2.1.5 Traffic and Circulation

This section addresses the potential impacts to traffic and circulation associated with construction and long-term operation of the proposed project. The traffic and circulation impact analysis is based on the results of a traffic study conducted for the project (Iteris, 2009). The study identified existing (year 2005) and future projected (years 2015 and 2030) traffic volumes and lane configurations to determine the traffic LOS for roadway elements within the study area. For this analysis, the "existing" traffic conditions are defined as the conditions that existed in year 2005 at the time that the CEQA NOP for this project was issued.

2.1.5.1 Regulatory Setting

Caltrans, as assigned by FHWA, directs that full consideration should be given to the safe accommodation of pedestrians and bicyclists during the development of federal-aid highway projects (see 23 CFR 652). It further directs that the special needs of the elderly and the disabled must be considered in all federal-aid projects that include pedestrian facilities. When current or anticipated pedestrian and/or bicycle traffic presents a potential conflict with motor vehicle traffic, every effort must be made to minimize the detrimental effects on all highway users who share the facility.

Caltrans is committed to carrying out the 1990 Americans with Disabilities Act (ADA) by building transportation facilities that provide equal access for all persons. The same degree of convenience, accessibility, and safety available to the general public will be provided to persons with disabilities.

2.1.5.2 Affected Environment

The existing lane configurations, traffic volumes, and LOS within the study area are presented in this subsection.

LOS denotes the possible range of traffic operating conditions that may occur on a roadway or at an intersection when it is subjected to various traffic volumes. LOS analysis is based on hourly traffic and typically examines the peak travel hours of the day. It is a measure of the "quality of flow" defined in six levels, A through F, by the *Highway Capacity Manual – 2000 Edition* (HCM) published by the Transportation Research Board (TRB). The six levels, A to F, relate to traffic congestion from best to worst, respectively. In general, LOS A represents free-flow conditions with no congestion. Conversely, LOS F represents severe congestion with stop-and-go conditions. Levels E and F typically are considered unsatisfactory operating conditions. For a multi-lane highway such as Ocean Boulevard in the vicinity of the Gerald Desmond Bridge, LOS is determined by the density of vehicles on the roadway. A very low density allows free-flow conditions, and a very high density provides stop-and-go conditions. Table 2.1.5-1 presents LOS information for multi-lane highways.

Table 2.1.5-1
Level of Service Criteria for Highway Segment

LOS	Maximum Density*	Description of Conditions
A	11	"Free-flow" conditions
B	18	Slight congestion
C	26	Moderate congestion
D	35	Significant congestion
E	43**	Extreme congestion
F	>43**	Gridlock/stop-and-go condition

* Density is measured in passenger cars per lane per mile.
** Assuming a free-flow speed of 50 miles per hour.
Source TRB, 2000.

The intersection capacity utilization (ICU) analysis methodology compares the level of traffic volume during the peak hours at an intersection to the amount of traffic that intersection is able to carry (capacity). Table 2.1.5-2 describes the LOS concept and the operating conditions expected with each LOS for signalized intersections.

Analysis of unsignalized intersections is conducted differently than signalized intersections due to different operating characteristics. For unsignalized intersections, LOS is based on average delay in seconds per vehicle. Table 2.1.5-3 describes the LOS concept for unsignalized intersections. Stop-controlled intersections were analyzed using the delay-based HCM method of determining LOS.

Traffic Study Area

The traffic study area is shown in Exhibit 2.1.5-1. The overall study area extends along Ocean Boulevard from Navy Way on the west to downtown Long Beach on the east. It includes the access between Ocean Boulevard, SR 710, and Pico Avenue. It extends north along Pico Avenue and SR 710 to 9th Street, and it includes the Terminal Island Freeway (SR 47) interchange with Ocean Boulevard, as well as the Terminal Island Freeway interchange with New Dock Street. The


Traffic Study Area
Figueroa Pl
Figueroa St
Anaheim St
C St
Harry Bridges Blvd
Neptune Ave
Fries Ave
A St
Water St
Henry Ford Ave
Shore Rd
Anchorage Rd
Hanjin Way
Pier A Wy
Pier B St
Carrack Ave
Lugger Wy
Edison Ave
9th St
TOYOTA MOTOR SALES
PIER B
PIER A
HANJIN SHIPPING CO.
PIER C
PIER C CONTAINER TERMINAL
Pier C St
Pico Ave
Golden Shores
Magnolia Ave
Ocean Blvd
Pier D St
Back Channel
Gerald Desmond Bridge
CALIFORNIA UNITED TERMINALS
PIER D
PIER E
CONTAINER TERMINAL
PIER S
Cerritos
Dock St
Channel
Pier T Ave
Queensway Bridge
Queensway Dr
Harbor Scenic Dr
PIER G
Harbor Plaza
PORT OF LONG BEACH ADMIN. BLDG.
LONG BEACH CONTAINER TERMINAL
PIER F
Pier F Ave
Pier G Ave
SEA-LAND CONTAINER TERMINAL
INTERNATIONAL TRANSPORTATION SERVICE CONTAINER TERMINAL
PIER J
Pier J Ave
Long Beach Harbor
NAVAL MOLE
PACIFIC CONTAINER TERMINAL
Harbor Scenic Wy
MAERSK CONTAINER TE
PIER J
West Basin
RIO DOCE PASHA
YANG MING LINE CONTAINER TERMINAL
John S. Gibson Blvd
Pier A St
Pier A Pl
La Paloma St
Falcon St
Hermosa St
Canal Ave
Harbor
Angeles
HUGO NEU-PROLER
MATSON CONTAINER TERMINAL
YUSEN CONTAINER TERMINAL
New Dock St
Ocean Blvd
Pier S Ave
Seaside Ave
Navy Way
Reeves Ave
TERMINAL ISLAND CONTAINER TRANSFER FACILITY
Vincent Thomas Bridge
Los
Terminal Way
Ferry St
Pilchard St
Way
LOS ANGELES EXPORT TERMINAL
EVERGREEN CONTAINER TERMINAL
L.A. WORLD CRUISE CENTER
PASHA HONDA AUTO TERMINAL
Harbor Blvd
Pacific Ave
Front St
6th St
Tuna St
Terminal
Cannery
Barracuda St
Wilys St
Earle St
Seaside Ave
FISH HARBOR
GLOBAL GATEWAY SOUTH CONTAINER TERMINAL
PIER 300
Nagoya W
TRANS PACIFIC CONTAINER SERVICE CORP. TERMINAL
DISTRIBUTION AND AUTO SERVICE, INC. (NISSAN)
110
47
103
710
N
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Traffic Study Area
EXHIBIT 2.1.5-1

This page intentionally left blank.

