66	$98.97	$101.61	$105.08	$107.82	$111.42	$114.26	$117.99	$120.96	$1,411.12
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TOTAL OPERATING USES OF FUNDS	**$0.00**	**$82.21**	**$84.52**	**$87.54**	**$89.95**	**$93.12**	**$95.66**	**$98.97**	**$101.61**	**$105.08**	**$107.82**	**$111.42**	**$114.26**	**$117.99**	**$120.96**	**$1,411.12**
NET OPERATING CASH FLOW	**$0.00**	**$0.15**	**$2.53**	**$1.80**	**$4.29**	**$2.78**	**$5.43**	**$3.87**	**$6.69**	**$5.08**	**$8.07**	**$6.41**	**$9.56**	**$7.86**	**$11.18**	**$75.70**

CASH BALANCES

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.															
Beginning Cash Balance	$0.00	$0.10	$0.50	$0.52	$0.54	$40.79	$28.36	$43.05	$30.28	$23.95	$1.08	($0.00)	($0.00)	($0.00)	$1.48
Additions (Deletions) to Cash	$0.10	$0.40	$0.02	$0.02	$40.25	($12.43)	$14.69	($12.77)	($6.33)	($22.87)	($1.08)	$0.00	$0.00	$1.48	($1.48)
Ending Cash Balance	**$0.10**	**$0.50**	**$0.52**	**$0.54**	**$40.79**	**$28.36**	**$43.05**	**$30.28**	**$23.95**	**$1.08**	**($0.00)**	**($0.00)**	**($0.00)**	**$1.48**	**($0.00)**

(Year of Expenditure Dollars in Millions) Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.																
Beginning Cash Balance	($0.00)	$42.00	$134.73	$240.34	$301.59	$332.23	$319.29	$308.21	$294.94	$286.65	$276.23	$268.30	$258.31	$251.09	$242.15	
Additions (Deletions) to Cash	$42.00	$92.73	$105.61	$61.26	$30.63	($12.93)	($11.08)	($13.27)	($8.29)	($10.42)	($7.92)	($9.99)	($7.22)	($8.94)	($5.96)	$236.19
Ending Cash Balance	**$42.00**	**$134.73**	**$240.34**	**$301.59**	**$332.23**	**$319.29**	**$308.21**	**$294.94**	**$286.65**	**$276.23**	**$268.30**	**$258.31**	**$251.09**	**$242.15**	**$236.19**	

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
All Dedicated Revenues / All Debt Issues															
Gross Coverage (Dedicated Tax Revenues / Debt Service)					5.98	4.33	2.72	2.30	2.10	2.35	2.84	3.89	5.24	6.40	9.33
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)					5.98	4.33	2.72	2.30	2.10	2.35	2.84	3.89	5.24	6.40	9.33

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
All Dedicated Revenues / All Debt Issues															
Gross Coverage (Dedicated Tax Revenues / Debt Service)	13.00	20.19	23.14	37.54											
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)	13.00	20.22	23.63	38.09											

REVENUE HOURS OF SERVICE (in millions)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

REVENUE HOURS OF SERVICE (in millions)	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bus/BRT Hours	-	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Exhibit 13. Capital and Operating Sources and Uses of Funds
Street Car West Bank 3 Alternative
Year-of-Expenditure Dollars in Millions

Southern California Association of Government / Pacific Electric Right-of-Way Alternative Analysis

Scenario: Street Car West Bank 3 Alternative

11/13/2011

CAPITAL SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Transfer from Operation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.36	$11.06	$14.23	$25.50	$22.53	$34.65	$31.73	$44.72	$41.88	$55.74	$53.00	$67.72	$65.13	$80.73	$548.99
Capital Funds																															
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7.40	$11.80	$125.10	$80.10	$1.40	$14.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$240.00
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$41.33	$43.06	$44.87	$46.77	$48.76	$50.84	$50.84	$326.48
Prop A 35% Bond	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$17.50	$28.60	$66.60	$11.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124.40
Prop C 25%	$0.10	$0.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.50
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$11.60	$0.00	$0.00	$7.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.50
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$0.00	$0.02	$0.02	$0.02	$0.70	$0.86	$0.75	$1.03	$2.27	$2.75	$1.89	$1.29	$2.30	$2.15	$2.02	$1.45	$1.54	$1.90	$2.04	$2.11	$2.18	$6.53	$2.43	$2.33	$2.46	$2.59	$11.97	$22.39	$33.79	$113.77
TSM Los Angeles County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.21	$8.56	$13.27	$9.14	$7.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.37	$0.70	$0.93	$1.11	$1.11	$1.11	$49.75
TSM Orange County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32.63	$44.95	$69.67	$48.00	$37.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.82	$1.94	$3.68	$4.88	$5.81	$5.81	$5.81	$261.19
Additional Sales Tax from Los Angeles County	$0.00	$0.00	$0.00	$0.00	$66.09	$70.19	$74.12	$78.18	$82.46	$86.90	$91.65	$96.62	$101.71	$106.79	$111.88	$117.07	$122.36	$127.90	$133.65	$139.63	$145.68	$151.80	$158.24	$164.99	$172.00	$179.38	$187.16	$195.25	$203.40	$159.29	$3,324.39
Additional Sales Tax from Orange County	$0.00	$0.00	$0.00	$0.00	$20.87	$22.17	$23.40	$24.69	$26.04	$27.44	$28.94	$30.51	$32.12	$33.72	$35.33	$36.97	$38.64	$40.39	$42.21	$44.09	$46.00	$47.94	$49.97	$52.10	$54.32	$56.64	$59.10	$61.66	$64.23	$50.30	$1,049.81
Subtotal Capital Funds	$0.10	$0.40	$0.02	$0.02	$86.99	$93.07	$98.38	$103.62	$109.53	$124.02	$135.14	$304.56	$268.72	$227.15	$246.10	$228.94	$229.04	$181.52	$177.76	$185.76	$193.79	$201.92	$214.74	$261.83	$274.02	$287.74	$301.43	$324.56	$347.78	$301.15	$5,509.78
Financing Program																															
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$58.01	$0.00	$33.85	$0.00	$0.00	$496.58	$238.45	$166.81	$376.40	$322.25	$803.96	$426.62	$27.48	$280.96	$219.87	$680.49	$292.12	$0.00	$10.49	$0.00	$464.87	$48.04	$0.00	$0.00	$0.00	$0.00	$4,947.26
Subtotal Financing Program	$0.00	$0.00	$0.00	$0.00	$58.01	$0.00	$33.85	$0.00	$0.00	$496.58	$238.45	$166.81	$376.40	$322.25	$803.96	$426.62	$27.48	$280.96	$219.87	$680.49	$292.12	$0.00	$10.49	$0.00	$464.87	$48.04	$0.00	$0.00	$0.00	$0.00	$4,947.26
TOTAL CAPITAL SOURCES OF FUNDS	$0.10	$0.40	$0.02	$0.02	$145.00	$93.07	$132.23	$103.62	$109.53	$620.60	$373.59	$471.37	$645.13	$549.40	$1,050.06	$655.56	$256.88	$473.55	$411.86	$891.75	$508.44	$236.57	$256.97	$306.55	$780.76	$391.51	$354.42	$392.29	$412.91	$381.88	$11,006.03

CAPITAL USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Project Expenses																															
Street Car West Bank 3 Alternative	$0.00	$0.00	$0.00	$0.00	$124.30	$86.42	$131.19	$92.27	$72.98	$520.49	$364.91	$377.06	$509.01	$402.59	$416.00	$298.13	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,395.35
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.11	$5.27	$8.55	$10.85	$12.68	$25.69	$34.81	$44.24	$56.97	$67.03	$77.43	$84.88	$84.88	$84.88	$601.28
TSM	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$38.84	$53.51	$82.94	$57.14	$44.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$276.72
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.97	$2.31	$4.38	$5.81	$6.92	$6.92	$6.92	$34.23
Financing Program																															
Retired Brige Financing Debt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$58.01	$0.00	$33.85	$0.00	$0.00	$496.58	$238.45	$166.81	$376.40	$322.25	$803.96	$426.62	$27.48	$280.96	$219.87	$680.49	$292.12	$0.00	$10.49	$0.00	$464.87	$4,899.22
Interest	$0.00	$0.00	$0.00	$0.00	$2.25	$2.22	$3.54	$3.57	$3.60	$20.90	$28.06	$32.92	$46.66	$58.42	$69.64	$76.72	$71.81	$68.49	$64.90	$60.51	$55.83	$55.11	$45.23	$37.26	$29.32	$20.26	$20.52	$20.52	$20.98	$1.96	$921.18
Debt Management Expenses	$0.00	$0.00	$0.00	$0.00	$0.35	$0.35	$0.55	$0.55	$0.55	$3.53	$4.61	$5.61	$7.67	$9.60	$14.43	$14.01	$12.74	$13.43	$12.49	$14.64	$11.57	$9.01	$8.90	$7.22	$8.69	$4.89	$3.14	$3.14	$3.08	$3.08	$177.81
TOTAL CAPITAL USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$126.90	$88.98	$135.28	$96.40	$77.13	$602.93	$397.59	$488.28	$616.85	$553.56	$1,053.78	$671.59	$254.47	$463.59	$408.19	$889.96	$506.69	$117.28	$369.91	$309.56	$777.77	$388.68	$106.90	$125.95	$115.86	$561.71	$10,305.79
NET CAPITAL CASH FLOW	$0.10	$0.40	$0.02	$0.02	$18.10	$4.08	($3.05)	$7.22	$32.40	$17.67	($24.00)	($16.91)	$28.28	($4.16)	($3.72)	($16.03)	$2.41	$9.96	$3.67	$1.79	$1.75	$119.29	($112.95)	($3.01)	$2.99	$2.83	$247.52	$266.34	$297.05	($179.83)	$700.24

OPERATING SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Fare Revenue	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$347.42	$367.40	$373.93	$394.89	$401.78	$423.98	$431.24	$454.61	$462.25	$486.78	$494.79	$520.42	$528.79	$555.65	$6,243.93
FTA Sec 5307 Preventative Maintenance	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.01	$5.87	$5.73	$5.60	$5.47	$5.34	$5.22	$5.10	$4.98	$4.87	$4.75	$4.64	$63.58
Advertising Income	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.01	$2.07	$2.16	$2.22	$2.32	$2.39	$2.49	$2.56	$2.67	$2.74	$2.85	$2.93	$3.05	$3.13	$35.59
TOTAL OPERATING SOURCES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$349.43	$369.47	$382.09	$402.98	$409.84	$431.97	$439.20	$462.51	$470.13	$494.62	$502.62	$528.21	$536.59	$563.42	$6,343.11

OPERATING USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$349.07	$358.40	$367.86	$377.49	$387.30	$397.32	$407.47	$417.79	$428.26	$438.88	$449.63	$460.49	$471.46	$482.69	$5,794.12
TOTAL OPERATING USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$349.07	$358.40	$367.86	$377.49	$387.30	$397.32	$407.47	$417.79	$428.26	$438.88	$449.63	$460.49	$471.46	$482.69	$5,794.12
NET OPERATING CASH FLOW	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.36	$11.06	$14.23	$25.50	$22.53	$34.65	$31.73	$44.72	$41.88	$55.74	$53.00	$67.72	$65.13	$80.73	$548.99

CASH BALANCES

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.																															
Beginning Cash Balance	$0.00	$0.10	$0.50	$0.52	$0.54	$18.65	$22.73	$19.68	$26.90	$59.29	$76.96	$52.97	$36.05	$64.34	$60.18	$56.46	$40.43	$42.84	$52.80	$56.46	$58.25	$60.00	$179.29	$66.34	$63.34	$66.32	$69.16	$316.68	$583.02	$880.07	
Additions (Deletions) to Cash	$0.10	$0.40	$0.02	$0.02	$18.10	$4.08	($3.05)	$7.22	$32.40	$17.67	($24.00)	($16.91)	$28.28	($4.16)	($3.72)	($16.03)	$2.41	$9.96	$3.67	$1.79	$1.75	$119.29	($112.95)	($3.01)	$2.99	$2.83	$247.52	$266.34	$297.05	($179.83)	$700.24
Ending Cash Balance	$0.10	$0.50	$0.52	$0.54	$18.65	$22.73	$19.68	$26.90	$59.29	$76.96	$52.97	$36.05	$64.34	$60.18	$56.46	$40.43	$42.84	$52.80	$56.46	$58.25	$60.00	$179.29	$66.34	$63.34	$66.32	$69.16	$316.68	$583.02	$880.07	$700.24	

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
All Dedicated Revenues / All Debt Issues																														
Gross Coverage (Dedicated Tax Revenues / Debt Service)					38.74	41.68	27.57	28.79	30.13	5.47	4.30	3.86	2.87	2.41	2.11	2.01	2.24	2.46	2.71	3.04	3.43	3.62	4.60	5.83	7.72	11.65	12.00	12.52	12.76	106.68
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)					38.74	41.68	27.57	28.79	30.13	5.47	4.30	3.86	2.87	2.41	2.11	2.01	2.25	2.62	2.93	3.46	3.84	4.25	5.30	7.03	9.15	14.40	14.59	15.82	15.86	147.77

REVENUE HOURS OF SERVICE (in millions)																														
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Exhibit 14. Capital and Operating Sources and Uses of Funds
LRT East Bank 1 Alternative
Year-of-Expenditure Dollars in Millions
*

Southern California Association of Government / Pacific Electric Right-of-Way Alternative Analysis
Scenario: LRT East Bank 1 Alternative
11/13/2011

CAPITAL SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Transfer from Operation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.21	$10.83	$14.08	$25.25	$22.31	$34.32	$31.42	$44.30	$41.48	$55.22	$52.50	$67.11	$64.54	$80.01	$543.58
Capital Funds																															
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7.40	$11.80	$125.10	$80.10	$1.40	$14.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$240.00
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$42.18	$43.95	$45.80	$47.75	$49.78	$51.92	$51.92	$333.30
Prop A 35% Bond	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$17.50	$28.60	$66.60	$11.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124.40
Prop C 25%	$0.10	$0.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.50
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$11.60	$0.00	$0.00	$7.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.50
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$0.00	$0.02	$0.02	$0.02	$0.82	$0.57	$0.87	$0.61	$1.02	$2.44	$1.67	$1.06	$1.99	$1.91	$1.77	$1.27	$1.53	$1.89	$2.03	$2.10	$2.17	$5.94	$2.80	$3.88	$2.42	$2.54	$11.90	$22.69	$34.07	$112.05
TSM Los Angeles County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.21	$8.56	$13.27	$9.14	$7.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.37	$0.70	$0.93	$1.11	$1.11	$1.11	$49.75
TSM Orange County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32.63	$44.95	$69.67	$48.00	$37.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.82	$1.94	$3.68	$4.88	$5.81	$5.81	$5.81	$261.19
Additional Sales Tax from Los Angeles County	$0.00	$0.00	$0.00	$0.00	$58.66	$62.30	$65.78	$69.38	$73.18	$77.13	$81.34	$85.75	$90.26	$94.77	$99.29	$103.90	$108.59	$113.51	$118.62	$123.92	$129.29	$134.73	$140.44	$146.43	$152.65	$159.20	$166.10	$173.29	$180.52	$141.37	$2,950.39
Additional Sales Tax from Orange County	$0.00	$0.00	$0.00	$0.00	$23.96	$25.45	$26.87	$28.34	$29.89	$31.50	$33.22	$35.02	$36.87	$38.71	$40.56	$42.44	$44.35	$46.36	$48.45	$50.62	$52.81	$55.03	$57.36	$59.81	$62.35	$65.02	$67.84	$70.78	$73.73	$57.74	$1,205.09
Subtotal Capital Funds	*$0.10*	*$0.40*	*$0.02*	*$0.02*	*$82.64*	*$88.56*	*$93.21*	*$98.59*	*$103.69*	*$117.05*	*$128.80*	*$297.99*	*$261.81*	*$219.82*	*$238.50*	*$220.99*	*$220.81*	*$173.10*	*$168.96*	*$176.57*	*$184.20*	*$191.93*	*$203.74*	*$252.19*	*$265.14*	*$276.83*	*$290.05*	*$312.67*	*$335.78*	*$292.02*	*$5,296.17*
Financing Program																															
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$86.93	$9.59	$74.77	$10.06	$0.00	$501.39	$217.82	$172.26	$332.11	$282.42	$763.83	$375.27	$39.55	$239.07	$183.45	$644.79	$245.98	$0.00	$0.00	$0.00	$386.14	$2.85	$0.00	$0.00	$0.00	$0.00	$4,568.30
Subtotal Financing Program	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$86.93*	*$9.59*	*$74.77*	*$10.06*	*$0.00*	*$501.39*	*$217.82*	*$172.26*	*$332.11*	*$282.42*	*$763.83*	*$375.27*	*$39.55*	*$239.07*	*$183.45*	*$644.79*	*$245.98*	*$0.00*	*$0.00*	*$0.00*	*$386.14*	*$2.85*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$4,568.30*
TOTAL CAPITAL SOURCES OF FUNDS	$0.10	$0.40	$0.02	$0.02	$169.57	$98.15	$167.98	$108.65	$103.69	$618.44	$346.62	$470.25	$593.92	$502.24	$1,002.33	$596.26	$260.58	$423.00	$366.49	$846.60	$452.49	$226.25	$235.17	$296.49	$692.76	$334.90	$342.55	$379.78	$400.32	$372.03	$10,408.06

CAPITAL USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Project Expenses																															
LRT East Bank 1 Alternative	$0.00	$0.00	$0.00	$0.00	$144.55	$100.49	$152.55	$107.30	$84.87	$462.41	$324.19	$334.99	$452.21	$357.67	$369.58	$264.87	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,155.67
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.61	$6.13	$9.94	$12.62	$14.74	$26.30	$34.41	$42.78	$54.09	$63.03	$72.27	$78.89	$78.89	$78.89	$576.61
TSM	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$38.84	$53.51	$82.94	$57.14	$44.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$276.72
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.97	$2.31	$4.38	$5.81	$6.92	$6.92	$6.92	$34.23
Financing Program																															
Retired Brige Financing Debt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$86.93	$9.59	$74.77	$10.06	$0.00	$501.39	$217.82	$172.26	$332.11	$282.42	$763.83	$375.27	$39.55	$239.07	$183.45	$644.79	$245.98	$0.00	$0.00	$0.00	$386.14	$4,565.45
Interest	$0.00	$0.00	$0.00	$0.00	$3.36	$3.69	$6.59	$7.05	$7.11	$23.47	$29.35	$32.91	$44.66	$54.97	$64.55	$70.49	$65.81	$62.57	$59.08	$54.84	$50.33	$49.12	$40.39	$33.76	$24.15	$15.05	$15.25	$15.56	$15.91	$0.12	$850.13
Debt Management Expenses	$0.00	$0.00	$0.00	$0.00	$0.52	$0.58	$1.03	$1.09	$1.09	$4.10	$4.88	$5.86	$7.40	$9.04	$13.62	$12.86	$11.79	$12.19	$11.30	$13.48	$10.37	$8.12	$7.88	$6.45	$7.66	$3.81	$2.33	$2.33	$2.33	$2.33	$164.44
TOTAL CAPITAL USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$148.43	$104.76	$160.17	$115.44	$93.06	$576.92	$368.01	$487.36	$567.85	$504.62	$1,006.27	$610.32	$253.48	$413.00	$362.75	$844.77	$450.71	$123.09	$321.75	$267.42	$733.00	$332.26	$95.66	$103.70	$104.05	$474.40	$9,623.25
NET CAPITAL CASH FLOW	$0.10	$0.40	$0.02	$0.02	$21.14	($6.61)	$7.81	($6.79)	$10.63	$41.53	($21.39)	($17.12)	$26.07	($2.38)	($3.94)	($14.06)	$7.10	$10.00	$3.74	$1.84	$1.78	$103.16	($86.59)	$29.08	($40.24)	$2.65	$246.89	$276.08	$296.26	($102.37)	$784.81

OPERATING SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Fare Revenue	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$344.66	$364.48	$370.95	$391.75	$398.59	$420.61	$427.82	$451.00	$458.57	$482.91	$490.86	$516.28	$524.59	$551.23	$6,194.30
FTA Sec 5307 Preventative Maintenance	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.07	$5.93	$5.79	$5.66	$5.53	$5.40	$5.28	$5.16	$5.04	$4.92	$4.81	$4.70	$64.29
Advertising Income	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.14	$2.21	$2.30	$2.37	$2.48	$2.55	$2.66	$2.73	$2.85	$2.92	$3.04	$3.13	$3.25	$3.34	$37.96
TOTAL OPERATING SOURCES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$346.80	$366.68	$379.32	$400.05	$406.86	$428.82	$436.00	$459.13	$466.70	$490.99	$498.94	$524.33	$532.65	$559.27	$6,296.54

OPERATING USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$346.59	$355.86	$365.25	$374.81	$384.55	$394.49	$404.58	$414.83	$425.22	$435.77	$446.43	$457.22	$468.11	$479.26	$5,752.96
TOTAL OPERATING USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$346.59	$355.86	$365.25	$374.81	$384.55	$394.49	$404.58	$414.83	$425.22	$435.77	$446.43	$457.22	$468.11	$479.26	$5,752.96
NET OPERATING CASH FLOW	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.21	$10.83	$14.08	$25.25	$22.31	$34.32	$31.42	$44.30	$41.48	$55.22	$52.50	$67.11	$64.54	$80.01	$543.58

CASH BALANCES

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.																															
Beginning Cash Balance	$0.00	$0.10	$0.50	$0.52	$0.54	$21.68	$15.07	$22.88	$16.09	$26.72	$68.25	$46.86	$29.74	$55.82	$53.44	$49.50	$35.44	$42.54	$52.54	$56.28	$58.11	$59.89	$163.05	$76.47	$105.54	$65.30	$67.95	$314.84	$590.92	$887.18	
Additions (Deletions) to Cash	$0.10	$0.40	$0.02	$0.02	$21.14	($6.61)	$7.81	($6.79)	$10.63	$41.53	($21.39)	($17.12)	$26.07	($2.38)	($3.94)	($14.06)	$7.10	$10.00	$3.74	$1.84	$1.78	$103.16	($86.59)	$29.08	($40.24)	$2.65	$246.89	$276.08	$296.26	($102.37)	$784.81
Ending Cash Balance	$0.10	$0.50	$0.52	$0.54	$21.68	$15.07	$22.88	$16.09	$26.72	$68.25	$46.86	$29.74	$55.82	$53.44	$49.50	$35.44	$42.54	$52.54	$56.28	$58.11	$59.89	$163.05	$76.47	$105.54	$65.30	$67.95	$314.84	$590.92	$887.18	$784.81	

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
All Dedicated Revenues / All Debt Issues																														
Gross Coverage (Dedicated Tax Revenues / Debt Service)					24.56	23.80	14.05	13.85	14.50	4.63	3.90	3.67	2.85	2.43	2.17	2.08	2.32	2.56	2.83	3.18	3.62	3.86	4.90	6.11	8.90	14.89	15.34	15.69	15.98	1,707.12
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)					24.56	23.80	14.05	13.85	14.50	4.63	3.90	3.67	2.85	2.43	2.17	2.08	2.33	2.73	3.07	3.64	4.06	4.56	5.68	7.42	10.62	18.56	18.79	20.00	20.04	2,393.07

REVENUE HOURS OF SERVICE (in millions)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Exhibit 15. Capital and Operating Sources and Uses of Funds
LRT West Bank 2 Alternative
Year-of-Expenditure Dollars in Millions

Southern California Association of Government / Pacific Electric Right-of-Way Alternative Analysis
Scenario: LRT West Bank 2 Alternative
11/13/2011

CAPITAL SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Transfer from Operation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.11	$10.63	$14.10	$25.16	$22.24	$34.14	$31.25	$44.01	$41.20	$54.81	$52.11	$66.57	$64.02	$79.34	$539.67
Capital Funds																															
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7.40	$11.80	$125.10	$80.10	$1.40	$14.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$240.00
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$43.18	$44.99	$46.88	$48.87	$50.94	$53.12	$53.12	$341.11
Prop A 35% Bond	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$17.50	$28.60	$66.60	$11.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124.40
Prop C 25%	$0.10	$0.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.50
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$11.60	$0.00	$0.00	$7.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.50
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$0.00	$0.02	$0.02	$0.02	$0.83	$0.58	$0.88	$0.62	$0.87	$2.36	$1.62	$1.00	$1.91	$1.85	$1.71	$1.22	$1.51	$1.88	$2.01	$2.09	$2.16	$5.79	$2.72	$3.90	$2.39	$2.51	$11.75	$22.40	$33.64	$110.25
TSM Los Angeles County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.21	$8.56	$13.27	$9.14	$7.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.37	$0.70	$0.93	$1.11	$1.11	$1.11	$49.75
TSM Orange County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32.63	$44.95	$69.67	$48.00	$37.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.82	$1.94	$3.68	$4.88	$5.81	$5.81	$5.81	$261.19
Additional Sales Tax from Los Angeles County	$0.00	$0.00	$0.00	$0.00	$57.12	$60.66	$64.05	$67.56	$71.26	$75.10	$79.20	$83.49	$87.89	$92.28	$96.68	$101.17	$105.73	$110.52	$115.49	$120.66	$125.89	$131.18	$136.75	$142.58	$148.63	$155.01	$161.73	$168.73	$175.77	$137.65	$2,872.75
Additional Sales Tax from Orange County	$0.00	$0.00	$0.00	$0.00	$23.33	$24.78	$26.16	$27.59	$29.11	$30.67	$32.35	$34.10	$35.90	$37.69	$39.49	$41.32	$43.19	$45.14	$47.17	$49.28	$51.42	$53.58	$55.85	$58.24	$60.71	$63.31	$66.06	$68.92	$71.79	$56.22	$1,173.38
Subtotal Capital Funds	$0.10	$0.40	$0.02	$0.02	$80.46	$86.26	$90.78	$96.03	$100.98	$114.04	$125.70	$294.75	$258.40	$216.23	$234.76	$217.08	$216.74	$168.88	$164.54	$171.96	$179.39	$186.92	$198.39	$247.69	$260.54	$271.97	$284.97	$307.25	$330.00	$287.55	$5,192.83
Financing Program																															
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$90.88	$13.12	$79.27	$14.31	$0.00	$495.58	$214.65	$168.80	$323.72	$273.65	$748.04	$365.99	$39.30	$233.41	$177.52	$632.26	$240.36	$0.00	$0.00	$0.00	$375.11	$0.38	$0.00	$0.00	$0.00	$0.00	$4,486.36
Subtotal Financing Program	$0.00	$0.00	$0.00	$0.00	$90.88	$13.12	$79.27	$14.31	$0.00	$495.58	$214.65	$168.80	$323.72	$273.65	$748.04	$365.99	$39.30	$233.41	$177.52	$632.26	$240.36	$0.00	$0.00	$0.00	$375.11	$0.38	$0.00	$0.00	$0.00	$0.00	$4,486.36
TOTAL CAPITAL SOURCES OF FUNDS	$0.10	$0.40	$0.02	$0.02	$171.34	$99.38	$170.05	$110.34	$100.98	$609.62	$340.35	$463.55	$582.13	$489.88	$982.80	$583.07	$256.15	$412.91	$356.17	$829.38	$441.99	$221.05	$229.65	$291.70	$676.85	$327.17	$337.08	$373.83	$394.02	$366.89	$10,218.85

CAPITAL USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Project Expenses																															
LRT West Bank 2 Alternative	$0.00	$0.00	$0.00	$0.00	$145.93	$101.46	$154.01	$108.33	$85.68	$447.46	$313.71	$324.16	$437.59	$346.11	$357.63	$256.30	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,078.38
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.65	$6.18	$10.04	$12.74	$14.89	$26.07	$33.91	$42.02	$52.96	$61.61	$70.55	$76.96	$76.96	$76.96	$565.50
TSM	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$38.84	$53.51	$82.94	$57.14	$44.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$276.72
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.97	$2.31	$4.38	$5.81	$6.92	$6.92	$6.92	$34.23
Financing Program																															
Retired Brige Financing Debt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$90.88	$13.12	$79.27	$14.31	$0.00	$495.58	$214.65	$168.80	$323.72	$273.65	$748.04	$365.99	$39.30	$233.41	$177.52	$632.26	$240.36	$0.00	$0.00	$0.00	$375.11	$4,485.98
Interest	$0.00	$0.00	$0.00	$0.00	$3.52	$3.97	$7.06	$7.69	$7.75	$23.73	$29.34	$32.61	$43.90	$53.89	$63.10	$68.82	$64.25	$61.10	$57.72	$53.59	$49.21	$48.01	$39.49	$33.07	$23.51	$14.53	$14.72	$15.02	$15.36	$0.02	$834.96
Debt Management Expenses	$0.00	$0.00	$0.00	$0.00	$0.55	$0.62	$1.10	$1.19	$1.19	$4.16	$4.90	$5.84	$7.30	$8.86	$13.35	$12.57	$11.52	$11.90	$11.03	$13.18	$10.13	$7.94	$7.70	$6.30	$7.49	$3.70	$2.25	$2.25	$2.25	$2.25	$161.51
TOTAL CAPITAL USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$149.99	$106.05	$162.17	$117.20	$94.61	$566.23	$361.07	$480.71	$556.62	$491.80	$986.80	$596.62	$248.21	$402.92	$352.44	$827.55	$440.22	$121.31	$314.51	$259.89	$718.53	$324.58	$93.33	$101.15	$101.49	$461.25	$9,437.26
NET CAPITAL CASH FLOW	$0.10	$0.40	$0.02	$0.02	$21.35	($6.67)	$7.88	($6.85)	$6.37	$43.39	($20.72)	($17.17)	$25.51	($1.92)	($4.00)	($13.55)	$7.94	$9.99	$3.73	$1.83	$1.77	$99.74	($84.86)	$31.81	($41.68)	$2.58	$243.75	$272.68	$292.53	($94.36)	$781.59

OPERATING SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Fare Revenue	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$341.58	$361.22	$367.64	$388.25	$395.03	$416.85	$423.99	$446.97	$454.47	$478.59	$486.47	$511.66	$519.90	$546.31	$6,138.93
FTA Sec 5307 Preventative Maintenance	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.27	$6.13	$5.98	$5.84	$5.71	$5.58	$5.45	$5.32	$5.20	$5.08	$4.96	$4.85	$66.37
Advertising Income	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.09	$2.16	$2.25	$2.32	$2.42	$2.49	$2.59	$2.67	$2.78	$2.86	$2.97	$3.05	$3.18	$3.26	$37.08
TOTAL OPERATING SOURCES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$343.67	$363.37	$376.16	$396.69	$403.43	$425.18	$432.30	$455.21	$462.70	$486.77	$494.64	$519.80	$528.04	$554.42	$6,242.38

OPERATING USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$343.56	$352.75	$362.06	$371.53	$381.19	$391.05	$401.04	$411.20	$421.50	$431.96	$442.54	$453.22	$464.02	$475.08	$5,702.72
TOTAL OPERATING USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$343.56	$352.75	$362.06	$371.53	$381.19	$391.05	$401.04	$411.20	$421.50	$431.96	$442.54	$453.22	$464.02	$475.08	$5,702.72
NET OPERATING CASH FLOW	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.11	$10.63	$14.10	$25.16	$22.24	$34.14	$31.25	$44.01	$41.20	$54.81	$52.11	$66.57	$64.02	$79.34	$539.67

CASH BALANCES

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.																															
Beginning Cash Balance	$0.00	$0.10	$0.50	$0.52	$0.54	$21.89	$15.22	$23.10	$16.25	$22.62	$66.01	$45.29	$28.12	$53.62	$51.71	$47.70	$34.16	$42.09	$52.08	$55.81	$57.64	$59.41	$159.15	$74.29	$106.10	$64.42	$67.00	$310.75	$583.43	$875.95	
Additions (Deletions) to Cash	$0.10	$0.40	$0.02	$0.02	$21.35	($6.67)	$7.88	($6.85)	$6.37	$43.39	($20.72)	($17.17)	$25.51	($1.92)	($4.00)	($13.55)	$7.94	$9.99	$3.73	$1.83	$1.77	$99.74	($84.86)	$31.81	($41.68)	$2.58	$243.75	$272.68	$292.53	($94.36)	$781.59
Ending Cash Balance	$0.10	$0.50	$0.52	$0.54	$21.89	$15.22	$23.10	$16.25	$22.62	$66.01	$45.29	$28.12	$53.62	$51.71	$47.70	$34.16	$42.09	$52.08	$55.81	$57.64	$59.41	$159.15	$74.29	$106.10	$64.42	$67.00	$310.75	$583.43	$875.95	$781.59	

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
All Dedicated Revenues / All Debt Issues																														
Gross Coverage (Dedicated Tax Revenues / Debt Service)					22.87	21.50	12.78	12.38	12.96	4.46	3.80	3.61	2.82	2.41	2.16	2.07	2.32	2.55	2.82	3.17	3.60	3.85	4.88	6.07	8.90	15.02	15.48	15.82	16.12	12,477.71
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)					22.87	21.50	12.78	12.38	12.96	4.46	3.80	3.61	2.82	2.41	2.16	2.07	2.32	2.72	3.06	3.64	4.05	4.56	5.67	7.40	10.66	18.80	19.02	20.26	20.29	17,583.72

REVENUE HOURS OF SERVICE (in millions)																														
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Exhibit 16. Capital and Operating Sources and Uses of Funds
LRT West Bank 3 Alternative
Year-of-Expenditure Dollars in Millions

Southern California Association of Government / Pacific Electric Right-of-Way Alternative Analysis
Scenario: LRT West Bank 3 Alternative
11/13/2011