Table 2.1.5-2
Level of Service Criteria
for Signalized Intersections

LOS*	V/C Ratio	Description of Conditions
A	0 to 0.60	Little or no delay/congestion
B	>0.60 to 0.70	Slight congestion/delay
C	>0.70 to 0.80	Moderate delay/congestion
D	>0.80 to 0.90	Significant delay/congestion
E	>0.90 to 1.00	Extreme congestion/delay
F	1.00 +	Intersection failure/gridlock

LOS – Level of Service

* The intersection LOS calculations were based on a maximum lane volume of 1,600 vehicles per lane for through lanes and single turn lanes and 2,880 vehicles per hour for multiple left-turn lanes as used by the POLB. For intersections within the City of Los Angeles, the maximum lane volume was based on 1,425 vehicles per hour per the capacities in the Circular 212 Critical Movement Analysis (CMA) methodology used by the City. Intersections with vehicular volumes that are at or near capacity (V/C ≅ 1.0) experience greater congestion and longer vehicle delays.

Source: TRB, 1985; and NCHRP, 1982.

Table 2.1.5-3
Level of Service Criteria for Unsignalized Intersections

LOS	Average Delay (seconds/vehicle)	Description of Conditions
A	≤ 10	Little or no delay
B	> 10 and ≤15	Slight delay
C	> 15 and ≤ 25	Moderate delay
D	> 25 and ≤ 35	Significant delay
E	> 35 and ≤50	Extreme congestion
F	> 50	Intersection gridlock

LOS – Level of Service

Source: TRB, 2000.

study area extends west along New Dock Street from its interchange with the Terminal Island Freeway to Pier S Avenue.

The traffic study area was defined to include the project site and other roadways estimated to carry sufficient additional traffic as a result of the construction and long-term operation of the Bridge Replacement Alternatives to potentially result in adverse traffic effects. Roadways receiving sufficient additional traffic to be included in the traffic study area were determined based on the criterion of including any intersection increasing in volume by 50 or more trips in any one peak hour. The number of additional trips was determined from a comparison of the future traffic volumes with and without the Bridge Replacement Alternatives, as presented in the section Traffic Forecasting Model below. The proposed build alternatives of the project, which entail rehabilitation or replacement of the existing roadway and bridge facilities, would not directly generate any additional new trips; however, the bridge replacement alternatives are expected to result in some local redistribution of traffic as motorists modify their travel paths to take advantage of the congestion-relief benefits of the Bridge Replacement Alternatives.

The study area includes roadway facilities where traffic changes are expected to be of sufficient magnitude to warrant study. The elimination from further consideration of the Toll-Operation Alternative substantially reduced the study area. (Section 1.7.1 presents the reasons that the Toll-Operation Alternative was eliminated from further consideration.) A toll facility would potentially impact traffic on I-110, SR 91, and I-405, as noted in Section 1.2. The proposed Bridge Replacement Alternatives would have more localized potential traffic effects. The northern limit of the study area on SR 710 is at 9th Street. Because there was no adverse effect of the proposed project on the portion of SR 710 south of 9th Street, which has fewer lanes than portions to the north, it was concluded that there would be no adverse effects to SR 710 or I-710 farther north where the highway has more lanes.

Within the traffic study area, eight roadway segments with potential traffic impacts associated with the project have been investigated. These are shown on Exhibit 2.1.5-2 and include:

1. Ocean Boulevard from Navy Way to Pier S Avenue;
2. Ocean Boulevard from Pier S Avenue to the Terminal Island Freeway;
3. Ocean Boulevard from the Terminal Island Freeway to the Horseshoe Ramps;
4. EB bridge upgrade (direction of travel is uphill) to the crest of the bridge;
5. WB bridge upgrade to the crest of the bridge;
6. Connectors between SR 710 and Ocean Boulevard;
7. SR 710 north of the Ocean Boulevard connectors; and
8. Ocean Boulevard from SR 710 Connectors to downtown Long Beach.

Within the traffic study area, 13 intersections with potential traffic impacts associated with the project have been investigated. The intersections are shown on Exhibit 2.1.5-3 and include:

1. Terminal Island Freeway and Ocean Boulevard (signalized);
2. Pier S Avenue and Ocean Boulevard (signalized);
3. Pier S Avenue and New Dock Street (signalized);
4. Navy Way and Seaside Avenue (signalized);
5. Pico Avenue/Pier B Street and 9th Street (signalized);
6. Pico Avenue and Pier C Street (signalized);
7. Terminal Island Freeway SB Off-Ramp and New Dock Street (stop sign controlled);
8. Terminal Island Freeway Northbound (NB) On-Ramp and New Dock Street (stop sign controlled);
9. Pico Avenue and Pier D Street (stop sign controlled);
10. Pico Avenue and Broadway (stop sign controlled);
11. Pico Avenue and Pier E Street (stop sign controlled);
12. Ocean Boulevard and Golden Shore (signalized); and
13. Ocean Boulevard and Magnolia Avenue (signalized).

The intersection of Navy Way and Seaside Avenue (Intersection 4) is located in Los Angeles, while the other intersections are located in Long Beach. Intersections 1 through 6, 12, and 13 are signalized in the existing year 2005 condition. Intersections 7 through 11 are currently controlled with stop signs. Traffic signals are proposed at intersections 9 and 11 as part of the construction traffic detour plans for the North-side and South-side Alignment Alternatives (bridge replacement alternatives), and these signals would remain after implementation of the proposed project; therefore, these signals are considered implemented in the analysis of future year 2015 and 2030 conditions with the proposed Bridge Replacement Alternatives of the project.