CAPITAL SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Transfer from Operation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.84	$10.90	$14.11	$24.69	$21.93	$33.31	$30.59	$42.79	$40.14	$53.16	$50.61	$64.44	$62.03	$76.69	$526.21
Capital Funds																															
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7.40	$11.80	$125.10	$80.10	$1.40	$14.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$240.00
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$40.24	$41.92	$43.68	$45.53	$47.46	$49.48	$49.48	$317.79
Prop A 35% Bond	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$17.50	$28.60	$66.60	$11.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124.40
Prop C 25%	$0.10	$0.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.50
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$11.60	$0.00	$0.00	$7.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.50
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$0.00	$0.02	$0.02	$0.02	$0.79	$0.72	$0.84	$0.85	$1.91	$2.83	$1.95	$1.35	$2.38	$2.22	$2.09	$1.49	$1.42	$1.78	$1.92	$1.99	$2.06	$5.91	$2.30	$2.20	$2.33	$2.46	$11.92	$21.70	$33.12	$110.59
TSM Los Angeles County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.21	$8.56	$13.27	$9.14	$7.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.37	$0.70	$0.93	$1.11	$1.11	$1.11	$49.75
TSM Orange County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32.63	$44.95	$69.67	$48.00	$37.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.82	$1.94	$3.68	$4.88	$5.81	$5.81	$5.81	$261.19
Additional Sales Tax from Los Angeles County	$0.00	$0.00	$0.00	$0.00	$67.57	$71.76	$75.77	$79.93	$84.31	$88.85	$93.70	$98.78	$103.98	$109.17	$114.38	$119.69	$125.09	$130.76	$136.64	$142.75	$148.94	$155.20	$161.78	$168.68	$175.85	$183.39	$191.34	$199.62	$207.95	$162.86	$3,398.75
Additional Sales Tax from Orange County	$0.00	$0.00	$0.00	$0.00	$23.74	$25.21	$26.62	$28.08	$29.62	$31.22	$32.92	$34.71	$36.53	$38.36	$40.19	$42.05	$43.95	$45.94	$48.01	$50.16	$52.33	$54.53	$56.84	$59.27	$61.78	$64.43	$67.23	$70.14	$73.06	$57.22	$1,194.15
Subtotal Capital Funds	$0.10	$0.40	$0.02	$0.02	$91.34	$97.77	$103.11	$108.85	$114.78	$129.38	$141.25	$310.97	$275.47	$234.25	$253.52	$236.71	$237.14	$189.82	$186.43	$194.83	$203.25	$211.78	$224.54	$271.46	$284.05	$298.22	$312.37	$336.06	$359.12	$309.60	$5,716.62
Financing Program																															
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$70.93	$0.00	$51.88	$0.00	$0.00	$533.56	$244.98	$192.60	$388.63	$330.29	$850.20	$438.06	$44.77	$289.62	$224.14	$723.62	$299.69	$0.00	$29.30	$2.03	$506.00	$53.80	$0.00	$0.00	$0.00	$0.00	$5,274.09
Subtotal Financing Program	$0.00	$0.00	$0.00	$0.00	$70.93	$0.00	$51.88	$0.00	$0.00	$533.56	$244.98	$192.60	$388.63	$330.29	$850.20	$438.06	$44.77	$289.62	$224.14	$723.62	$299.69	$0.00	$29.30	$2.03	$506.00	$53.80	$0.00	$0.00	$0.00	$0.00	$5,274.09
TOTAL CAPITAL SOURCES OF FUNDS	$0.10	$0.40	$0.02	$0.02	$162.26	$97.77	$154.99	$108.85	$114.78	$662.95	$386.23	$503.57	$664.10	$564.55	$1,103.73	$674.77	$282.75	$490.34	$424.68	$943.14	$524.87	$245.10	$284.43	$316.27	$830.19	$405.18	$362.97	$400.50	$421.15	$386.29	$11,516.92

CAPITAL USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Project Expenses																															
LRT West Bank 3 Alternative	$0.00	$0.00	$0.00	$0.00	$138.81	$96.51	$146.50	$103.04	$81.50	$535.76	$375.61	$388.12	$523.94	$414.40	$428.20	$306.88	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3,539.26
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.47	$5.88	$9.55	$12.12	$14.16	$27.55	$36.94	$46.65	$59.74	$70.10	$80.81	$88.48	$88.48	$88.48	$632.42
TSM	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$38.84	$53.51	$82.94	$57.14	$44.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$276.72
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.97	$2.31	$4.38	$5.81	$6.92	$6.92	$6.92	$34.23
Financing Program																															
Retired Brige Financing Debt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$70.93	$0.00	$51.88	$0.00	$0.00	$533.56	$244.98	$192.60	$388.63	$330.29	$850.20	$438.06	$44.77	$289.62	$224.14	$723.62	$299.69	$0.00	$29.30	$2.03	$506.00	$5,220.29
Interest	$0.00	$0.00	$0.00	$0.00	$2.74	$2.71	$4.73	$4.78	$4.81	$23.07	$30.31	$35.45	$49.63	$61.69	$73.24	$80.51	$75.31	$71.87	$68.15	$63.65	$58.84	$57.49	$48.01	$39.97	$31.97	$22.88	$23.17	$22.47	$22.90	$2.20	$982.54
Debt Management Expenses	$0.00	$0.00	$0.00	$0.00	$0.43	$0.43	$0.74	$0.74	$0.74	$3.94	$4.98	$6.14	$8.16	$10.14	$15.24	$14.67	$13.47	$14.05	$13.06	$15.42	$12.12	$9.49	$9.40	$7.67	$9.36	$5.34	$3.55	$3.55	$3.37	$3.36	$189.54
TOTAL CAPITAL USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$141.98	$99.64	$151.96	$108.55	$87.05	$633.69	$410.91	$520.43	$635.24	$569.17	$1,107.39	$691.32	$284.84	$480.43	$421.05	$941.40	$523.18	$139.30	$383.96	$319.40	$827.01	$402.39	$113.34	$150.72	$123.69	$606.96	$10,875.00
NET CAPITAL CASH FLOW	$0.10	$0.40	$0.02	$0.02	$20.28	($1.87)	$3.03	$0.29	$27.73	$29.26	($24.68)	($16.86)	$28.86	($4.63)	($3.66)	($16.55)	($2.09)	$9.91	$3.64	$1.74	$1.69	$105.79	($99.54)	($3.13)	$3.19	$2.78	$249.63	$249.78	$297.46	($220.67)	$641.92

OPERATING SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Fare Revenue	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$326.08	$344.83	$350.96	$370.64	$377.11	$397.94	$404.76	$426.69	$433.86	$456.88	$464.40	$488.45	$496.31	$521.53	$5,860.45
FTA Sec 5307 Preventative Maintenance	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.86	$5.72	$5.59	$5.46	$5.33	$5.21	$5.09	$4.97	$4.85	$4.74	$4.63	$4.53	$61.98
Advertising Income	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2.20	$2.26	$2.37	$2.43	$2.54	$2.61	$2.73	$2.80	$2.92	$3.00	$3.12	$3.21	$3.34	$3.43	$38.97
TOTAL OPERATING SOURCES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$328.28	$347.10	$359.18	$378.80	$385.24	$406.01	$412.82	$434.70	$441.87	$464.85	$472.38	$496.40	$504.28	$529.48	$5,961.39

OPERATING USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$327.45	$336.20	$345.07	$354.10	$363.31	$372.70	$382.23	$391.91	$401.73	$411.69	$421.77	$431.96	$442.25	$452.79	$5,435.18
TOTAL OPERATING USES OF FUNDS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$327.45	$336.20	$345.07	$354.10	$363.31	$372.70	$382.23	$391.91	$401.73	$411.69	$421.77	$431.96	$442.25	$452.79	$5,435.18
NET OPERATING CASH FLOW	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.84	$10.90	$14.11	$24.69	$21.93	$33.31	$30.59	$42.79	$40.14	$53.16	$50.61	$64.44	$62.03	$76.69	$526.21

CASH BALANCES

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.																															
Beginning Cash Balance	$0.00	$0.10	$0.50	$0.52	$0.54	$20.82	$18.95	$21.97	$22.27	$49.99	$79.25	$54.57	$37.71	$66.58	$61.95	$58.29	$41.74	$39.65	$49.56	$53.19	$54.93	$56.62	$162.41	$62.88	$59.75	$62.93	$65.72	$315.35	$565.13	$862.59	
Additions (Deletions) to Cash	$0.10	$0.40	$0.02	$0.02	$20.28	($1.87)	$3.03	$0.29	$27.73	$29.26	($24.68)	($16.86)	$28.86	($4.63)	($3.66)	($16.55)	($2.09)	$9.91	$3.64	$1.74	$1.69	$105.79	($99.54)	($3.13)	$3.19	$2.78	$249.63	$249.78	$297.46	($220.67)	$641.92
Ending Cash Balance	$0.10	$0.50	$0.52	$0.54	$20.82	$18.95	$21.97	$22.27	$49.99	$79.25	$54.57	$37.71	$66.58	$61.95	$58.29	$41.74	$39.65	$49.56	$53.19	$54.93	$56.62	$162.41	$62.88	$59.75	$62.93	$65.72	$315.35	$565.13	$862.59	$641.92	

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
All Dedicated Revenues / All Debt Issues																														
Gross Coverage (Dedicated Tax Revenues / Debt Service)					33.27	35.79	21.66	22.61	23.67	5.21	4.18	3.77	2.83	2.39	2.11	2.01	2.24	2.46	2.71	3.03	3.42	3.65	4.55	5.70	7.43	10.83	11.16	12.00	12.27	100.01
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)					33.27	35.79	21.66	22.61	23.67	5.21	4.18	3.77	2.83	2.39	2.11	2.01	2.26	2.61	2.92	3.42	3.79	4.23	5.19	6.77	8.69	13.16	13.34	14.87	14.98	134.86

REVENUE HOURS OF SERVICE (in millions)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Exhibit 17. Capital and Operating Sources and Uses of Funds
Maglev West Bank 3 Alternative
Year-of-Expenditure Dollars in Millions

Southern California Association of Government / Pacific Electric Right-of-Way Alternative Analysis
Scenario: Maglev West Bank 3 Alternative
11/13/2011

CAPITAL SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Transfer from Operation	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Capital Funds													
Measure R	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$7.40	$11.80	$125.10	$80.10
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Prop A 35% Bond	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Prop C 25%	$0.10	$0.40	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Local Agency Contribution	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$11.60	$0.00
Interest on Capital Reserve Allocated to Capital Funds	$0.00	$0.00	$0.02	$0.02	$0.02	$3.22	$2.24	$3.42	$2.42	$1.92	$5.78	$4.02	$3.49
TSM Los Angeles County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$6.21	$8.56
TSM Orange County Share	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$32.63	$44.95
Additional Sales Tax from Los Angeles County	$0.00	$0.00	$0.00	$0.00	$174.59	$185.41	$195.77	$206.51	$217.82	$229.55	$242.08	$255.21	$268.65
Additional Sales Tax from Orange County	$0.00	$0.00	$0.00	$0.00	$64.57	$68.58	$72.41	$76.38	$80.56	$84.90	$89.54	$94.39	$99.36
Subtotal Capital Funds	*$0.10*	*$0.40*	*$0.02*	*$0.02*	*$239.18*	*$257.21*	*$270.42*	*$286.30*	*$300.79*	*$323.77*	*$349.20*	*$529.16*	*$505.11*
Financing Program													
Construction Bridge Financing	$0.00	$0.00	$0.00	$0.00	$433.11	$137.06	$403.30	$159.69	$74.17	$1,410.09	$614.55	$818.78	$987.97
Subtotal Financing Program	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$433.11*	*$137.06*	*$403.30*	*$159.69*	*$74.17*	*$1,410.09*	*$614.55*	*$818.78*	*$987.97*
TOTAL CAPITAL SOURCES OF FUNDS	**$0.10**	**$0.40**	**$0.02**	**$0.02**	**$672.29**	**$394.28**	**$673.72**	**$445.99**	**$374.96**	**$1,733.86**	**$963.76**	**$1,347.94**	**$1,493.08**

(Year of Expenditure Dollars in Millions) Fiscal Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Transfer from Operation	*$0.00*	*$0.00*	*$0.00*	*$0.63*	*$8.22*	*$11.30*	*$19.27*	*$17.18*	*$25.75*	*$23.69*	*$32.88*	*$30.88*	*$40.69*	*$38.76*	*$49.18*	*$47.36*	*$58.41*	*$404.20*
Capital Funds																		
Measure R	$1.40	$14.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$240.00
Section 5309 Rail & Fixed Guideway Modernization Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$35.28	$36.76	$38.31	$39.94	$41.64	$43.43	$43.43	$278.79
Prop A 35% Bond	$0.00	$17.50	$28.60	$66.60	$11.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$124.40
Prop C 25%	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.50
Local Agency Contribution	$0.00	$7.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19.50
Interest on Capital Reserve Allocated to Capital Funds	$5.26	$4.51	$4.45	$3.19	$1.05	$1.44	$1.62	$1.72	$1.81	$2.00	$2.16	$2.12	$2.32	$2.49	$13.83	$17.80	$37.65	$131.99
TSM Los Angeles County Share	$13.27	$9.14	$7.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.37	$0.70	$0.93	$1.11	$1.11	$1.11	$49.75
TSM Orange County Share	$69.67	$48.00	$37.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.82	$1.94	$3.68	$4.88	$5.81	$5.81	$5.81	$261.19
Additional Sales Tax from Los Angeles County	$282.07	$295.52	$309.24	$323.20	$337.84	$353.03	$368.82	$384.80	$400.98	$418.00	$435.82	$454.32	$473.81	$494.37	$515.76	$537.27	$420.77	$8,781.19
Additional Sales Tax from Orange County	$104.33	$109.30	$114.38	$119.54	$124.95	$130.57	$136.41	$142.32	$148.31	$154.60	$161.19	$168.04	$175.24	$182.85	$190.76	$198.72	$155.63	$3,247.84
Subtotal Capital Funds	*$476.00*	*$506.07*	*$500.95*	*$512.52*	*$475.54*	*$485.04*	*$506.86*	*$528.84*	*$551.10*	*$574.60*	*$635.42*	*$663.55*	*$694.07*	*$725.45*	*$768.90*	*$804.13*	*$664.39*	*$13,135.15*
Financing Program																		
Construction Bridge Financing	$693.16	$2,056.71	$985.05	$487.35	$758.09	$448.21	$1,787.17	$685.16	$170.76	$425.82	$42.80	$1,380.68	$235.23	$0.00	$0.00	$0.00	$0.00	$15,194.89
Subtotal Financing Program	*$693.16*	*$2,056.71*	*$985.05*	*$487.35*	*$758.09*	*$448.21*	*$1,787.17*	*$685.16*	*$170.76*	*$425.82*	*$42.80*	*$1,380.68*	*$235.23*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$15,194.89*
TOTAL CAPITAL SOURCES OF FUNDS	**$1,169.16**	**$2,562.78**	**$1,486.00**	**$1,000.50**	**$1,241.84**	**$944.55**	**$2,313.30**	**$1,231.18**	**$747.61**	**$1,024.11**	**$711.11**	**$2,075.11**	**$969.99**	**$764.21**	**$818.09**	**$851.49**	**$722.79**	**$28,734.23**

CAPITAL USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Project Expenses													
Maglev West Bank 3 Alternative	$0.00	$0.00	$0.00	$0.00	$568.23	$395.05	$599.70	$421.80	$333.62	$1,087.08	$762.15	$787.52	$1,063.10
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TSM	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$38.84	$53.51
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Financing Program													
Retired Brige Financing Debt	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$433.11	$137.06	$403.30	$159.69
Interest	$0.00	$0.00	$0.00	$0.00	$16.76	$21.78	$37.48	$44.08	$47.33	$86.06	$97.16	$112.32	$142.55
Debt Management Expenses	$0.00	$0.00	$0.00	$0.00	$2.60	$3.42	$5.84	$6.80	$7.24	$15.70	$16.79	$20.88	$24.39
TOTAL CAPITAL USES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$587.59**	**$420.25**	**$643.02**	**$472.68**	**$388.19**	**$1,621.95**	**$1,013.16**	**$1,362.87**	**$1,443.25**
NET CAPITAL CASH FLOW	**$0.10**	**$0.40**	**$0.02**	**$0.02**	**$84.69**	**($25.98)**	**$30.70**	**($26.68)**	**($13.23)**	**$111.91**	**($49.40)**	**($14.93)**	**$49.83**

(Year of Expenditure Dollars in Millions) Fiscal Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Project Expenses																		
Maglev West Bank 3 Alternative	$840.85	$868.85	$622.68	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$8,350.63
Rehabilitation & Replacement	$0.00	$0.00	$0.00	$14.21	$24.08	$39.07	$49.62	$57.96	$85.14	$104.19	$123.88	$150.46	$171.48	$193.20	$208.77	$208.77	$208.77	$1,639.58
TSM	$82.94	$57.14	$44.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$276.72
TSM Rehabilitation & Replacement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.97	$2.31	$4.38	$5.81	$6.92	$6.92	$6.92	$34.23
Financing Program																		
Retired Brige Financing Debt	$74.17	$1,410.09	$614.55	$818.78	$987.97	$693.16	$2,056.71	$985.05	$487.35	$758.09	$448.21	$1,787.17	$685.16	$170.76	$425.82	$42.80	$1,380.68	$14,959.66
Interest	$165.15	$188.75	$202.82	$191.22	$183.28	$174.74	$165.24	$154.97	$143.97	$132.24	$117.93	$103.34	$87.28	$81.71	$66.35	$66.09	$9.62	$2,840.21
Debt Management Expenses	$27.59	$39.49	$36.94	$36.17	$35.81	$32.57	$39.14	$30.91	$26.02	$25.65	$21.36	$26.95	$17.64	$13.53	$12.51	$9.95	$9.70	$545.60
TOTAL CAPITAL USES OF FUNDS	**$1,190.70**	**$2,564.31**	**$1,521.27**	**$1,060.38**	**$1,231.14**	**$939.54**	**$2,310.70**	**$1,228.89**	**$742.47**	**$1,020.17**	**$712.35**	**$2,070.23**	**$965.94**	**$465.02**	**$720.36**	**$334.53**	**$1,615.68**	**$28,646.63**
NET CAPITAL CASH FLOW	**($21.53)**	**($1.53)**	**($35.28)**	**($59.88)**	**$10.71**	**$5.01**	**$2.60**	**$2.29**	**$5.14**	**$3.94**	**($1.24)**	**$4.88**	**$4.05**	**$299.20**	**$97.73**	**$516.96**	**($892.89)**	**$87.61**