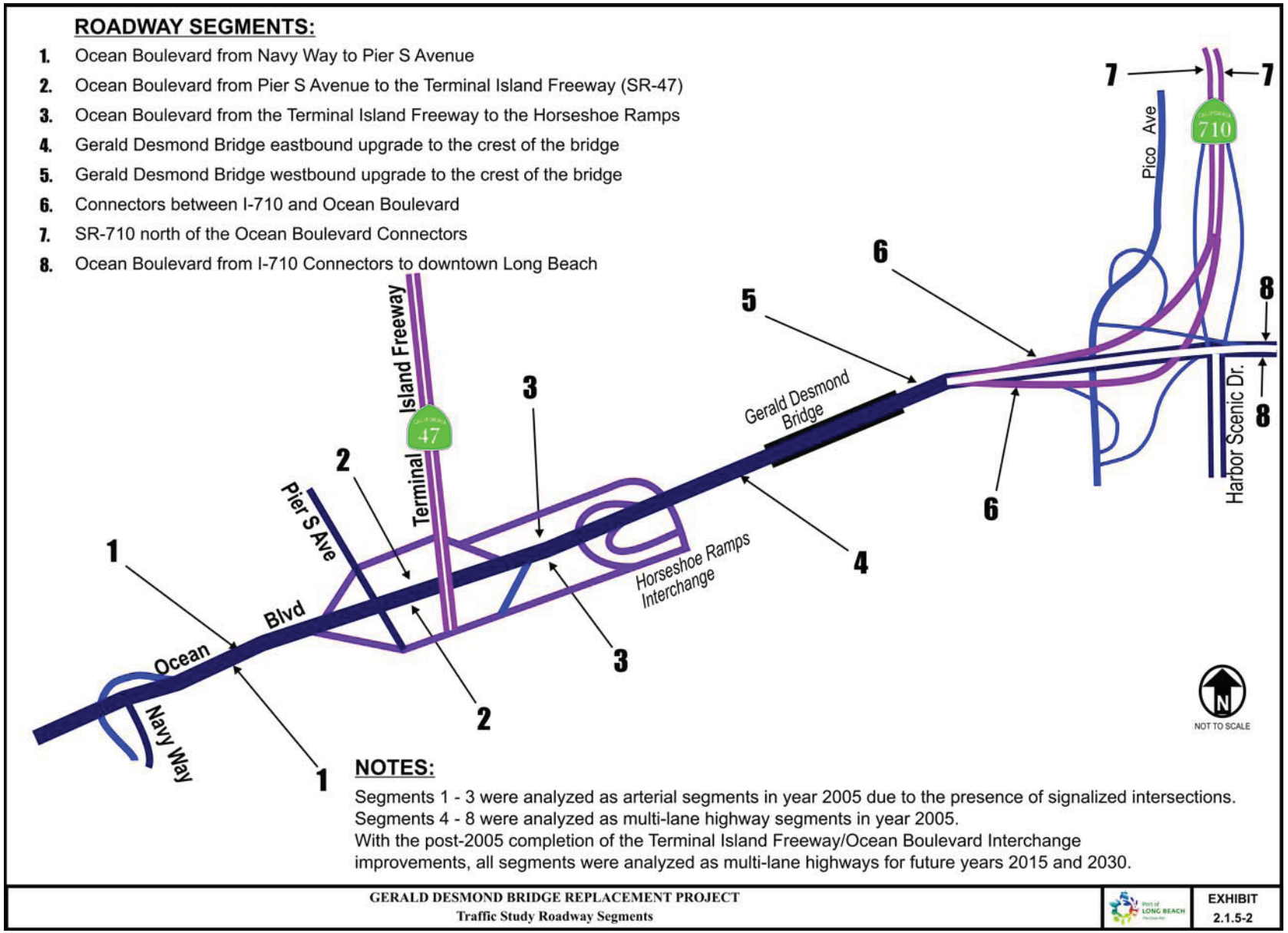
The analysis of future year 2015 and 2030 conditions with the No Action/Rehabilitation Alternatives assumes that signals would not be in place at intersections 9 and 11, because no construction traffic detour plans would be necessary if the existing bridge is rehabilitated or if no action is taken.

Existing Lane Configuration

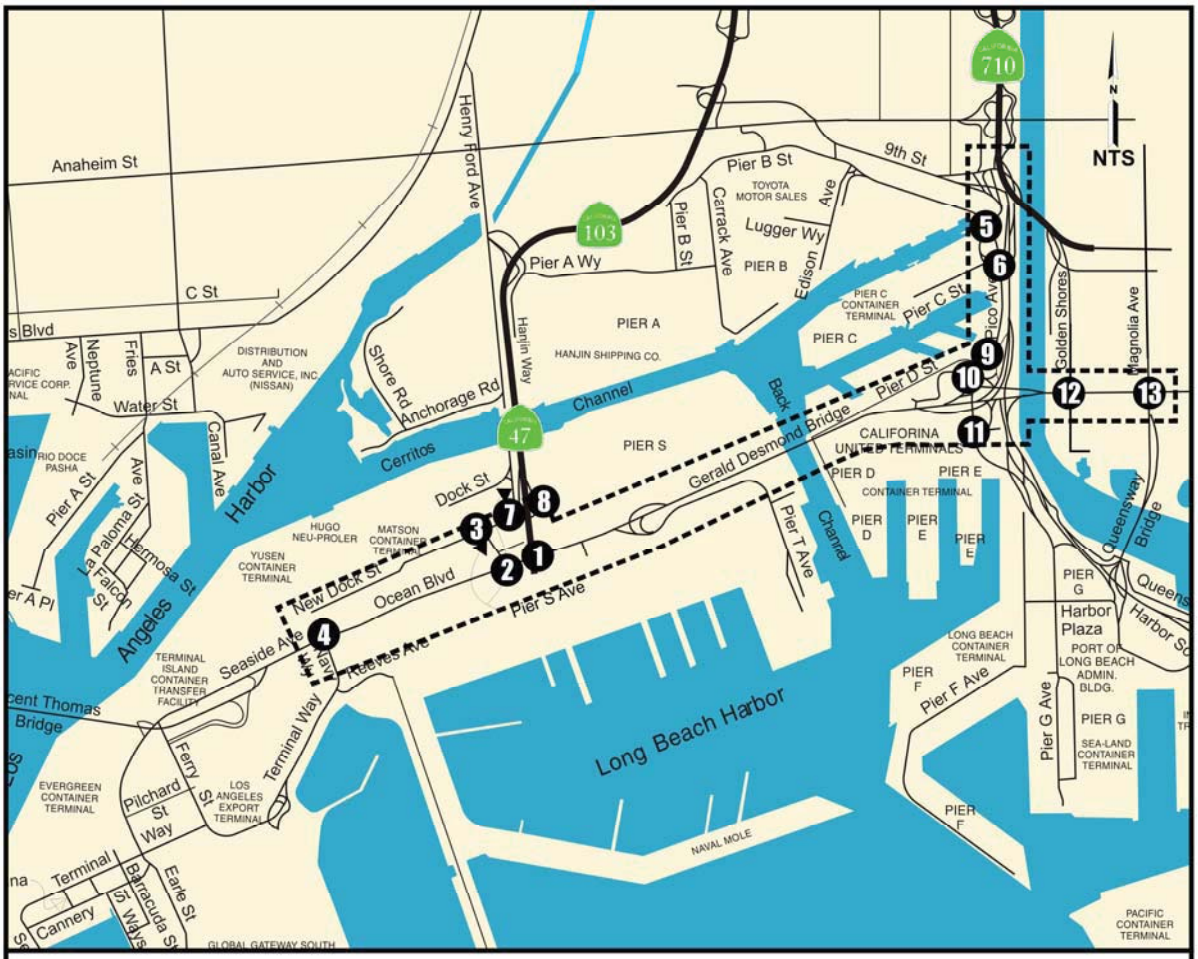
Exhibits 2.1.5-4a and 2.1.5-4b show the existing lane configuration of the Gerald Desmond Bridge and roadways within the immediate project area.

Gerald Desmond Bridge

The Gerald Desmond Bridge is a five-lane thoroughfare with two traffic lanes in each direction and one truck lane in each direction on the uphill side of the bridge. The truck lanes end at the roadway crest on the bridge.