OPERATING SOURCES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Fare Revenue	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
FTA Sec 5307 Preventative Maintenance	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
Advertising Income	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*
TOTAL OPERATING SOURCES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**

(Year of Expenditure Dollars in Millions) Fiscal Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Fare Revenue	*$0.00*	*$0.00*	*$0.00*	*$245.99*	*$260.13*	*$264.75*	*$279.60*	*$284.48*	*$300.19*	*$305.33*	*$321.88*	*$327.29*	*$344.66*	*$350.33*	*$368.47*	*$374.40*	*$393.42*	*$4,420.90*
FTA Sec 5307 Preventative Maintenance	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$0.00*	*$5.08*	*$4.96*	*$4.85*	*$4.73*	*$4.63*	*$4.52*	*$4.42*	*$4.32*	*$4.22*	*$4.12*	*$4.03*	*$3.93*	*$53.79*
Advertising Income	*$0.00*	*$0.00*	*$0.00*	*$1.92*	*$1.97*	*$2.06*	*$2.12*	*$2.22*	*$2.28*	*$2.38*	*$2.44*	*$2.55*	*$2.62*	*$2.72*	*$2.80*	*$2.91*	*$2.99*	*$33.98*
TOTAL OPERATING SOURCES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$247.90**	**$262.10**	**$271.89**	**$286.68**	**$291.54**	**$307.21**	**$312.34**	**$328.84**	**$334.25**	**$351.59**	**$357.27**	**$375.39**	**$381.34**	**$400.34**	**$4,508.67**

OPERATING USES OF FUNDS

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
TOTAL OPERATING USES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
NET OPERATING CASH FLOW	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**

(Year of Expenditure Dollars in Millions) Fiscal Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Bus Rapid Transit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Regional Rail	$0.00	$0.00	$0.00	$247.28	$253.89	$260.59	$267.41	$274.36	$281.45	$288.65	$295.96	$303.37	$310.90	$318.51	$326.20	$333.98	$341.93	$4,104.47
TOTAL OPERATING USES OF FUNDS	**$0.00**	**$0.00**	**$0.00**	**$247.28**	**$253.89**	**$260.59**	**$267.41**	**$274.36**	**$281.45**	**$288.65**	**$295.96**	**$303.37**	**$310.90**	**$318.51**	**$326.20**	**$333.98**	**$341.93**	**$4,104.47**
NET OPERATING CASH FLOW	**$0.00**	**$0.00**	**$0.00**	**$0.63**	**$8.22**	**$11.30**	**$19.27**	**$17.18**	**$25.75**	**$23.69**	**$32.88**	**$30.88**	**$40.69**	**$38.76**	**$49.18**	**$47.36**	**$58.41**	**$404.20**

CASH BALANCES

(Year of Expenditure Dollars in Millions) Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.													
Beginning Cash Balance	$0.00	$0.10	$0.50	$0.52	$0.54	$85.23	$59.26	$89.96	$63.27	$50.04	$161.95	$112.55	$97.62
Additions (Deletions) to Cash	$0.10	$0.40	$0.02	$0.02	$84.69	($25.98)	$30.70	($26.68)	($13.23)	$111.91	($49.40)	($14.93)	$49.83
Ending Cash Balance	**$0.10**	**$0.50**	**$0.52**	**$0.54**	**$85.23**	**$59.26**	**$89.96**	**$63.27**	**$50.04**	**$161.95**	**$112.55**	**$97.62**	**$147.45**

(Year of Expenditure Dollars in Millions) Fiscal Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total 2011 - 2040
Enterprise Debt Reduction Fund and Capital Carryover Fund Bal.																		
Beginning Cash Balance	$147.45	$125.92	$124.39	$89.11	$29.23	$39.94	$44.95	$47.55	$49.85	$54.99	$58.93	$57.68	$62.56	$66.61	$365.80	$463.53	$980.49	
Additions (Deletions) to Cash	($21.53)	($1.53)	($35.28)	($59.88)	$10.71	$5.01	$2.60	$2.29	$5.14	$3.94	($1.24)	$4.88	$4.05	$299.20	$97.73	$516.96	($892.89)	$87.61
Ending Cash Balance	**$125.92**	**$124.39**	**$89.11**	**$29.23**	**$39.94**	**$44.95**	**$47.55**	**$49.85**	**$54.99**	**$58.93**	**$57.68**	**$62.56**	**$66.61**	**$365.80**	**$463.53**	**$980.49**	**$87.61**	

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
All Dedicated Revenues / All Debt Issues													
Gross Coverage (Dedicated Tax Revenues / Debt Service)					14.27	11.66	7.16	6.42	6.30	3.65	3.41	3.11	2.58
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)					14.27	11.66	7.16	6.42	6.30	3.65	3.41	3.11	2.58

DEBT SERVICE COVERAGE RATIOS Fiscal Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
All Dedicated Revenues / All Debt Issues																	
Gross Coverage (Dedicated Tax Revenues / Debt Service)	2.34	2.14	2.09	2.32	2.53	2.77	3.06	3.40	3.82	4.33	5.06	6.02	7.44	8.29	10.65	11.14	59.91
Net Coverage ((Ded. Tax Revenues - Operating Exp.) / Debt Svc.)	2.34	2.14	2.09	2.32	2.57	2.83	3.17	3.51	3.99	4.51	5.34	6.32	7.90	8.76	11.39	11.85	65.98

REVENUE HOURS OF SERVICE (in millions)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-
Maglev Hours	-	-	-	-	-	-	-	-	-	-	-	-	-

REVENUE HOURS OF SERVICE (in millions)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bus/BRT Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Street Car Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Rail Hours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maglev Hours	-	-	-	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08

Appendix A: Inflation and Interest Rate Projections

This appendix summarizes the inflation and interest rate projections applied in the financial plan. The projection is prepared for the Santa Clara Valley Transportation Authority by the Moody's Economy.com in June 2010. The forecast includes 30 years of annual projections (through 2040) of San Jose inflation and national interest rates; the San Jose inflation was assumed applicable for this project. Table A.1 lists the inflation and interest rates applied in this financial plan:

Inflation and Income

- San Jose CA CPI: Urban Consumer - All Items, (Index 1982-84=100, SA)
- San Jose RS Means Construction Cost Index (Jan 1993=100)
- Interest Rates: Nonfinancial Commercial Paper - 1 Month, (%)
- U.S. 3-month Treasury- Bill, (%)

The Economy.com projections included baseline, optimistic and pessimistic forecasts. The baseline forecasts were based on assumptions regarding the most likely set of economic outcomes over the next 30 years. The range between the high and low forecasts was assumed to capture between 80% and 85% of likely economic outcomes. The baseline forecast was applied in the financial analysis. The high and low forecasts may be considered as ranges in a financial plan risk analysis.

Model Structure

The Economy.com projections were developed using the Economy.com's proprietary state-of-the-art integrated economic forecast model. The model applied a comprehensive database of historic socioeconomic variables which is regularly updated in real-time as new data is released. The model forecasted economic trends using a two-tier structure in which macroeconomic assumptions drove a national forecast, which in turn was applied to develop forecasts of regional economic trends. These regional forecasts varied based on economic trends particular to each metropolitan area. The assumptions and methodological approaches employed to develop these forecasts were informed by the professional judgment of Economy.com's team of macro and regional economists and commodity and industry specialists, who have a depth of expertise on the particulars of individual economic trends.

Forecast Summary

Figure A.1 presents the San Jose CA Consumer Price Index/All Urban Consumers inflation projections. The left line graph summarizes the baseline (or most likely), optimistic, and pessimistic projections of inflation in the San Jose Consumer Price Index prepared by Economy.com. The right graph summarizes the annual and average variance between the Economy.com baseline and optimistic projection and between the Economy.com baseline and pessimistic projections. The baseline inflation projection is applied to escalate O&M costs, fare revenues and advertising revenues.

Figure A.1. California San Jose Consumer Price Index Inflation Projections – All Urban Consumers

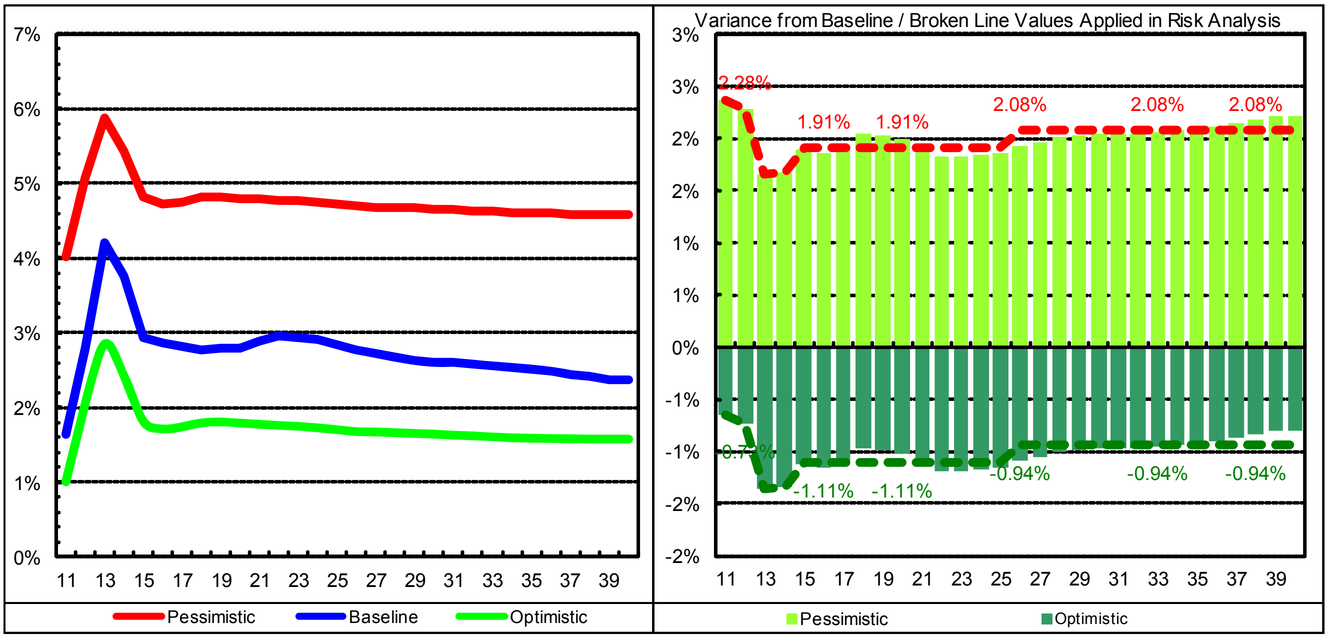


Figure A.2 shows construction cost inflation projections: The left line graph summarizes the baseline, optimistic, and pessimistic projections of inflation in the San Jose RS Means Construction Cost Index (solid lines) compared to U.S. CPI (dotted lines). The right graph summarizes the annual and average variance between the Economy.com baseline and optimistic projections and between the Economy.com baseline and pessimistic projections of the RS Means Construction Cost Index. The baseline annualized growth rate 3.33% was applied to escalate capital costs.

Figure A.2. California San Jose RS Means Construction Cost Index Inflation Projections

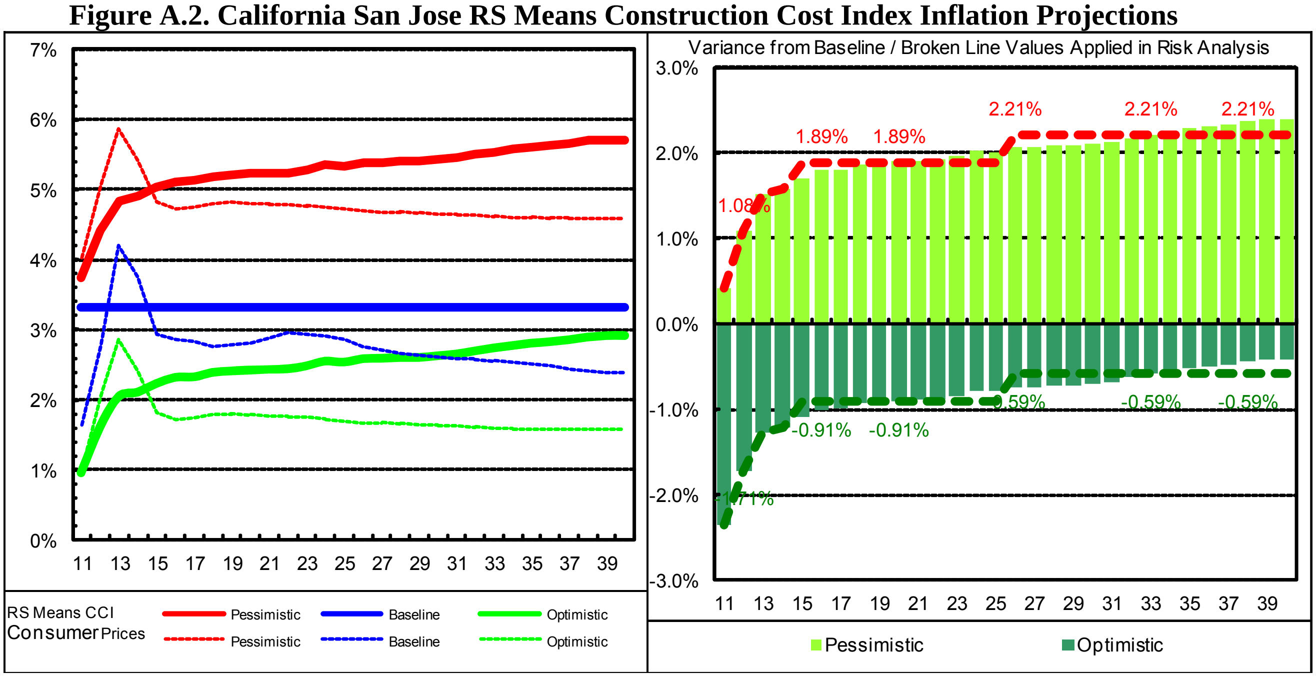
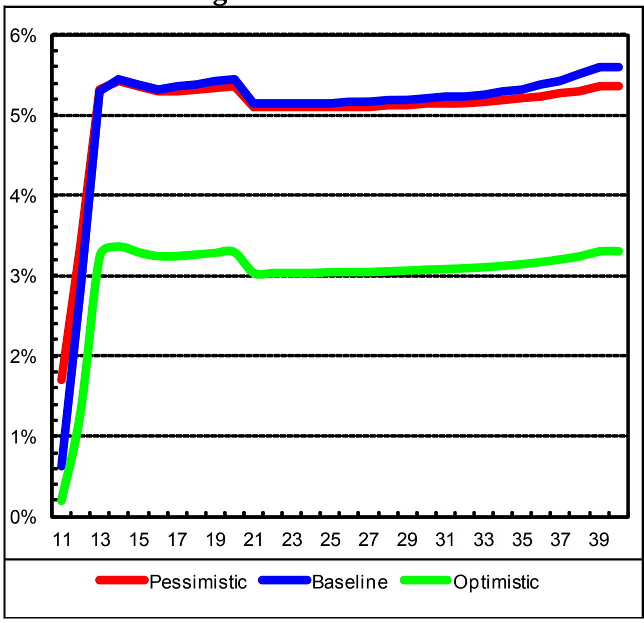


Figure A.3 summarizes nonfinancial commercial paper interest rate projections. The left line graph summarizes the baseline, optimistic, and pessimistic projections of nonfinancial commercial paper interest rates prepared by Economy.com. The right graph summarizes the annual and average variance between the Economy.com baseline and optimistic projections and between the Economy.com baseline and pessimistic projections. The baseline index was applied as the short-term interest rate in the bridge financing computations.