ROADWAY SEGMENTS:
1. Ocean Boulevard from Navy Way to Pier S Avenue
2. Ocean Boulevard from Pier S Avenue to the Terminal Island Freeway (SR-47)
3. Ocean Boulevard from the Terminal Island Freeway to the Horseshoe Ramps
4. Gerald Desmond Bridge eastbound upgrade to the crest of the bridge
5. Gerald Desmond Bridge westbound upgrade to the crest of the bridge
6. Connectors between I-710 and Ocean Boulevard
7. SR-710 north of the Ocean Boulevard Connectors
8. Ocean Boulevard from I-710 Connectors to downtown Long Beach
Ocean Blvd
Navy Way
Pier S Ave
Terminal Island Freeway
47
710
Pico Ave
Gerald Desmond Bridge
Horseshoe Ramps Interchange
Harbor Scenic Dr.
NOT TO SCALE
NOTES:
Segments 1 - 3 were analyzed as arterial segments in year 2005 due to the presence of signalized intersections.
Segments 4 - 8 were analyzed as multi-lane highway segments in year 2005.
With the post-2005 completion of the Terminal Island Freeway/Ocean Boulevard Interchange
improvements, all segments were analyzed as multi-lane highways for future years 2015 and 2030.
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Traffic Study Roadway Segments
EXHIBIT
2.1.5-2

This page intentionally left blank.



1. Terminal Island Freeway and Ocean Boulevard
2. Pier S Avenue and Ocean Boulevard
3. Pier S Avenue and New Dock Street
4. Navy Way and Seaside Avenue
5. Pico Avenue/Pier B Street and 9th Street
6. Pico Avenue and Pier C Street
7. Terminal Island Freeway Southbound Off-Ramp and New Dock Street
8. Terminal Island Freeway Northbound On-Ramp and New Dock Street
9. Pico Avenue and Pier D Street
10. Pico Avenue and Broadway
11. Pico Avenue and Pier E Street
12. Ocean Boulevard and Golden Shore Street
13. Ocean Boulevard and Magnolia Avenue

Key

- 13 Study Intersection
- Traffic Study Area
- Signalized Intersection
- STOP Stop Sign Controlled

Note:

Intersections #5, #6, and #9-11 are currently controlled with stop signs. Traffic signals are proposed at intersections #9 and #11 as part of the construction traffic detour plans for the North-side and South-side Alignment Alternatives (Bridge Replacement Alternatives) and these signals would remain after implementation of the proposed project. Therefore, these signals are considered implemented in the analysis of future year 2015 and 2030 conditions under the proposed Bridge Replacement Alternatives of the project. The analysis of future year 2015 and 2030 conditions under the No Action/Rehabilitation Alternatives assumes that signals would not be in place at intersections #9 and #11, since no construction traffic detour plans would be necessary if the existing bridge is rehabilitated or if no action is taken.

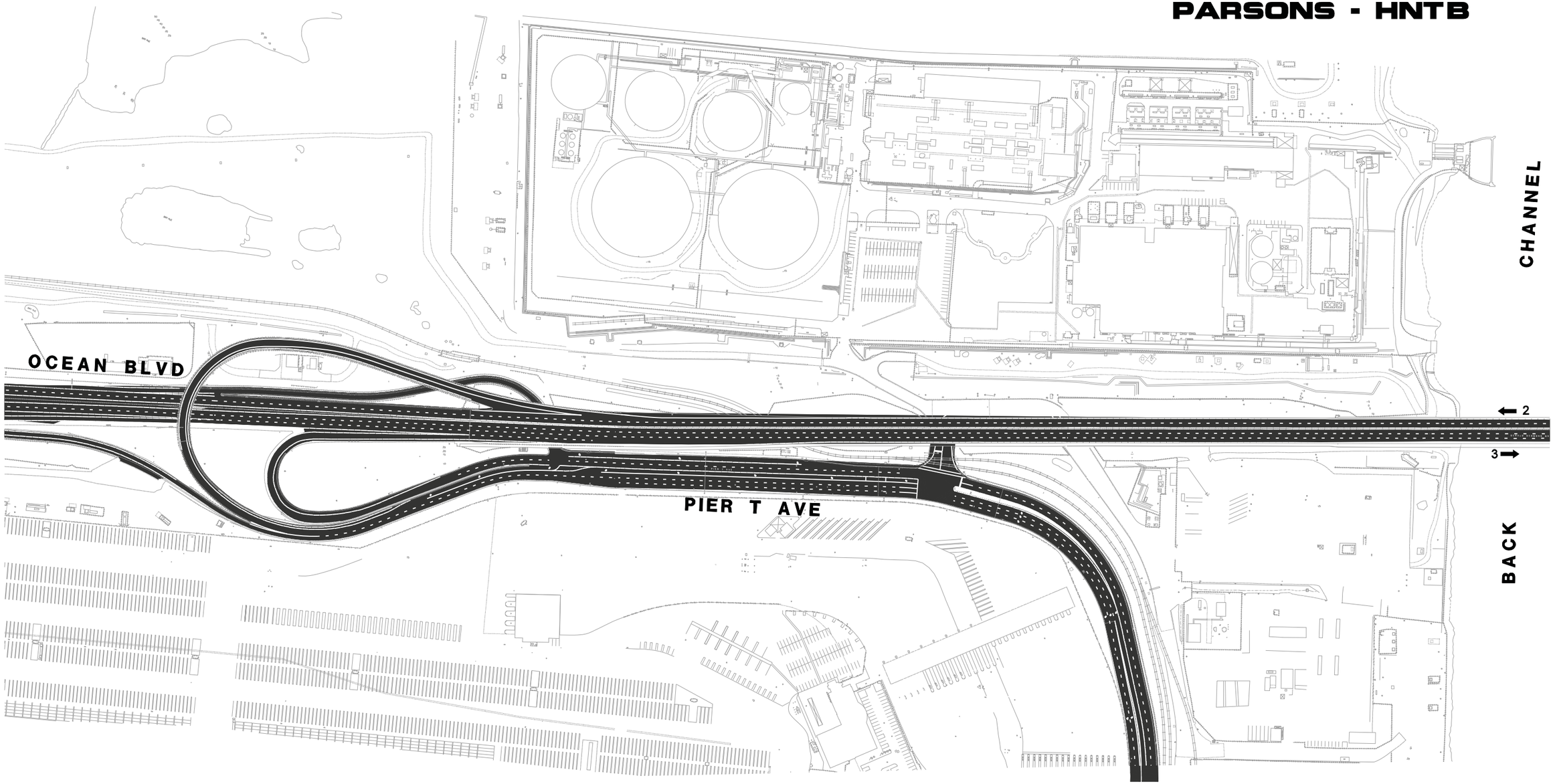
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Traffic Study Intersections

Port of LONG BEACH

EXHIBIT 2.1.5-3

This page intentionally left blank.