Figure A.3. Nonfinancial Commercial Paper Interest Rate Projections



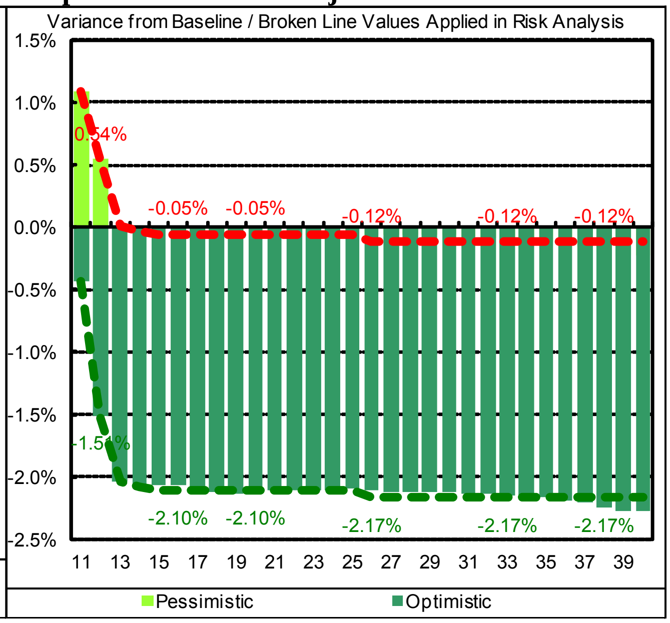
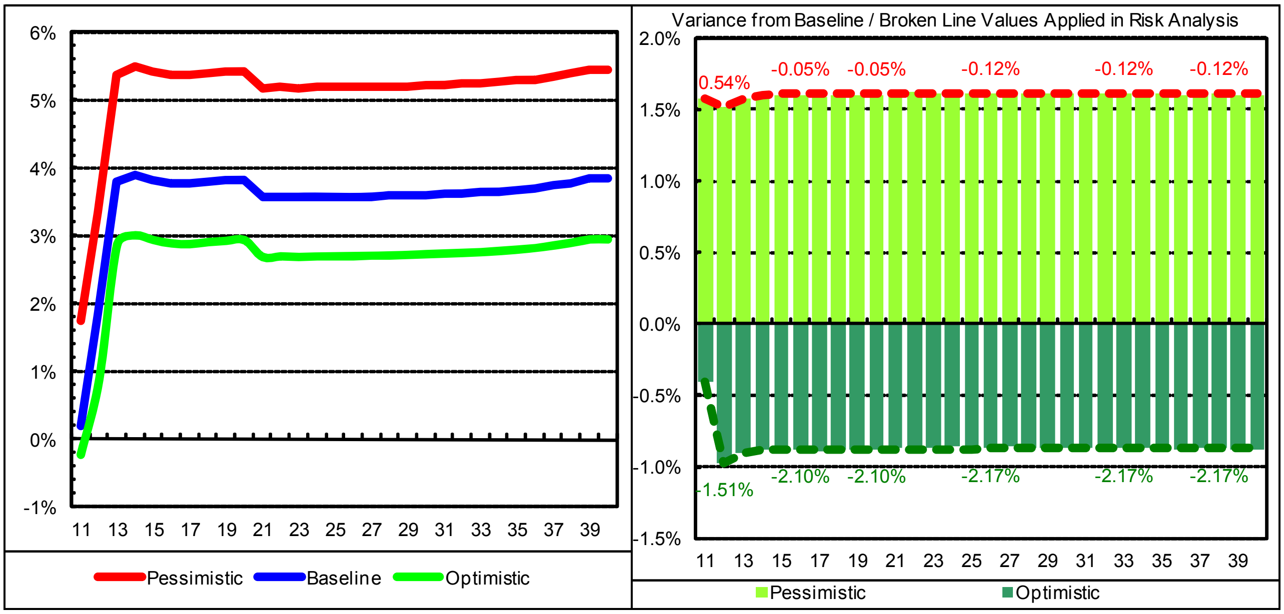


Figure A.4 displays US treasury 3-month interest rate projections. The left line graph summarizes the baseline, optimistic, and pessimistic projections of US treasury 3-month interest rates prepared by Economy.com. The right graph summarizes the annual and average variance between the Economy.com baseline and optimistic projections and between the Economy.com baseline and pessimistic projections. The baseline index was applied as the interest rate in the cash balance interest computations.

Figure A.4. Nonfinancial Commercial Paper Interest Rate Projections



Appendix B: Pacific Electric Right-of-Way / West Santa Ana Branch Operations and Maintenance Cost Methodology

1. Introduction

This appendix describes the methodology used to calculate the low and high operations and maintenance (O&M) cost estimates for each alternative technology. The O&M costs are, to the extent possible, based on existing cost models for Metro and OCTA, with the assumption that these primary operators would be responsible for operations in their respective counties for bus-related alternatives. For rail-related alternatives, O&M costs are based on cost models for peer transit operators after adjustment to reflect the operating conditions in Los Angeles and Orange counties.

The memorandum is organized by alternative technology. Sections 3 through 6 summarize the methodology and sources of information used to calculate the O&M unit cost estimates for each transit alternative. The final high and low O&M unit cost estimates, applied in the financial plan, are listed in Section 7. Section 8 calculates the projected total O&M costs for the design year operating statistics for each alternative, representing the costs of operation if operated by Metro or OCTA. Finally, an appendix is included at the end of this memorandum. It lists a series of tables showing the detailed calculation used to derive the O&M unit cost estimates.

2. Transportation Systems Management Alternative

TSM bus services are assumed to be operated by Metro for routes operating in Los Angeles County and OCTA for routes operating in Orange County. O&M unit costs for Metro were derived from the local and rapid bus cost model documented in the Metro Fiscal Year 2012 Proposed Budget. The unit costs for OCTA were derived from the agency's local bus cost model.

The Metro cost model is an activity-based model which identifies costs by function and then develops aggregate costs per revenue service hour for the following modes: Orange Line, Silver Line, local and rapid bus, all bus, light rail, heavy rail and total rail. The FY2011 approved budget model was used for this exercise, primarily because it represented costs in 2011 dollars. This meant that no inflation adjustment was required for application in the financial plan. The model aggregates costs by major activity (or function) and by major object class. For each object class, one of four cost drivers was assigned: vehicle-hours, vehicle-miles, route miles, and passengers. For each mode, operating expenses assigned to each cost driver were then totaled and divided by FY2011 units of service to derive O&M unit costs. For the TSM alternative, Metro's local and rapid bus cost model was used to derive the O&M unit costs.

Similar to the Metro cost model, OCTA's model is an activity-based one which addresses costs by function and then develops aggregate costs per revenue service hour and aggregate costs per revenue service mile. The OCTA "Local Directly Operated Large Bus" (LDL) mode was identified as the most representative of vehicle operations for the TSM alternative. Again, the FY2011 approved budget model was used, and the O&M unit costs were derived for vehicle-hour and vehicle-mile cost drivers by totaling the expenses for each driver and dividing them by the respective FY2011 units of service.

The resulting O&M unit costs in 2011 dollars were applied in the financial plan.

3. Bus Rapid Transit Alternatives

The Metro Orange Line represents a dedicated BRT design similar to the BRT project alternatives considered for this study. As such, O&M unit costs for Metro BRT were derived from the FY2011 approved budget model for the Orange Line. OCTA does not operate exclusive bus fixed guideway, so there was no OCTA O&M cost model to use for BRT alternatives. The LDL mode was identified by OCTA as the most representative of vehicle operations for this mode, and O&M unit costs for OCTA BRT were thus derived from the LDL's FY2011 approved budget model. The O&M unit costs for OCTA for BRT alternatives are the same as those for the TSM alternative.

A second set of O&M unit costs was also derived for each agency based on operating costs of directly operated motor bus experiences reported by Metro and OCTA to the National Transit Database (NTD) for FY2009. NTD costs are summarized by function (Vehicle Operations, Vehicle Maintenance, Non-Vehicle Maintenance, and General Administration) and by object class (Operators' Salaries/Wages, Other Salaries/Wages, Fringe Benefits, Services, Fuel/Lube, Tires/Tubes, Other Materials/Supplies, Utilities, Casualty/Liability Costs, Taxes, Directly Operated Services, Miscellaneous Expenses, and Expense Transfers).

Costs in each function and object class line item were assigned to one of three main cost drivers: vehicle revenue hours (costs for Vehicle Operations), vehicle revenue miles (costs for Vehicle Maintenance, fuel and propulsion electricity), and directional route miles (costs for non-vehicle maintenance). General administrative costs were treated as either a function of total operating cost or were derived as a cost per vehicle revenue hour. Costs were then aggregated by cost driver and divided by the corresponding units of service for each driver, as documented in NTD for FY2009, to derive the O&M unit costs. These were then inflated from 2009 to 2011 dollars for application in the financial plan by applying a Consumer Price Index (CPI) adjustment rate for the Los Angeles – Riverside – Orange County area.

4. Streetcar and Light Rail Transit Alternatives

The Metro Light Rail cost model addresses the combined operations of the Metro Blue, Green, and Gold Lines and represents a design similar to the LRT project alternatives considered for this study. O&M unit costs for Metro Streetcar and LRT were thus derived from the Metro FY2011 approved budget model for the Light Rail Line.

A second set of O&M unit costs was also derived from the well-documented operating costs for light rail, reported by Metro to NTD for FY2009. The process for deriving these costs is identical to that described in the previous section. The LRT O&M unit costs, derived from NTD, were also inflated from 2009 to 2011 dollars for application in the financial plan by applying the CPI-based adjustment factor.

OCTA does not operate a streetcar or light rail transit mode, so there was no OCTA O&M cost model to use for deriving unit costs for these alternatives. Instead, the operating experiences of several peer transit systems offering LRT service in North America were identified. These agencies included: Tri-County Metropolitan Transportation District of Oregon, Metropolitan Transit Authority of Harris County, Dallas Area Rapid Transit, Utah Transit Authority, Denver Regional Transportation District (RTD), Santa Clara Valley Transportation Authority, Sacramento Regional Transit District, San Diego Metropolitan Transit System, and Metro[1]. These systems were selected because they represent the "new" LRT operations in the

[1] Other North American agencies offering LRT service were excluded from this analysis. These agencies were either too old, too small, operated on the East Coast, or provided seasonal operations only.

United States and (except for UTA and RTD) do not have winter operations. LRT costs for each agency were well-documented in the NTD for FY2009. The O&M unit costs for each agency were calculated for three cost drivers: vehicle revenue hours, vehicle revenue miles and directional route miles. General administrative costs were also calculated as a function of total operating cost or as a cost per vehicle revenue hour.

Metro and RTD were identified as having the highest and lowest[2] total O&M cost per vehicle revenue hour. Application of both agencies' operating experience for Orange County operations required conversion of the labor-related costs to reflect the impact of different wage and fringe benefit costs in Orange County. This was accomplished by comparing the FY2009 O&M experience reported by OCTA to NTD for directly operated motor bus operations with the same experiences reported by Metro and RTD. The ratio of OCTA to Metro and OCTA to RTD motor bus costs was derived for each cost driver. These ratios were then applied to the Metro and RTD LRT experiences and the resulting OCTA O&M unit costs for LRT were calculated, one set based on the Metro LRT experience and the second set based on the RTD LRT experience. The O&M unit costs were then inflated from 2009 to 2011 dollars for application in the financial plan by applying the CPI-based adjustment factor.

5. Slow-Speed MagLev Alternatives

Neither Metro nor OCTA (nor any other North American transit agency) operates a slow-speed mag-lev system. In the absence of a suitable experience for such operations, the well-documented experiences of three new technology transit systems in North America were identified. These included:

- Vancouver SkyTrain system: SkyTrain uses linear induction motors that are similar to the slow-speed MagLev technology in that propulsion is achieved with no moving parts. To this extent, SkyTrain was considered a good analog to the slow-speed MagLev concept, particularly with respect to vehicle maintenance. SkyTrain differs from slow-speed MagLev in that the vehicle moves on a relatively conventional steel-wheel-on-steel-wheel guideway.

- Miami Dade Transit (MDT) Metromover: Metromover is an automated technology, similar to SkyTrain, but relies on rotating electric motors and rubber tire propulsion. It provided a useful comparison. O&M costs were well documented in the NTD.

- Jacksonville Transit Authority (JTA) People Mover: The People Mover is similar to Metromover in that it is automated and relies on rotating electric motors and rubber tire propulsion. O&M costs were also well-documented in the NTD.

SkyTrain O&M unit costs were derived from a cost model developed by TransLink, the regional transit planning and funding agency in the Vancouver region for SkyTrain and motor bus operations. These unit costs were then converted to costs representative of Los Angeles and Orange County experiences by adjusting for labor costs. This was accomplished by comparing the FY2009 O&M unit costs for motor bus operations at TransLink with the FY2009 O&M unit costs for motor bus operations at each of Metro and OCTA, as reported to the NTD. The ratio of Metro to TransLink and OCTA to TransLink motor bus costs was derived for costs related to vehicle revenue hours, vehicle revenue miles, directional route miles

[2] Metropolitan Transit Authority of Harris County has the lowest total O&M cost per vehicle revenue hour. On the other hand, Dallas Area Rapid Transit has one of the highest. Given that both agencies operate within close proximity in the same State, the operating experiences should be comparable. Due to this discrepancy, both agencies were not considered in subsequent analysis.

and general administration. These ratios were then applied to the SkyTrain experience to obtain the Metro and OCTA O&M unit costs for MagLev.

Similar labor adjustments were carried out for the MDT and JTA Metromover and People Mover experiences, respectively. The O&M unit costs for these experiences were well-documented in the NTD for FY2009. The ratio of Metro to MDT and JTA motor bus costs and OCTA to MDT and JTA motor bus costs was first calculated for each cost driver based on costs reported to the NTD. These ratios were then applied to the MDT and JTA automated transit experiences to calculate the Metro and OCTA O&M unit costs for MagLev. The JTA People Mover experience had a very high total O&M cost per vehicle revenue hour relative to Metromover and was not considered in subsequent analysis.

The SkyTrain and Metromover are both fully automated systems. The Metro Board requires a driver on all the transit service offerings of the agency, whether automated or not. For that reason, an additional cost component was added to the Metro and OCTA O&M unit costs per vehicle revenue hour for MagLev to account for labor. For Metro, this cost was composed of unit costs per vehicle revenue hour for the following three object classes for its LRT operations reported to the NTD: Vehicle Operations Operators' Salaries/Wages, Other Salaries/Wages and Fringe Benefits. For OCTA, the cost component was composed of unit costs per vehicle revenue hour for the same three object classes. However, since OCTA does not operate a LRT system, the unit cost values calculated for OCTA LRT operations based on the Metro experience were used instead(refer to *Section 3*).

The two sets of O&M unit costs for each of Metro and OCTA MagLev, calculated based on the SkyTrain and Metromover experiences, were then inflated from 2009 to 2011 dollars for application in the financial plan by applying the CPI-based adjustment factor.

6. Determining Low and High O&M Unit Cost Estimates

With the exception of the TSM alternative, all other transit alternatives had two sets of O&M unit costs (high and low), representing the costs of operation if operated by Metro and OCTA. These unit costs were applied to operating statistics to calculate total cost estimates by agency by mode and to establish the O&M unit cost sets associated with the low and high cost estimates for each agency/mode grouping. Table 1 summarizes the high and low O&M unit cost estimates for each mode by agency.

7. Projected Total O&M Costs

The projected design year operating statistics generated for each alternative are summarized in table 2 by cost driver. The high and low O&M unit cost estimates are then applied to these operating statistics to project the total O&M costs for each alternative. Table 3 summarizes the high and low total O&M costs for each alternative, representing the costs of operation if operated by Metro and OCTA.

Table 1. Summary of 2011 O&M Unit Costs

Mode	Route Miles	Bus- or Train-Hours	Vehicle-Miles	Annual Ridership
TSM				
LA County Cost Structure	$ -	$ 87.23	$ 3.67	$ 0.13
Orange County Cost Structure	$ -	$ 96.74	$ 1.91	$ -
BRT				
LA County Cost Structure				
Low	$ 15,133	$ 87.99	$ 3.33	$ -
High	$ 200,526	$ 66.28	$ 2.45	$ 1.30
Orange County Cost Structure				
Low	$ -	$ 96.74	$ 1.91	$ -
High	$ 2,395	$ 85.39	$ 2.82	$ -
Streetcar and LRT				
LA County Cost Structure				
Low	$ 753,360	$ 115.57	$ 2.92	$ 0.92
High	$ 219,268	$ 536.98	$ 10.60	$ -
Orange County Cost Structure				
Low	$ 37,619	$ 139.84	$ 4.65	$ -
High	$ 34,702	$ 552.44	$ 9.00	$ -
MagLev				
LA County Cost Structure				
Low	$ 191,547	$ 240.97	$ 1.47	$ -
High	$ 678,241	$ 325.25	$ 9.56	$ -
Orange County Cost Structure				
Low	$ 30,315	$ 218.21	$ 1.25	$ -
High	$ 107,340	$ 316.40	$ 8.11	$ -

Table 2. Projected Design Year Operating Statistics

Alternative	Route Miles	Annual Bus- or Train-Hours	Annual Vehicle-Miles	Annual Ridership
TSM				
LA County Segment		55,925	1,617,135	8,413,331
Orange County Segment		339,915	6,355,110	18,928,796
BRT				
Street-Running	40.5	69,320	2,121,192	18,321,065
HOV Lane-Running	36.9	124,538	3,910,478	21,474,427
Streetcar				
East Bank	35.2	139,780	12,746,715	
West Bank 1	31.8	137,505	12,829,218	
West Bank 2	43.8	139,780	12,706,032	
West Bank 3	42.7	137,505	12,664,210	25,434,261
LRT				
East Bank	35.2	128,415	13,136,856	27,125,171
West Bank 1	31.8	130,690	12,532,068	
West Bank 2	43.8	119,175	13,251,966	26,496,991
West Bank 3	42.7	119,695	12,298,860	27,846,012
MagLev				
East Bank	29.3	86,665	10,903,846	
West Bank 1	29.7	82,130	11,323,344	
West Bank 2	30.0	88,940	10,877,823	
West Bank 3	29.7	82,450	10,981,917	24,280,787