PARSONS - HNTB



1:3000

EXHIBIT 2.1.5-4a

MARK	DATE	BY	REVISIONS

DRAWN DMP DATE 03/28/08
DESIGNED _____ P.E. NO. _____
PROJ. MGR. _____ P.E. NO. _____
SECT. HEAD _____ P.E. NO. C _____

ASS'T CHIEF HARBOR ENGR. P.E. NO. C-25677 DATE .....
CHIEF HARBOR ENGINEER P.E. NO. C-43065 DATE .....

GERALD DESMOND BRIDGE REPLACEMENT PROJECT

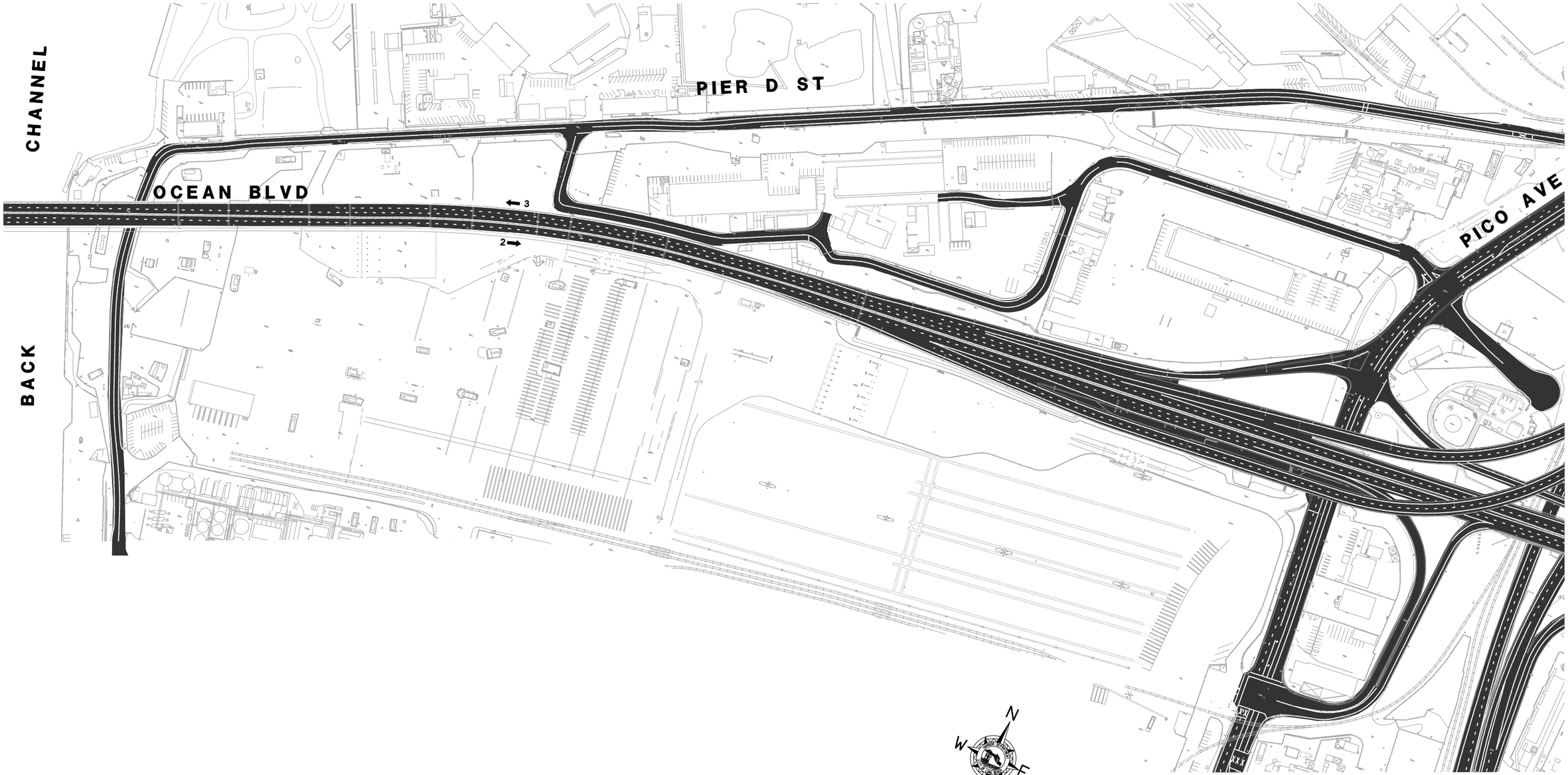
Existing Roadway Segment Lane Configuration

SCALE _____ SHEET _____ OF _____
SPECIFICATION NUMBER _____
DRAWING NUMBER _____

FILE: C:\South-Alignment\GDB-South-Align-Exhibit2-2-5-5.dgn
DATE: 11/4/2009 TIME: 10:58:08 AM
SCALE: 3183.4091 M / M.
PLTDRV: N:\STDVMS\PLOT_DRV\v8\DWP-pdf.plt
PENTBL: N:\STDVMS\PLOT_DRV\INFO-ONLY.TBL
USER: p0033148

This page intentionally left blank.

PARSONS - HNTB



1:3000

EXHIBIT 2.1.5-4b

MARK	DATE	BY	REVISIONS

DRAWN DWP DATE 03/28/08
DESIGNED _____ P.E. NO. _____
PROJ. MGR. _____ P.E. NO. _____
SECT. HEAD _____ P.E. NO. C _____

ASS'T CHIEF HARBOR ENGR. P.E. NO. C 25077 DATE .....
CHIEF HARBOR ENGINEER P.E. NO. C 43065 DATE .....

GERALD DESMOND BRIDGE REPLACEMENT PROJECT

Existing Roadway Segment Lane Configuration

SCALE
SHEET ____ OF ____
SPECIFICATION NUMBER
DRAWING NUMBER

FILE: C:\South-Alignment\GDB-South-Align-Exhibit2-2-5-5.dgn
DATE: 11/4/2009 TIME: 10:55:27 AM
SCALE: 3183.4091 M / M.
PLTDRV: N:\STD\MS\PLOT_DRV\v8\DWP-pdf.plt
PENTBL: N:\STD\MS\PLOT_DRV\INFO-ONLY.TBL
USER: p0033148

This page intentionally left blank.

Ocean Boulevard

The section of Ocean Boulevard connecting to the Gerald Desmond Bridge also has two or three lanes in each direction, depending upon the exact location and direction. The roadway has three lanes in each direction east of the Pico Avenue interchange and west of the Ocean Boulevard/ Terminal Island Freeway interchange.

Interchanges and Ramps

Major interchanges along Ocean Boulevard within the project area include Terminal Island East, SR 710, and Pico Avenue, as shown in Exhibit 2.1.5-2.

The Terminal Island East interchange, which is identified by its "horseshoe ramps," is located at the west end of the Gerald Desmond Bridge. (Note: the Terminal Island East interchange is referred to in this subsection as the Horseshoe Ramps to avoid confusion with the Terminal Island Freeway interchange.) The Horseshoe Ramps provide access to the Pier T area and include ramps to and from Ocean Boulevard in both directions. The SR 710 freeway and Pico Avenue interchanges lie immediately east of the Gerald Desmond Bridge. The SB SR 710 connector ramp to WB Ocean Boulevard consists of two lanes that merge into one lane prior to merging with Ocean Boulevard. The connector ramp for the opposite move (EB Ocean Boulevard to NB SR 710) consists of two lanes.

Existing (Year 2005) Traffic Conditions

The existing (year 2005) average daily traffic (ADT) on the Gerald Desmond Bridge is approximately 59,700 vpd, which includes approximately 25 percent trucks. This truck percentage is higher than on typical urban roadways and is principally attributable to the large truck volumes generated by the ports.

Study Methodology

Based on traffic counts taken for the existing year (2005), the morning (AM), midday (MD), and evening (PM) peak traffic hours were determined to be 8:00 a.m. to 9:00 a.m., 2:00 p.m. to 3:00 p.m., and 4:00 p.m. to 5:00 p.m., respectively. The AM and PM peak hours represent traffic peaks typical of commuter traffic. In addition to commuter traffic, the traffic activity at the Ports consists of a component associated with cargo movement. The cargo movement traffic peaks during the typical workday in the early afternoon and creates a third peak hour (MD). Because of this distinctive tri-modal peaking of traffic, all three peak-hour time periods were used for analysis of the existing and future traffic conditions.

Subsequent to 2005, the segment of Ocean Boulevard between Pier S Avenue and the Terminal Island Freeway was improved with a grade-separated overpass for through traffic on Ocean Boulevard. Because these improvements were implemented subsequent to the 2005 issuance of the NOP, they are not included in the analysis of existing year (2005) traffic conditions; the improvements are included in all analysis of future year traffic conditions. The grade separation improvements elevate the mainline of Ocean Boulevard over the Terminal Island Freeway and Pier S Street, so that through traffic on Ocean Boulevard avoids intersections at both the Terminal Island Freeway and Pier S Street. At-grade segments of Ocean Boulevard parallel to the elevated segment serve Ocean Boulevard traffic going to and from the Terminal Island Freeway and Pier S Street. Thus, intersections of Ocean Boulevard with the Terminal Island Freeway and Pier S Street remain but are avoided by Ocean Boulevard motorists continuing past both the Terminal Island Freeway and Pier S Street. The intersections of Ocean Boulevard with the Terminal Island Freeway and Pier S Street are signalized.

Because Ocean Boulevard was a restricted-access facility east of its intersection with the Terminal Island Freeway in the year 2005 condition, it was analyzed using the HCM multi-lane highway method. The segments of Ocean Boulevard west of the Terminal Island Freeway with at-grade intersections were analyzed as arterial streets using the HCM method. Exhibit 2.1.5-2 indicates which segments were analyzed as multi-lane highway segments and which were analyzed as arterial segments.

The LOS analysis of multi-lane highway segments was performed using the Traffic Software Integrated System Corridor Simulation (CORSIM) micro-simulation program developed by FHWA. CORSIM uses microscopic traffic following logic to simulate corridor segment operations on freeways and arterial streets. Results are reported in terms of vehicle density (vehicles per mile per lane) during peak hours on analysis segments, along with travel speeds, to determine the segment LOS, consistent with the HCM methods. CORSIM was used because it incorporates the effects of upstream and downstream operations into each study segment, and it can explicitly model the merge condition at the crest of the Gerald Desmond Bridge where the truck climbing lanes end under the existing and no action/rehabilitation alternatives conditions.

LOS analysis was conducted for the unsignalized study intersections in the City of Long Beach using the HCM unsignalized intersection method.

The signalized intersections in the City of Long Beach were analyzed using the ICU method, consistent with City of Long Beach requirements. The one signalized intersection in the City of Los Angeles was analyzed using the Critical Movement Analysis (CMA) method, consistent with City of Los Angeles requirements. Traffix software was used to perform the HCM, ICU, and CMA intersection analyses.

The merge and diverge areas (ramp junctions) where ramps enter and leave a roadway represent locations of potential congestion and delay. The HCM ramp junction method was used for these analyses. Because of the more complex traffic maneuvers occurring at ramp merges and diverges than on a multi-lane highway segment, similar vehicle densities result in slightly lower LOS at ramp junctions than on a mainline segment. Merge/diverge analysis was performed for the ramp junction areas where the ramp from SR 710 SB merges with Ocean Boulevard WB and the ramp to SR 710 NB diverges from Ocean Boulevard EB. On-ramp locations that join the mainline by adding a mainline lane and off-ramps that diverge by dropping a mainline lane were not analyzed because they are not true ramp junctions and do not constitute true merge/diverge sections.

Results of Analysis

Exhibit 2.1.5-5 shows the existing peak-hour traffic volumes on roadway segments in the traffic study area for the AM, MD, and PM peak periods.

The LOS analysis results of the study segments with existing year 2005 conditions are shown in Table 2.1.5-4. Generally, the segments operate at acceptable LOS A to C in the peak hours; however, on Ocean Boulevard between Pier S Avenue and the Terminal Island Freeway (Segment 2), failing LOS F conditions occur in both directions during the peak hours, except for the EB direction during the midday peak hour when there are LOS E conditions. Additionally, WB Ocean Boulevard between the Horseshoe Ramps and the Terminal Island Freeway (Segment 3) has LOS E conditions during all three peak periods.

The results of the ramp junction LOS analyses for existing year 2005 conditions are shown in Table 2.1.5-5. All of the ramp junction areas analyzed operate at acceptable LOS B during the peak hours.

The results of the study intersections LOS analyses under existing year 2005 conditions are shown in Table 2.1.5-6. All of the study intersections operate at acceptable LOS D or better during peak hours under the existing year 2005 conditions, except the intersection of the Terminal Island Freeway and Ocean Boulevard, which operates at LOS E conditions in the PM peak hour.

2.1.5.3 Environmental Consequences

Evaluation Criteria

Criteria for the determination of an adverse effect to traffic were identified by the Port and are consistent with criteria used in other recent projects within the Port. The criteria are those required by the jurisdiction in which the study roadway or intersection is situated, unless that jurisdiction has no appropriate criteria, in which case criteria identified by the Port were used.