Table 3. Projected Total O&M Costs

Alternative	Route Miles	Annual Bus- or Train-Hours	Annual Vehicle-Miles	Annual Ridership	Total O&M Cost
TSM					
LA County Cost Structure	$ -	$ 4,878,111	$ 5,927,382	$ 1,081,131	**$ 11,886,625**
Orange County Cost Structure	$ -	$ 32,881,939	$ 12,139,931	$ -	**$ 45,021,870**
BRT					
Street-Running					
LA County Cost Structure					
Low	$ 612,872	$ 6,099,330	$ 7,054,355	$ -	**$ 13,766,557**
High	$ 8,121,323	$ 4,594,184	$ 5,198,724	$ 23,734,790	**$ 41,649,021**
Orange County Cost Structure					
Low	$ -	$ 6,705,724	$ 4,052,034	$ -	**$ 10,757,758**
High	$ 96,994	$ 5,919,060	$ 5,986,506	$ -	**$ 12,002,560**
HOV Lane-Running					
LA County Cost Structure					
Low	$ 558,395	$ 10,957,854	$ 13,004,904	$ -	**$ 24,521,152**
High	$ 7,399,427	$ 8,253,758	$ 9,583,995	$ 27,819,945	**$ 53,057,126**
Orange County Cost Structure					
Low	$ -	$ 12,047,279	$ 7,470,041	$ -	**$ 19,517,320**
High	$ 88,373	$ 10,633,986	$ 11,036,294	$ -	**$ 21,758,653**
Streetcar					
East Bank					
LA County Cost Structure					
Low	$ 26,518,266	$ 16,153,706	$ 37,196,653	$ -	**$ 79,868,625**
High	$ 7,718,236	$ 75,059,726	$ 135,140,242	$ -	**$ 217,918,204**
Orange County Cost Structure					
Low	$ 1,324,172	$ 19,546,317	$ 59,243,990	$ -	**$ 80,114,479**
High	$ 1,221,505	$ 77,220,641	$ 114,683,463	$ -	**$ 193,125,609**
West Bank 1					
LA County Cost Structure					
Low	$ 23,956,842	$ 15,890,795	$ 37,437,408	$ -	**$ 77,285,045**
High	$ 6,972,724	$ 73,838,086	$ 136,014,936	$ -	**$ 216,825,746**
Orange County Cost Structure					
Low	$ 1,196,269	$ 19,228,189	$ 59,627,446	$ -	**$ 80,051,904**
High	$ 1,103,519	$ 75,963,831	$ 115,425,751	$ -	**$ 192,493,100**
West Bank 2					
LA County Cost Structure					
Low	$ 32,997,160	$ 16,153,706	$ 37,077,934	$ -	**$ 86,228,800**
High	$ 9,603,941	$ 75,059,726	$ 134,708,922	$ -	**$ 219,372,590**
Orange County Cost Structure					
Low	$ 1,647,691	$ 19,546,317	$ 59,054,904	$ -	**$ 80,248,912**
High	$ 1,519,941	$ 77,220,641	$ 114,317,434	$ -	**$ 193,058,016**
West Bank 3					
LA County Cost Structure					
Low	$ 32,168,464	$ 15,890,795	$ 36,955,892	$ 23,411,640	**$ 108,426,791**

Alternative	Route Miles	Annual Bus- or Train-Hours	Annual Vehicle-Miles	Annual Ridership	Total O&M Cost
High	$ 9,362,746	$ 73,838,086	$ 134,265,527	$ -	**$ 217,466,359**
Orange County Cost Structure					
Low	$ 1,606,310	$ 19,228,189	$ 58,860,525	$ -	**$ 79,695,024**
High	$ 1,481,769	$ 75,963,831	$ 113,941,157	$ -	**$ 191,386,757**
LRT					
East Bank LA County Cost Structure					
Low	$ 26,518,266	$ 14,840,307	$ 38,335,138	$ 24,968,083	**$ 104,661,793**
High	$ 7,718,236	$ 68,956,895	$ 139,276,504	$ -	**$ 215,951,634**
Orange County Cost Structure					
Low	$ 1,324,172	$ 17,957,077	$ 61,057,282	$ -	**$ 80,338,531**
High	$ 1,221,505	$ 70,942,114	$ 118,193,601	$ -	**$ 190,357,219**
West Bank 1 LA County Cost Structure					
Low	$ 23,956,842	$ 15,103,218	$ 36,570,284	$ -	**$ 75,630,344**
High	$ 6,972,724	$ 70,178,535	$ 132,864,562	$ -	**$ 210,015,821**
Orange County Cost Structure					
Low	$ 1,196,269	$ 18,275,205	$ 58,246,357	$ -	**$ 77,717,831**
High	$ 1,103,519	$ 72,198,924	$ 112,752,263	$ -	**$ 186,054,705**
West Bank 2 LA County Cost Structure					
Low	$ 32,997,160	$ 13,772,485	$ 38,671,044	$ 24,389,858	**$ 109,830,547**
High	$ 9,603,941	$ 63,995,156	$ 140,496,896	$ -	**$ 214,095,993**
Orange County Cost Structure					
Low	$ 1,647,691	$ 16,664,990	$ 61,592,288	$ -	**$ 79,904,969**
High	$ 1,519,941	$ 65,837,530	$ 119,229,257	$ -	**$ 186,586,727**
West Bank 3 LA County Cost Structure					
Low	$ 32,168,464	$ 13,832,579	$ 35,889,751	$ 25,631,600	**$ 107,522,394**
High	$ 9,362,746	$ 64,274,388	$ 130,392,099	$ -	**$ 204,029,232**
Orange County Cost Structure					
Low	$ 1,606,310	$ 16,737,705	$ 57,162,457	$ -	**$ 75,506,472**
High	$ 1,481,769	$ 66,124,801	$ 110,654,067	$ -	**$ 178,260,637**

MagLev										
East Bank										
LA County Cost										
Structure										
Low	$	5,612,340	$	20,883,856	$	16,068,386	$	-	**$**	**42,564,582**
High	$	19,872,451	$	28,188,160	$	104,223,181	$	-	**$**	**152,283,792**
Orange County Cost										
Structure										
Low	$	888,221	$	18,911,145	$	13,636,043	$	-	**$**	**33,435,410**
High	$	3,145,058	$	27,420,828	$	88,446,455	$	-	**$**	**119,012,340**
West Bank 1										
LA County Cost										
Structure										
Low	$	5,688,959	$	19,791,047	$	16,686,577	$	-	**$**	**42,166,583**
High	$	20,143,747	$	26,713,132	$	108,232,906	$	-	**$**	**155,089,784**
Orange County Cost										
Structure										
Low	$	900,347	$	17,921,564	$	14,160,656	$	-	**$**	**32,982,567**
High	$	3,187,994	$	25,985,952	$	91,849,210	$	-	**$**	**121,023,156**
West Bank 2										
LA County Cost										
Structure										
Low	$	5,746,423	$	21,432,068	$	16,030,038	$	-	**$**	**43,208,529**
High	$	20,347,219	$	28,928,113	$	103,974,444	$	-	**$**	**153,249,776**
Orange County Cost										
Structure										
Low	$	909,442	$	19,407,572	$	13,603,500	$	-	**$**	**33,920,514**
High	$	3,220,195	$	28,140,638	$	88,235,370	$	-	**$**	**119,596,203**
West Bank 3										
LA County Cost										
Structure										
Low	$	5,688,959	$	19,868,158	$	16,183,435	$	-	**$**	**41,740,552**
High	$	20,143,747	$	26,817,213	$	104,969,414	$	-	**$**	**151,930,374**
Orange County Cost										
Structure										
Low	$	900,347	$	17,991,391	$	13,733,677	$	-	**$**	**32,625,415**
High	$	3,187,994	$	26,087,200	$	89,079,728	$	-	**$**	**118,354,922**

Appendix F: Outreach Meeting Record

Pacific Electric ROW/West Santa Ana Branch Corridor Alternatives Analysis Meeting Record
Reporting Period: April 2009 - June 2012

TYPE	STAKEHOLDERS	CONTACT NAME	PURPOSE	MEETING DATE & TIME	LOCATION
Conceptual Screening					
ELECTED OFFICIALS AND STAKEHOLDER BRIEFINGS					
City	La Palma	City Manager Dominic Lazzaretto and Public Works Director Jeff Moneda	Interview	Mon., April 26, 2011	La Palma City Hall
City	Paramount	Public Works Director Christopher Cash	Interview	Fri., April 30, 2011	Paramount City Yard
County of Los Angeles	Los Angeles Supervisor Don Knabe's Office	Planning Deputy Julie Moore	Interview	Thurs., May 6, 2011	Kenneth Hahn Hall of Administration
City	Bellflower	Councilmember Scott Larsen, City Manager Michael Egan, Public Works Director Deborah Chankin	Interview	Mon., May 10, 2010	Larsen Gangloff & Larsen, 16600 Woodruff Avenue, Bellflower, CA
City	Cerritos	Councilmember Bruce Barrows, City Manager Art Gallucci, Public Works Director Hal Arbogast	Interview	Mon., May 10, 2010	Cerritos City Hall
City	Cudahy	Mayor Frank Gurule, City Manager George Perez	Interview	Mon., May 10, 2010	Cudahy City Hall
City	Lynwood	Public Works Director Dan Ojeda	Interview	Mon., May 10, 2010	Lynwood City Hall
City	South Gate	City Manager Ron Bates	Interview	Mon.,May 10, 2010	South Gate City Hall
City	City of Cypress	Councilmember Phil Luebben, City Engineer Kamren Dadbeh, Public Works Director Doug Dancs	Interview	Wed., May 12, 2010	Cypress City Hall
Agency	Metro and Gateway Cities Council of Government	Metro Director Diane DuBois, Transportation Deputy Karen Heit	Interview	Wed., May 12, 2010	Gateway Cities Council of Government Office
City	La Palma	Mayor Pro-tem Ralph Rodriguez, Orange County Council of Governments Representative/Council-member Mark Waldman	Interview	Wed., May 12, 2010	Central Park, Conference Room, La Palma, CA

City	Anaheim	Public Works Director Danny Wu	Interview	Wed., May 12, 2010	OCTA Headquarters, 600 S. Main St., Orange, CA
City	Garden Grove	Mayor William Dalton, Public Works Director Keith Jones	Interview	Thurs., May 13, 2011	Garden Grove City Hall
City	Santa Ana	Councilmember Michelle Martine, Public Works Executive Director Raul Godinez	Interview	Fri., May 14, 2010	OCTA Headquarters, 600 S. Main St., Orange, CA
County of Orange	County of Orange, Supervisor Janet Nguyen's Office	Supervisor Nguyen, Chief of Staff Nick Lecong, Executive Aide Nate Mitchell	Interview	Wed., May 19, 2010	Orange County Hall of Administration
City	Stanton	Councilmember Carol Warren, Public Works Director Nick Guilliams, Community Development Director Omar Dadahoy	Interview	Wed., May 19, 2010	Stanton City Hall
City	South Gate	Vice Mayor Maria Davila, Councilmember Gil Hurtado	Interview	Wed., May 19, 2010	South Gate City Hall
City	Vernon	Mayor Pro Tem Michael McCormick, Director of Community Services Keith Wilson	Interview	Thurs., May 20, 2010	Vernon City Hall
City	Downey	Special Projects Coordinator Shannon DeLong, Planning Assistant Jessica Halak	Interview	Thurs., June 3, 2010	Downey City Hall
City	Bell	Mayor Oscar Hernandez, Councilmember George Mirabel, City Manager Robert Rizzo, Public Works Director Luis Ramirez	Interview	Thurs., June 3, 2010	Bell City Hall
City	Huntington Park	Councilmember Elba Guerrero, Public Works Director Patrick Fu, City Engineer Wes Lind	Interview	Fri., June 4, 2010	Huntington Park City Hall
City	Los Angeles	Planning Deputy Edel Vizcarra, Councilmember Jose Huizar's Office	Interview	Mon., June 7, 2010	Los Angeles City Hall
City	Los Angeles	Deputy Mayor of Transportation Jaime de la Vega, Associate Director Borja Leon	Interview	Wed. , June 30, 2010	Los Angeles City Hall

Agency	Central Cities East Association	Executive Director Estela Lopez, Transportation Consultant Mike Kodama, Planning Deputy Edel Vizcarra	Interview	Wed., June 30, 2010	Los Angeles City Hall
Agency	Union Pacific Railroad	Director of Public Affairs Lupe Valdez	Interview	Tues., June 22, 2010	Union Pacific RR Office, City of Industry
Community-Based Organization (CBO)	Bellflower Kingdom Causes	Chrissy Padilla, Operations Director	Bi-lingual presentation, encourage participation at community meetings	Thurs., Oct. 28, 2010	16429 Bellflower Bl., Bellflower, CA
CBO	Women's Club	Yvonne Correa, Chair	Bi-lingual presentation, encourage participation at community meetings	Tues., Nov 9, 2010	Clubhouse, Salt Lake Park, Huntington Park
CBO	Kiwanis Club	Bill St. Marie, Programs Chair	Presentation, encourage participation at community meetings	Friday, Nov 12, 2010	9302 Laurel St., Bellflower, CA
Educational Institution	Cypress College Associated Student Body	Dr. Kasler, President	Presentation, encourage participation at community meetings	Wed., Dec 1, 2010	Cypress College, Cypress, CA
Bus. Organization	South Gate Chamber of Commerce	Catalina Hernandez, Executive Director	Presentation, encourage participation at community meetings	Tues., May 24, 2011	3350 Tweedy Bl., South Gate, CA
City Commission	South Gate Planning Commission	Alvie Betancourt, City Planner	Presentation, encourage participation at community meetings	Wed. May 25, 2011	South Gate City Hall

Initial Screening					
BRIEFINGS, COUNCIL PRESENTATIONS, ANNOUNCEMENTS AT COUNCIL MEETINGS					
Agency	Metro and Gateway Cities Council of Governments (COG)	Metro Director Diane DuBois	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Wed., Nov. 3, 2010	Gateway Cities COG Office
Agency	Gateway Cities Council of Governments (COG)	COG Chair/South Gate Councilmember Gil Hurtado	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Wed., Nov. 3, 2010	Gateway Cities COG Office
City	Santa Ana	Councilmember Michelle Martinez	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Thurs., Nov. 4, 2010	SCAG Office, 818 W. 7th St., Los Angeles, CA
City	Bellflower	Councilmember Scott Larsen	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Thurs., Nov. 4, 2010	Bellflower City Hall
City	Cerritos	Councilmembers Bruce Barrow and Laura Chen	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Thurs., Nov. 4, 2010	Cerritos City Hall
City	Los Angeles	Planning Deputy Edel Vizcarra, Councilmember Jose Huizar';s office	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Mon., Nov. 8, 201o	Los Angeles City Hall
City	Huntington Park	Councilmember Elba Guerrero	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Tues., Nov. 9, 2010	O Restaurant, Los Angeles, CA
County	County of Los Angeles, Supervisor Don Knabe's Office	Planning Deputy Julie Moore	Provided Project Update	Mon., Jan. 10, 2011	Kenneth Hahn Hall of Administration
City	Los Angeles	Planning Deputy Paul Habib, Office of Councilmember Jose Huizar	Provided Project Update	Thurs., Jan. 13, 2011	Los Angeles City Hall
City	South Gate	Mayor Maria Davila	Provided Project Update	Tues., Feb. 1, 2011	South Gate City Hall
City	Buena Park	Councilmember Miller Oh	Provided Project Update	Thurs., Feb. 3, 2011	Buena Park City Hall
City	Maywood	Mayor Ed Varela, City Manager Lilian Myers	Provided Project Update	Fri., Feb. 11, 2011	Maywood City Hall
City	Bell	Councilmember Ana Maria Quintana	Provided Project Update	Friday, July 15, 2011	Bell City Hall

City	Buena Park	Council Presentation	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Tues., Nov. 9, 2011	Buena Park City Hall
City	Los Angeles	Councilmember Jan Perry's Planning Team, Staff Members	Present AA Scoping Results and Next Steps. Invite Participation in Community Meetings.	Wed., Dec. 1, 2010	Los Angeles City Hall
City	Downey	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Tues.,Oct. 26, 2010	Downey City Hall
City	Lynwood	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Tues., Nov. 2, 2010	Lynwood City Hall
City	Cudahy	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Tues., Nov. 2, 2010	Cudahy City Hall
City	Maywood	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Wed. Nov. 10, 2010	Maywood City Hall
City	Garden Grove	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Tues., Nov. 9, 2011	Garden Grove City Hall
City	Santa Ana	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Mon., Nov. 15, 2010	Santa Ana City Hall
City	Vernon	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Mon., Nov. 15, 2010	Vernon City Hall
City	Anaheim	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Tues., Nov. 16, 2010	Anaheim City Hall
City	Cypress	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Mon.,Nov. 22, 2010	Cypress City Hall

City	Stanton	Council Members	Made announcement at Council Meeting to invite participation in community meetings.	Tues., Nov. 23, 2010	Stanton City Hall
Final Screening					
BRIEFINGS, COUNCIL PRESENTATIONS, ANNOUNCEMENTS AT COUNCIL MEETINGS					
Agency	FTA	Mary Nguyen, Environmental Protection Specialist	Review of Preliminary Draft AA Report Comments	Thurs., Jan 12, 2012	FTA Offices
Agency	Orange County Transportation Authority	Ed Alegre, Senior Transportation Analyst	Review of Preliminary Draft AA Report Comments	Wed., Jan 25, 2012	OCTA Headquarters, 600 S. Main St., Orange, CA
Agency	Los Angeles Metropolitan Transportation Authority	Fanny Pan	Review of Preliminary Draft AA Report Comments	Thurs., March 1, 2012	Metro Headquarters, One Gateway Plaza, Los Angeles, CA 90012
Elected Officials	Cerritos	Councilmember Bruce Barrows	Provided Project Update	Tues., April 10, 2012	Cerritos City Hall
Elected Officials	Santa Ana	Councilmember Michelle Martinez, Public Works Director Raul Godinez	Provided Project Update	Wed., April 11, 2012	Santa Ana City Hall
Elected Officials/Agency	Orange County Transportation Authority	Carol Cavecche, Boardmember	Provided Project Update	Wed., April 11, 2012	OCTA Headquarters, 600 S. Main St., Orange, CA
City Staff	Huntington Park	Jack Wong, Planning Director	City tour of alignment and stations	Tues., April 17, 2012	Huntington Park City Hall
Elected Officials	Metro	Diane DuBois, Boardmember	Provided Project Update	Thurs., April 19, 2012	Metro Headquarters, One Gateway Plaza, Los Angeles, CA 90012
Elected Officials	Huntington Park	Huntington Park City Council	Meeting to discuss recommendations/ alignment and stations	Mon., May 7, 2012	Huntington Park City Hall
Agency	OLDA	OLDA Board	Presentation/comments	Wed., May 9, 2012	SCAG offices, Paramount
Elected Officials/Agency	Metro	Diane DuBois, Boardmember	Provided Project Update	Mon., June 18, 2012	Conference Call

BRIEFINGS, COUNCIL PRESENTATIONS, ANNOUNCEMENTS AT COUNCIL MEETINGS					
City Technical Staff	TAC Meeting #1	TAC members represent all cities involved in the AA, and Metro and OCTA.	Project Overview, input on mobility problem and needs	Tues., May 25, 2010, 1:30 - 3 pm	SCAG Main Office, Los Angeles, CA
City Technical Staff	TAC Meeting #2	TAC members represent all cities involved in the AA, and Metro and OCTA.	Results of Community Meetings and Initial Set of Alternatives	Tues., July 13, 2010, 1:30 - 3 pm	City of Buena Park, Police Dept. Community Room
City Technical Staff	TAC Meeting #3	TAC members represent all cities involved in the AA, and Metro and OCTA.	Results of Screening of Initial Set of Alternatives	Tues., Oct. 26, 2010, 1:30 - 3 pm	LA County Metro Headquarters
City Technical Staff	TAC Meeting #4	TAC members represent all cities involved in the AA, and Metro and OCTA.	Results of Final Screening of Alternatives	Tues., Jan. 18. 2011, 1:30 - 3 pm	Bellflower City Hall
City Technical Staff	TAC Meeting #5	TAC members represent all cities involved in the AA, and Metro and OCTA.	Refinement of Final Alternatives	Tues., Feb. 15, 2011,1:30 - 3:30 pm	City of Buena Park, Walter D. Ehlers Community Center
City Technical Staff	TAC Meeting #6	TAC members represent all cities involved in the AA, and Metro and OCTA.	Additional Refinement of Final Alternatives	Tues., Mar. 15, 2011, 1:30 - 3:30 pm	Bellflower City Hall
City Technical Staff	TAC Meeting #7	TAC members represent all cities involved in the AA, and Metro and OCTA.	Additional Refinement of Final Alternatives	Tues., April 19, 2011, 1:30 - 3:30 pm	Buena Park City Hall
City Technical Staff	TAC Meeting #8	TAC members represent all cities involved in the AA, and Metro and OCTA.	Additional Refinement of Final Alternatives	Tues., July 19, 2011, 1:30 - 3:30 pm	Bellflower City Hall
City Technical Staff	TAC Meeting #9	TAC members represent all cities involved in the AA, and Metro and OCTA.	Additional Refinement of Final Alternatives	Mon., March 19, 2012 1:30 - 3:30 pm	Cerritos Sheriffs Station
City Technical Staff	TAC Meeting #10	TAC members represent all cities involved in the AA, and Metro and OCTA.	Additional Refinement of Final Alternatives	Tues., April 17, 2012 1:30 - 3:30 pm	Buena Park City Hall
City Technical Staff	TAC Meeting #11	TAC members represent all cities involved in the AA, and Metro and OCTA.	Results of Final Screening of Alternatives	Tues., May 8, 2012 1:30 - 3:30 pm	Buena Park City Hall
City Technical Staff	TAC Meeting #12	TAC members represent all cities involved in the AA, and Metro and OCTA.	Results of Final Screening of Alternatives	Tues., June 12, 2012 1:30 - 3:30 pm	Cerritos Sheriffs Station
STEERING COMMITTEE					
Elected Officials	Meeting #1	Steering Committee members represent all cities involved in the AA, and Metro and OCTA.	Project Overview, input on mobility problem and needs	Wed., May 26, 2010, 1:30 - 3 pm	SCAG Main Office, Los Angeles, CA

Elected Officials	Meeting #2	Steering Committee members represent all cities involved in the AA, and Metro and OCTA.	Results of Community Meetings and Initial Set of Alternatives	Wed., July 21, 2010, 1:30 - 3:00 pm	City of Buena Park, Walter D. Ehlers Community Center
Elected Officials	Meeting #3	Steering Committee members represent all cities involved in the AA, and Metro and OCTA.	Results of Screening of Initial Set of Alternatives	Wed., Nov. 10, 2010, 1:30 - 3 pm	LA County Metro Headquarters
Elected Officials	Meeting #4	Steering Committee members represent all cities involved in the AA, and Metro and OCTA.	Results of Final Screening of Alternatives	Friday, Feb. 25, 2011, 3 - 4:30 pm	South Gate Civic Center- Main Hall
Elected Officials	Meeting #5	Steering Committee members represent all cities involved in the AA, and Metro and OCTA.	Refinement of Final Alternatives	Wed. Apr. 27, 2011, 1:30 - 3:30 pm	City of Buena Park, Walter D. Ehlers Community Center
Elected Officials	Meeting #6	Steering Committee members represent all cities involved in the AA, and Metro and OCTA.	Refinement of Final Alternatives	Wed., April 25, 2012, 3:00 pm	City of Bellflower City Hall
Elected Officials	Meeting #7	Steering Committee members represent all cities involved in the AA, and Metro and OCTA.	Results of Final Screening of Alternatives	Wed., June 20, 2012, 3:00 pm	Metro Headquarters

COMMUNITY MEETINGS AND OPEN HOUSES					
Conducted during Conceptual Screening					
	Host City	**Purpose**	**Date and Time**	**Location**	
Public Meeting	City of Garden Grove	Introduce project, elicit community input	Tues., June 15, 2010, 6:30 - 8:30 pm	Garden Grove Community Center	
Public Meeting	City of Huntington Park	Introduce project, elicit community input	Wed., June 16, 2010, 6:30 - 8:30 pm	Huntington Park Community Center	
Public Meeting	City of Cypress	Introduce project, elicit community input	Thurs., June 17, 2010, 6:30 - 8:30 pm	Cypress Community Center	
Public Meeting	City of Cerritos	Introduce project, elicit community input	Sat., June 19, 2010, 1 -3 pm	Cerritos Park East Community Center	
Public Meeting	City of Paramount	Introduce project, elicit community input	Tues., June 22, 2010, 6:30 - 8:30 pm	Progress Park Plaza West Auditorium	
Public Meeting	City of Stanton	Introduce project, elicit community input	Wed., June 23, 2010, 6:30 - 8:30 pm	Stanton City Council Chambers	
Conducted during Initial Screening					
Public Meeting	City of Paramount	Present Preliminary Alternatives, solicit feedback	Tues., Nov. 16, 2010, 6:30- 8:30 pm	Progress Park Plaza West Auditorium	
Public Meeting	City of Cerritos	Present Preliminary Alternatives, solicit feedback	Tues., Nov. 23, 2010, 6:30 - 8:30 pm	Cerritos Park East Community Center	
Public Meeting	City of Huntington Park	Present Preliminary Alternatives, solicit feedback	Wed., Dec. 1, 2010, 6:30 - 8:30 pm	Huntington Park Community Center	
Public Meeting	City of Garden Grove	Present Preliminary Alternatives, solicit feedback	Thurs., Dec. 2, 2010, 6:30 - 8:30pm	The Courtyard Center, Garden Grove	
Public Meeting	City of Cypress	Present Preliminary Alternatives, solicit feedback	Tues., Dec. 7, 2010, 6:30 - 8:30 pm	Cypress College	
Public Meeting	City of Stanton	Present Preliminary Alternatives, solicit feedback	Sat., Dec. 11, 2010, 1- 3 pm	Stanton Community Center	
Public Meeting	City of South Gate	Provide Project Update	Mon., June 27, 2011, 5:30 - 7:30 pm	South Gate Civic Center, Main Hall	
Public Meeting	City of Garden Grove	Provide Project Update	Tues., June 28, 2011, 5:30 - 7:30 pm	The Courtyard Center, Garden Grove	

Focus Groups					
City staff	Focus Group #1	Cities represented: Bell, Cudahy, Downey, Huntington Park, Lynwood, Maywood, South Gate	Initial station location discussion	Thurs., Sept. 9, 2010	South Gate City Hall
City staff	Focus Group #2	Cities represented: Buena Park, Cypress, Stanton. OCTA staff also attended.	Initial station location discussion	Thurs., Sept. 16, 2010	Stanton City Yard\
City staff	Focus Group #3	Cities represented: Anaheim, Garden Grove, Santa Ana	Initial station location discussion	Tues., Sept. 21, 2010	Santa Ana City Hall
City staff	Focus Group #4	Cities represented: Bellflower, Cerritos, Artesia	Initial station location discussion	Wed., Sept. 29, 2010	Bellflower City Hall
Conducted during Final Screening					
Public Meeting	City of Santa Ana	Final Screening Results	Tues., May 15, 2012, 5:30 - 7:30 pm	Santa Ana City Hall	
Public Meeting	City of Garden Grove	Final Screening Results	Wed., May 16, 2012, 5:30 - 7:30 pm	Garden Grove Community Center	
Public Meeting	Buena Park	Final Screening Results	Sat., May 19, 2012, 5:30 - 7:30 pm	Buena Park Community Center	
Public Meeting	Little Tokyo	Final Screening Results	Tues., May 22, 20212, 5:30 - 7:30 pm	Japanese American Museum	
Public Meeting	Bellflower	Final Screening Results	Wed., May 23, 2012, 5:30 - 7:30 pm	Bellflower Community Center	
Public Meeting	South Gate	Final Screening Results	Thurs., May 24, 2012, 5:30 - 7:30 pm	South Gate Community Center	

Additional Organizations and Media Contacted

CITY OF BELLFLOWER

City of Bellflower: Public Affairs Department
Bellflower Chamber of Commerce
City of Bellflower Public Safety Commission
City of Bellflower Parks and Recreation Commission
City of Bellflower Planning Commission
Kingdom Causes
Bellflower Noon Lions Club
Kiwanis Club of Bellflower
Rotary Club of Bellflower
Elks Lodge of Bellflower/Long Beach
Soroptimist Club of Bellflower

CITY OF LYNWOOD

Director of Neighborhood Services
Block Watch
City of Lynwood Planning Commission
City of Lynwood Public Safety Commission
City of Lynwood Traffic and Parking Commission
City of Lynwood Chamber of Commerce
Rotary Club of Lynwood
Press Telegram
Los Angeles Wave/Lynwood Press

CITY OF PARAMOUNT

City of Paramount Quarterly newsletter
City's Website Calendar
Paramount Petroleum Refinery
Paramount Unified School District
Neighborhood Watch Program
Chamber of Commerce
City Managers Executive Secretary
Emmanuel Reform Church
Our Lady of the Rosary Parish
Paramount Journal

CITY OF LAKEWOOD

City Public Info Officer
The Lakewood Living Magazine
School District Superintendents Office
Rotary Club of Lakewood
Gateway Cities COG

CITY OF DOWNEY

City of Downey Steering Committee Members
Downey Chamber of Commerce

CITY OF CERRITOS

Public Information Officer
City Website
Cerritos TV3
Los Cerritos Community News
Cerritos Regional Chamber of Commerce
The China Press
Chinese Daily News
India Journal
International Daily News
Korea Daily
Nguoi Viet
Rafu Shimpo
Sing Tao Newspapers Los Angeles Ltd.
Taiwan Daily
United Times
Viet Bao Daily News
Viet Tide
Cerritos College Radio WPMD

CITY OF BUENA PARK

City Public Information Officer
Holder Elementary School near ROW
Chamber of Commerce
City of Buena Park Planning Commission
City of Buena Park Traffic and Transportation Commission

CITY OF BUENA PARK
Orange County Register
Buena Park Independent

CITY OF ARTESIA
City Public Information Officer
Planning Commission
Parks and Recreation Commission

SUPERVISOR DON KNABE
Field Deputy
Communications Director

CITY OF HUNTINGTON PARK
City Planning Commission
City Community Development Commission
Women's Club
Chamber of Commerce

CITY OF SOUTH GATE
Assistant to City Manager
City Community Action Committee
Chamber of Commerce
Mobile Home Park

CITY OF CUDAHY
City Manager

CITY OF BELL

Director of Community Services
The following environmental justice organizations:
East Yard Communities for Environmental Justice
Urban and Environmental Policy Program, Occidental College
USC
Coalition For A Safe Environment
Natural Resources Defense Council
The Cunningham Report
Community Action and Environmental Justice
Coalition for Clean Air
Long Beach Alliance for Children with Asthma
Environmental and Health Coordinator Physicians for Social Responsibility
Communities for a Better Environment
Los Angeles Board of Harbor Commissioners
California Transportation and Air Initiative
UCLA Pub Hlth-COEH

CITY OF BELL

Legal Aid Foundation of Los Angeles
Move LA
Bus Riders Union

CITY OF MAYWOOD

City Steering Committee

CITY OF VERNON

Director of Community Services and Water
Chamber of Commerce
Rotary Club of Vernon
Vernon Sun Newspaper

CITY OF GARDEN GROVE

Community Services Director
Main Street Commission
Planning Commission
Traffic Commission
Neighborhood Improvement and Conservation Commission
Garden Grove Chamber of Commerce
Salvation Army Family Services
Seventh Day Adventist Church
St Callistus Christian Services
St. Columban's Catholic Church
Asian American Senior Services Center
H. Louis Lake Senior Center
Orange County Korean-American Center
St. Anselm's Cross-Cultural Community Center
Garden Grove Journal

CITY OF ANAHEIM

Public Information Officer
Community Services
Director

CITY OF SANTA ANA

Public Information Officer
Deputy City Manager
Neighborhood Services Director
ComLink
OCTA

CITY OF SANTA ANA

Trails4All
Orange County Wheelman
Latino Health Access
Greater Santa Ana Business Alliance
Downtown Anaheim
Orange County Congregation Community Organization
Santa Ana Collaborative for Responsible Development Community Coalition (SACRED)
Chief of Staff for JANET NGUYEN

CITY OF SANTA ANA

Miniondas
Excelsior
Rumores

County Community Services Center
Templo Calvario
Salvation Army Family Services
Seventh-Day Adventist Church
St. Barbaras Catholic Church
Trinity Cristo Rey Lutheran Church
Abrazar Senior Center
Asian American Senior Center
H. Louis Lake Senior Center
Midway City Community Center (also a FRC)
Santa Ana Senior Center
Southern California Indian Center
Southwest Senior Center
Vietnamese Community Center
Westminster Senior Center (also a FRC)
Santa Ana Vietnamese Hope Community Center
Boat People SOS
Cambodian Family
Casa de la Familia

CITY OF CYPRESS

Mayor's Office
City Manager's Office
Economic Development Manager
Cypress Chamber of Commerce
Kiwanis
Cypress College

CITY OF LA PALMA

City Manager's Office
News Enterprise
Orange County Wheelmen
Trails4All

CITY OF STANTON

Community Development Director
Public Information Officer
City Clerk
Orange County News
OC Register

Appendix G: Public Comment Log

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
1	Robert Allen	6/10/2010	Email	Public	Not Stated	Few bike lanes that run North/South and no bike lanes East/West	Bike Pathway
2	Greg Laemmle	6/10/2010	Email	Public	Not Stated	Supports the project. Would like to see a bikeway and/or multi-use pedestrian path	Multi-modal commuting
3	Constance Condit	6/10/2010	Email	Public	Not Stated	Supports the project. Would like to see multi-use path to encourage people to get out of their cars and increase exercise.	Multi-use path
4	Elliot Gordon	6/10/2010	Email	Public	Irvine, CA	Supports the Project. Would like to see multi-use path in place that would connect rivers, trails and other rec areas. Wants to increase physical activity	Multi-use path
5	Charles C. Mack (Legislative Representative of Local 1422)	6/10/2010	Email	Public (The United Transportation Union)	Not Stated	Fully supports project. Best ever public transit solutions to reduce traffic congestion in Southern California	"Rail to Trail" conversion
6	Ron McGill	6/10/2010	Email	Public	Pasadena, CA	wholeheartedly supports the plan	
7	Phil Willems	6/10/2010	Email	Public	Not Stated	Supports the project. Would like to see a bikeway proposed in the plans. States that a multi-use path can enhance the corridor by attracting transit riders and improving access to the transit stations.	Multi-use path
8	Dr Robert C Hirst	6/10/2010	Email	Public	Laguna Niguel, CA	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
9	Jill Bailey	6/10/2010	Email	Public	Los Angeles County resident	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
10	Felicia Bander	6/10/2010	Email	Public	Not Stated	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
11	Mike and Bonnie LeLesch	6/10/2010	Email	Public	Not Stated	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
12	Steve Grove	6/10/2010	Email	Public	Not Stated	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
13	David Erickson	6/14/2010	Email	Public	Lancaster, CA	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
14	V. & B. Jones	6/14/2010	Email	Public	Not Stated	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
15	Alicia Kern	6/10/2010	Email	Public	Palos Verdes, CA	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
16	Dick Roether	6/10/2010	Email	Public	Pasadena, CA	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
17	Dan Hazard	6/10/2010	Email	Public	Huntington Beach, CA	Supports the project	multi-use path