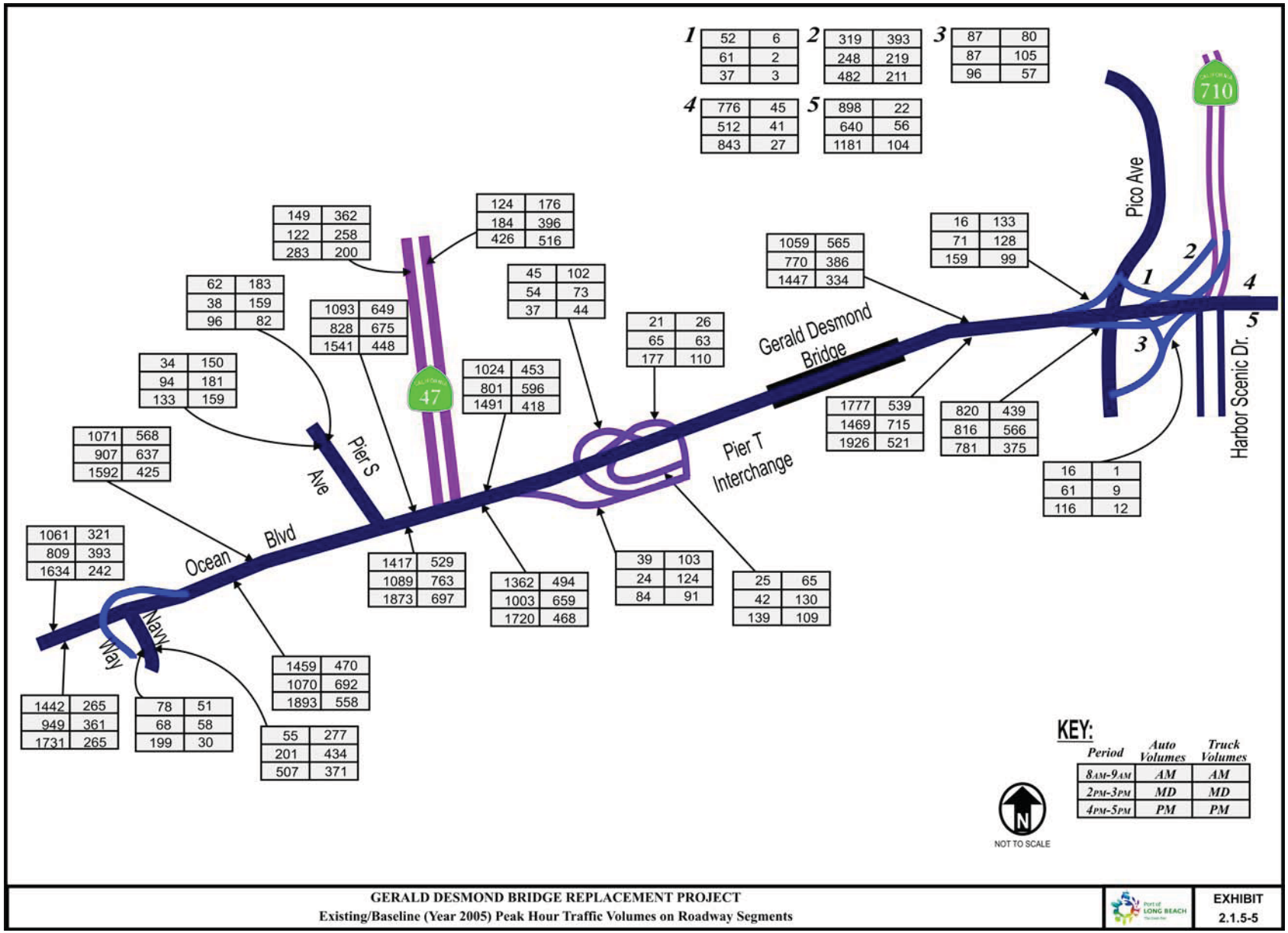
For signalized intersections, the proposed project would result in an adverse effect if the following thresholds established by the cities of Long Beach and Los Angeles are exceeded:

- City of Long Beach: Build condition LOS is E or F and the intersection volume-to-capacity ratio (V/C) increases by more than 0.020 from the no build to the build condition;
- City of Los Angeles:
  - Build condition LOS is C (defined as V/C greater than 0.700 to 0.800) and the V/C increases by more than 0.040;
  - Build condition LOS is D (defined as V/C greater than 0.800 to 0.900 and the V/C increases by more than 0.020; or
  - Build condition LOS is E or F (defined as V/C greater than 0.900) and the V/C increases by more than 0.010.

All of the unsignalized study area intersections are located in Long Beach. The City of Long Beach has no established criteria for determination of adverse effects at unsignalized intersections. The criteria used in this analysis are:

> If the Build condition has an LOS E or F at an unsignalized intersection, then the intersection is to be reanalyzed using the signalized intersection method and criteria to identify any adverse effects.

Similarly, the City of Long Beach has no criteria for the determination of adverse effects for intersections at which signal installation is part of the proposed project. For comparisons of intersections that are unsignalized with the no action/rehabilitation alternatives and signalized with the Bridge Replacement Alternatives, this analysis assumes that there would be an adverse effect if the Bridge Replacement Alternatives would result in LOS E or F at the future signalized intersection.


1
52 6
61 2
37 3
2
319 393
248 219
482 211
3
87 80
87 105
96 57
4
776 45
512 41
843 27
5
898 22
640 56
1181 104
710
Pico Ave
1
2
3
4
5
Harbor Scenic Dr.
Gerald Desmond Bridge
Pier T Interchange
Pier S Ave
Ocean Blvd
Navy Way
47
149 362
122 258
283 200
124 176
184 396
426 516
62 183
38 159
96 82
1093 649
828 675
1541 448
45 102
54 73
37 44
1059 565
770 386
1447 334
16 133
71 128
159 99
34 150
94 181
133 159
1024 453
801 596
1491 418
21 26
65 63
177 110
1777 539
1469 715
1926 521
820 439
816 566
781 375
16 1
61 9
116 12
1071 568
907 637
1592 425
1061 321
809 393
1634 242
1417 529
1089 763
1873 697
1362 494
1003 659
1720 468
39 103
24 124
84 91
25 65
42 130
139 109
1459 470
1070 692
1893 558
1442 265
949 361
1731 265
78 51
68 58
199 30
55 277
201 434
507 371
KEY:
Period
Auto Volumes
Truck Volumes
8AM-9AM
AM
AM
2PM-3PM
MD
MD
4PM-5PM
PM
PM
N
NOT TO SCALE
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Existing/Baseline (Year 2005) Peak Hour Traffic Volumes on Roadway Segments
Port of LONG BEACH
EXHIBIT
2.1.5-5

This page intentionally left blank.