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
18	Bryan Meek	6/10/2010	Email	Public	Not Stated	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor. Would appreciate a separation between cycling and motor vehicles.	multi-use path
19	Harvey L Kale	6/10/2010	Email	Public	Not Stated	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
20	Shirley Otis-Green	6/10/2010	Email	Public	Duarte, CA	Supports the project. Urges the adoption of development plans that take into account the promotion of an integrated trail system throughout Southern California	multi-use path
21	Wesley Reutimann	6/21/2010	Email	Public	Not Stated	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
22	Carl R. Nelson	6/23/2010	Email	Public (retired Orange County Director of Public Works)	Statonto, CA	Supports the project. Would like to see transit linkages across Orange and LA county through an expanded light rail system.	Light Rail system
23	George Ridenour	6/23/2010	Email	Public	Not Stated	Supports the project. Believes that an elevated Mag-Lev train system would is the best option for the 20 mile PE RoW	Elevated Magnetic Levitation Train
24	Melissa V Rentchler	6/10/2010	email	Public	Longbeach, CA	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
25	Allison Mannos	6/10/2010	email	Public	Los Angeles, CA	Supports the project. Request that a multi-use path be included in the plans for the 20 mile Pacific Electric Corridor	multi-use path
26	Michael Gimbel		email	Public	San Morino, CA		
27	Colin Liu		email	Public	Cypress, CA		
28	M Pelayo		email	Public	Artesia, CA		
29	Lloyd Gonzales		email	Public	Buena Park, CA		
30	James Suazo		email	Public	Santa Ana, Ca		
31	Chad Druten		email	Public	Paramount, CA		
32	Herb Sutherland		email	Public	Cypress, CA		

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
33	Michael E. Bailey		email	Public	Mission Viejo, CA	This line would be perfect for a light rail system or a Metrolink type system. It should have connections to the Santa Ana Transportation Center (Metrolink Station) and a connection to La Union Station. Buses could be used to connect people to this line from where they live and work. This is also a great way to releave conjestion and help reduce air pollution. People will use the system as a less expensive alternative to cars. If we are going to make the Clean Air Act work, we need investments like this one and in bus transit. This line is also a perfect vehicle to build an integrated public transportation system of rail, buses, bicycles, and walkability. Thank you.	Light Rail system
34	John Chamberlain		email	Public	Garden Grove, CA		
35	Nancy Chamberlain		email	Public	Garden Grove, CA	Very disconcerting for our family. We live with that rail road right away in our back yard.	Opposed to project
36	Marlon Regisford		email	Public	Irvine, CA		
37	William Walker		email	Public	Los Angeles, CA		
38	Lawrence Kato		email	Public	La Palma, CA		
39	Richard A. Rosich		email	Public	Alhambra, CA		
40	Richard A. Rosich		email	Public	Alhambra, CA	Is there a path that would lead it throught the city of Whittier. This city is in need of mass transit. The city is also limited in its ability to connect with the regions freeways.	Connect line to Whittier

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
41	John Chamberlain		email	Public	Garden Grove, CA	I attended the June 15th meeting at the G.G. meeting regarding our transportation needs. I found the meeting: (1) very friendly, (2) well organized, (3) very informative. I especially thought the table by table setup was nice and then the table by table opinions presended by an individual at each table. I do think the cookies could have been a little sweeter. I did not realize that an official/representative of SCAG was setting at our table. I think that should have been made knowed so it was apparent to everyone he would probably be presenting SCAG position. I want you to know, if in fact, the person was a SCAG representative he was very cordial and informative. I would not have know the proposal tracks were 10-20 feet. I [my family] live adjacent to the tracks. Our back yard faces the track. I understand the need to evaulate our transportation needs. Thank you much. John C.	
42	Jim Hamlin		email	Public	Cypress, CA		
43	Steve Donaldson		email	Public	San Carlos, CA		
44	Konstantin Akhrem		email	Public	Huntington Beach, CA		
45	Bob Bengford		email	Public	Not Stated		
46	Steven Chan		email	Public	Orange, CA		
47	Al Jones		email	Public	City of Industry, CA	This could be a big help if connected to the Amtrack/Metrolink line at the Santa Ana station and run to Union Station. It could relieve a lot of congestion; in addition, construction would be cheaper since it would not have to deal with the existing traffic	Connect to Amtrak

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
48	eric marshall		email	Public	Buena Park, CA		
49	Emil Ali		email	Public	Cerritos, CA		
50	Quintin Sumabat		email	Public	Cerritos, CA		
51	ROY RICHY		email	Public	Westminster, CA	WE LIVE IN WESTMINSTER AN IN FAVOR OF IT	
52	unantiege		email	Public	Not Stated	Very Good site, thank yo mister, it's help's me!	
53	Keith McCarthy		email	Public	Downey, CA	A great amount of work has been invested by the Orange Line Development Authority; proposing to use MagLev technology along this corridor. I was among those who helped assemble this agency, and continue to support this proposal.	MagLev
54	Wesley Reutimann		email	Public	Pasadena, CA		
55	Wallace Phelps		email	Public	Long Beach, CA	This right of way coupled with the present "green line" would connect Orange County with a direct route to the traffic plagued LA International Airport. This would provide a rapid link to the Harbor, South Bay, and LA Westside. Together with the present Blue, Red, Purple, Gold Line, and soon to be completed Agua (Exposition Blvd.) would connect Orange County to the Southern California transportation system. The currently underutilized Green Line would become and invaluable artery. Please keep in mind that these old right of ways were laid out before any development in the most optimum manner. At the same time it would provide the people of L.A. County with easy access to the many O.C. attractions.	Connect project to existing lines
56	Andrew		email	Public	Downey, CA		
57	Matthew Stafford		email	Public	Downey, CA		

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
58	Paul Ayala		email	Public	Garden Grove, CA		
59	Dennis Lytton		email	Public	Los Angeles, CA		
60	Eric Tooley		Email	Public	Los Angeles, CA	I believe that this corridor is important and should be put to better use as a rapid transit line. It should be built as light rail so that it can connect to the rapidly expanding Los Angeles Metro system . I do not think BRT would be a good investment over time. Commuter rail is possible, but light rail is preferred by me. The corridor should include a bike path that is separate from traffic as much as is possible. I frequently ride the Green line in Los Angeles and would be thrilled to be able to head into other cities and counties with such a system with as few transfers as possible.	Connect project to existing lines. Use light rail system and bike paths

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
61	Theresa M. SHERRIN	10/11/2010	Email	Public	Cypress, CA	I have been responding to this cause for years. You need to look at what is good for the people and not what the current politician wants. When I was young married with small children in the late 50's we use the old P.E. Street Car to get around. It went from L.A. to Santa Ana and moved people out to the country. Orange Co. was country at that time. The Street Car should NEVER have been discontinued. No one seems to care if it works only will it please a group. A good example of this is the train that goes along the 105 Freeway. It should have gone into LAX so those of us out here in Orange County could have taken it to the Airport. When you go to other Countries you can take their trains right to the Airport. You don't need someone to take you. All of this would have less cars on the road or at the airports. I know the CAR DEALERS don't want that. Taxi/ shuttles, car rentals don't want this but just WHO are you suppose to be working for. If the OLD RED CAR /P. E. Street Car was back in business it would increase business at areas near the stops. People could get to school at Cypress College without all of the parking and traffic congestion we now have at Valley View and Lincoln. This would be true all along the route.	Connect line to LAX/Cypress college

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
62	Michael Alvarez	10/20/2010	email	Public	Paramount, CA	I want to express my gratitude on the process of the Santa Ana ROW. I've been waiting for this sort of development for the past decade or so. We need jobs and an adequate mass transit system in this town. But I do strongly feel that a light rail line would serve this ROW best. We need a line that allows us to bring both counties together intimately without the limitations that we will receive with Metrolink or High Speed Rail. I am not saying that Metrolink and High Speed Rail are a waste of funds, what I am saying is that they won't serve the Santa Ana Corridor the way a light rail line would.	Light Rail system
63	Chrissy Padilla	11/1/2010	Email	Public	Belflower, CA	Thanks again for last Thursday. I was so encouraged! Not only did you do a fabulous job educating my neighbors about possibilities for the PE-ROW, but you also ignited a conversation about long-term sustainability for our, mostly rental, neighborhood. I love that the neighbors are thinking about these questions. My hope is that we are able to help them organize and connect with the city about their fears. Because the proposed project is still quite a bit away, it gives us time to make changes within our own community to protect the vulnerable so that all come out winners.	
64	Douglas Dumhart	11/30/2010	Mail	Public	La Palma, CA	Opposes PE-ROW project due to quality of life concerns to the residents of La Palma. Urges project managers to explore alternative to using the PE-ROW.	

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments	
						Purpose & Need	Alternatives
65	Matt Card	5/31/2011	Email	Public	Fullerton, CA	Good day- I am a founding, but not active member, of NOCBAC- I am currently cycle touring on the east coast of the USA-I am writing you about the potential improvements along the existing Pacific Electric Right-of-Ways- I noticed that the proposed transit methods consist only of major mass transit improvement options- I noticed that there are no mentions of bicycle/recreation path improvements along the route-Considering the current budgets and economically trying times a lower cost alternatively beneficail use might be feasible- As a way to start the ball rolling and gain citizen awareness, and as is done in many places in the USA and worldwide, graded bike paths might be a way to extend the use of existing funds to provide the maximum length of paths along the existing rights-of way-	Bike Pathway
66	Michael E. Bailey	5/30/2011	Email	Public	Mission Viejo, CA	Supports both a street car or light rail system but thinks a street car option would be esier to sell to folks in Santa Ana and Garden Grove. Has concerns regarding diabled riders. What can be done to bridge the gap between the boarding platforms and the streetcar or light rail car floors? Another issue is that the current Metrolink automated ticketing machines are hard for some members of the disability community to use.	Street Car system

Comments From Public Meetings

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						Purpose & Need	Alternatives
67	Alan Jones	6/21/2011	Email	Public	Not Stated	I am unable to attend these meetings due to conflicts with my employment. I would, however, urge you to retain this right of way for rail traffic either now or in the future. If you look at what has happened in Europe you would understand how important this is.	Light Rail system
68	Mark Johnston	7/11/2011	Written response	Public	Chino, CA	Supports DMU but would also support light rail system. Stress the need to make system connect to existing systems cush as the blue line, LAX, Disneyland monorail, ect. Blue line should beused to connect Orange County to downtown LA/Union Station. "Please consider all my suggestions. I have a lot more ideas. Strangely, I go to meetings all over southern California and have never been contacted, so I wonder how much of peoples comments are ever even read Thank you for your time" (sent in three pages of suggestions).	Diesel Multiple Units

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments: Purpose & Need	Comments: Alternatives
69	Nels Nelson	8/1/2011	Email	Public	Belflower, CA	Supports use of PE ROW for public transit but wishes to see a biketrail included at least through from Bellflower to Paramount, and hopefully beyond.This 2.3 mile addition would allow bike riders to ride a 30 mile circuit along the Pacific Electric Corridor, down one of the river beds, then along the Pacific Coast Highway and up another river bed to complete the circuit. "We understand that this corridor is also being looked at as a possible public transportation route. We support that initiative, but if this corridor is to be transformed into a public bus route, or some other form of public transportation method, we would like to see it also include a bike path. Ultimately we would like to see the entire corridor converted to a bike path, regardless of the status of a public transportation route."	Bike Pathway
Comments From Project Website							
70	N/A		Email	Public		FIRE YOUR CONSULTANTS!! I am a transit professional with 30+ years experience. Based on the press reports and my quick review of the total number of peak LRT vehicles (~80) needed that your studies indicate for an LA County-Orange County, projected operating costs are overstated at least twice the likely number. Consider this: 78 peak vehicles X 12 hours per day X 300 days per year equals a maximum of 281,000 hours per year. According to NTD, LAMTA's LRT operating costs in FY 2010 was about $168 million for 429,000 annual vehicle revenue hours, or about $391.00 per RVH. Applying this to this estimate to the PE ROW, I get an estimate of $110-$120 million annually, including an allowance for inflation between 2010 and 2012 of +/- 10%.	

Comments From Public Meetings

ID	Name/ Info.	Date	Submission Method	Type of Commenter	City	Comments: Purpose & Need	Comments: Alternatives
71	N/A		Email	Public		Concerning Project Scope, Please make sure that project is well integrated with existing rail networks. Thus the following should be requirements in your alternatives screening: - end points in SARC and Union Station - direct connection to Metro Green Line in Norwalk - direction connection to Metrolink and light rail / subway line inside SARC and Union Station Further, provide a fast and safe ride. Thus the following should be requirements: - one seat ride between Union Station and SARC (no transfers) - grade separations	
72	Mark B.		Email	Public		I attended the session in Bellflower today and appreciate the info. From the comments around me I'd recommend adjusting the presentation by 1. Clarify Acronyms from the start, like "TSM is a way of saying xxxxxxxxxxxxxxx and AA study means YYYYYYYYYYYY", just the language we speak that may seem foreign to you at the moment. As a retired engineer it's easy to get into the presentation and leave some of the attendees behind from the start. 2. Consider (Maybe you have and determined not to) Q&A (that's Questions & Answers) after the presentation is completed and go back thru the slides for more clarity of understanding and address individuals that want to "drill down" in sessions like you have at the storyboards. Thank you,	

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73	N/A		Email	Public		I read about the May 19, 2012 meeting after it happened. I am sorry that I missed the meeting, but have requested to be placed on a email notification site. I am very in favor of alternative communting alternatives. Since the sixties, we have relayed more & more on the automobile. The track is too far for me to walk to, but on the occassion that I would like to go to LA to explore, I would rather do it that way.	
74	N/A		Email	Public		Would bus service be workable? The bus could access the corridor and leave it for other destinations.	
75	N/A		Email	Public		I assume all who are making the study are reidents of the two cities. The best reason to make a study is to find out who would use that line. Te best way to do that is with a 2 part survey. Part 1: Mail to each residence in each city involved in the line. 2. Door to door survey. If you do not do these things you are wasting money now and if the project is approve you will waste money in the furture.	

Comments From Public Meetings

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						Purpose & Need	Alternatives
76	N/A		Email	Public		Read the updated alternative analysis and west bank version #3 is best. It is almost the same idea i had proposed earlier. I had the line connecting at LIttle Tokio station also for access into LAUS. You need to get with the downtown connector team ASAP and make sure the connection can be made at this location. They either need to build a knock out panel for you or better yet, have you contribute to the junction now and build it as the same time as the connector. Just leave it closed off with tail tracks until you can connected it later. I was thinking your route could head south from Little Tokio at grade on Central ave for at least 4-6 blocks (saving $) before having to tunnel to get south of the 10 freeway. The rest of the route as far south towards the Green Line looks pretty good. From Green to Santa Ana also like the station spacing. I just have problems with the Santa Ana end-it must be light rail right to the Santa Ana Amtrak and Metrolink station If mSanta Ana w ants a street car, they can build that (and Garden Grove for that matter) as circulators that feed the light rail. Can't wait for the spring public hearings Thank you.	
77	N/A		Email	Public		the bikeway could be put in before any other project as it is badly needed for cross-town commutes.	

Comments From Public Meetings

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						Purpose & Need	Alternatives
78	N/A		Email	Public		This project should be Light rail so that it fits in with the LA Metro system. A maglev train will cause operational confusion at the Union Station terminus, creating more unnecessary modes. Light rail can be operated by LA Metro, with subsidies from OCTA to account for the Orange County portion. The light rail should connect to the northbound Gold Line just north of Little Tokyo to proceed into Union Station on the Gold Line tracks. This would also technically allow the trains to continue running all the way to Pasadena or to a future northbound extension into Glendale. There is no reason to add a different transportation mode to the system in LA County, Light Rail makes the most sense.	
79	N/A		Email	Public		That old railway roadbed has been waiting patiently for far too long, as the tiny towns along it have now mushroomed into teeming cities. Garden Grove and all of the other communities can surely make good use of an alternate rail connection to Los Angeles and Santa Ana, and perhaps SCRRA will allow existing Metrolink trainsets to be utilized by having them run from Union Station to Santa Ana on the San Diegan Line, then return on the Pacific Electric route (and vice versa). If some businesses along the way are willing to ship by rail again due to the high environmental and financial costs of trucking, maybe Union Pacific would be willing to help cover the cost of laying down new track. Only a few miles of single track are missing, as the lines is still in place and active in the City of Stanton, but a signalling system will probably need to be installed - unless crews can safely separate trains by radio or GPS.	

Comments From Public Meetings

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80	N/A		Email	Public		I was unable to make it to the community meeting regarding the PE/Santa Ana Branch planning. However, I've reviewed the information on the web site. I currently reside in Orange County. I have some experience using transit systems to get to work, as for a while I commuted to the LAX area, which necessitated a drive to Norwalk and then a trip on the Green Line, in addition to bus connections near LAX. Every day I wished that the transit systems were better and mourned the lack of a connection between the Green Line and the Norwalk Metrolink station (the bus connection was so inefficient that I drove to Norwalk). I'm very happy to see study of the PE ROW through Santa Ana. If this had existed while I was employed near LAX, my commute would have been so much better. Having commuted daily on the Green Line light rail system, I can say I would very much favor light rail as an alternative for this corridor. It was a fast and efficient system and rarely broke down. When the PE ROW is figured in with the Green Line you have something that we've been missing: a transit alternative to the 405 (I wish we had Metrolink down the middle of the 405). The PE ROW + Green Line corridor roughly parallels the 405, albeit inland a bit. However, it heads to West LA, which is a horrible place to be in a car. With the additional rail development taking place, this line becomes a great connection to a high concentration of jobs in West LA. Furthermore, the presentation indicates that light rail would run 18 hours a day, which is much more than Metrolink. I really like Metrolink, but the problem is if I go to downtown LA in the evening, there's no way to get back. If such a light rail alternative existed, I could get back in the late evenings and stay out of my car. i'm excited to see that the study includes another way to get to Union Station besides taking the Green Line to the Blue Line. I recommend the transit	