Table 2.1.5-4
Existing (Year 2005) Peak-Hour LOS
for Arterial and Highway Segments

	Segment	From	To	Speed* or Vehicle Density	LOS
AM Peak Hour					
1	EB Ocean Boulevard	Navy Way	Pier S Avenue	38.0*	A
	WB Ocean Boulevard	Pier S Avenue	Navy Way	30.4*	B
2	EB Ocean Boulevard	Pier S Avenue	Terminal Island Freeway	10.6*	F
	WB Ocean Boulevard	Terminal Island Freeway	Pier S Avenue	9.4*	F
3	EB Ocean Boulevard	Terminal Island Freeway	Horseshoe Ramps	29.6*	B
	WB Ocean Boulevard	Horseshoe Ramps	Terminal Island Freeway	14.4*	E
4	EB Gerald Desmond Bridge	Upgrade	Crest	17.0	B
	EB Gerald Desmond Bridge	Crest	Downgrade	21.8	C
5	WB Gerald Desmond Bridge	Upgrade	Crest	20.2	C
	WB Gerald Desmond Bridge	Crest	Downgrade	20.1	C
6	NB Connector	EB Ocean Boulevard	NB SR 710	13.8	B
	SB Connector	SB SR 710	WB Ocean Boulevard	17.4	B
7	SR 710 NB	NB Connector	NB SR 710 Mainline	14.2	B
	SR 710 SB	SB SR 710 Mainline	SB Connector	9.2	A
8	EB Ocean Boulevard	NB Connector	Downtown	4.6	A
	WB Ocean Boulevard	Downtown	SB Connector	6.6	A
MD Peak Hour					
1	EB Ocean Boulevard	Navy Way	Pier S Avenue	37.6*	A
	WB Ocean Boulevard	Pier S Avenue	Navy Way	31.8*	B
2	EB Ocean Boulevard	Pier S Avenue	Terminal Island Freeway	14.0*	E
	WB Ocean Boulevard	Terminal Island Freeway	Pier S Avenue	9.2*	F
3	EB Ocean Boulevard	Terminal Island Freeway	Horseshoe Ramps	29.5*	B
	WB Ocean Boulevard	Horseshoe Ramps	Terminal Island Freeway	13.7*	E
4	EB Gerald Desmond Bridge	Upgrade	Crest	18.8	C
	EB Gerald Desmond Bridge	Crest	Downgrade	23.1	C
5	WB Gerald Desmond Bridge	Upgrade	Crest	19.4	C
	WB Gerald Desmond Bridge	Crest	Downgrade	19.0	C
6	NB Connector	EB Ocean Boulevard	NB SR 710	16.0	B
	SB Connector	SB SR 710	WB Ocean Boulevard	10.7	A
7	SR 710 NB	NB Connector	NB SR 710 Mainline	17.4	B
	SR 710 SB	SB SR 710 Mainline	SB Connector	6.5	A
8	EB Ocean Boulevard	NB Connector	Downtown	1.8	A
	WB Ocean Boulevard	Downtown	SB Connector	6.6	A

Table 2.1.5-4
Existing (Year 2005) Peak-Hour LOS for Arterial and Highway Segments

	Segment	From	To	Speed* or Vehicle Density	LOS
PM Peak Hour					
1	EB Ocean Boulevard	Navy Way	Pier S Avenue	36.1*	A
	WB Ocean Boulevard	Pier S Avenue	Navy Way	33.8*	B
2	EB Ocean Boulevard	Pier S Avenue	Terminal Island Freeway	9.7*	F
	WB Ocean Boulevard	Terminal Island Freeway	Pier S Avenue	9.3*	F
3	EB Ocean Boulevard	Terminal Island Freeway	Horseshoe Ramps	29.7*	B
	WB Ocean Boulevard	Horseshoe Ramps	Terminal Island Freeway	12.7*	E
4	EB Gerald Desmond Bridge	Upgrade	Crest	20.2	C
	EB Gerald Desmond Bridge	Crest	Downgrade	25.7	C
5	WB Gerald Desmond Bridge	Upgrade	Crest	18.9	C
	WB Gerald Desmond Bridge	Crest	Downgrade	19.5	C
6	NB Connector	EB Ocean Boulevard	NB SR 710	13.2	B
	SB Connector	SB SR 710	WB Ocean Boulevard	14.4	B
7	SR 710 NB	NB Connector	NB SR 710 Mainline	13.8	B
	SR 710 SB	SB SR 710 Mainline	SB Connector	8.3	A
8	EB Ocean Boulevard	NB Connector	Downtown	8.5	A
	WB Ocean Boulevard	Downtown	SB Connector	6.9	A

LOS – Level of Service; EB – eastbound; WB – westbound; NB – northbound; SB – southbound

* In the existing year 2005 condition, Segments 1 through 3 are analyzed as arterial segments because of the presence of traffic signals on Ocean Boulevard at the Terminal Island Freeway, Pier S Avenue, and Navy Way. The LOS for arterials is determined by speed (in miles per hour). For Urban Street Class II arterials, the speed range for each LOS is LOS A >35 mph; LOS B >28-35 mph; LOS C >22-28 mph; LOS D >17-22 mph; LOS E >13-17 mph; and LOS F ≤ 13 mph. All other segments are analyzed as multi-lane highways where LOS is determined by vehicle density (vehicles per lane per mile).

Source: Iteris, 2009.

Table 2.1.5-5
Existing (Year 2005) Peak-Hour LOS for Ramp Junctions

Ramp Location	AM Peak Hour		MD Peak Hour		PM Peak Hour	
	Density (pc/mi/ln)	LOS*	Density (pc/mi/ln)	LOS*	Density (pc/mi/ln)	LOS*
EB Ocean Boulevard to SR 710/ Downtown Diverge	11.1	B	10.9	B	15.5	B
SB SR 710 Connector Ramp and WB Ocean Boulevard	16.7	B	15.2	B	16.2	B

LOS – Level of Service; NB – northbound; pc/mi/ln – passenger cars equivalents per mile per lane; SB – southbound

* LOS criteria for ramp junction areas are in density (pc/mi/ln). Density ranges for different LOS types: LOS A: 0 - 10; LOS B: 10.1 - 20; LOS C: 20.1 - 28; LOS D: 28.1 - 35; LOS E: 35.1 - 43; LOS F: >43.

Source: Iteris, 2009.

Table 2.1.5-6
Existing (Year 2005) Peak-Hour LOS for Intersections

	Intersection	LOS	V/C or Delay*
AM Peak Hour			
1	Terminal Island Freeway / Ocean Boulevard	C	0.792
2	Pier S Avenue / Ocean Boulevard	C	0.709
3	Pier S Avenue / New Dock Street	A	0.327
4	Navy Way / Seaside Avenue	A	0.474
5	Pico Avenue / Pier B Street and 9th Street	A	0.428
6	Pico Avenue / Pier C Street	A	0.309
7	Terminal Island Freeway SB Off-Ramp / New Dock	B	*10.8*
8	Terminal Island Freeway NB On-Ramp / New Dock	A	*7.4*
9	Pico Avenue / Pier D Street	B	*10.1*
10	Pico Avenue / Broadway	B	*10.6*
11	Pico Avenue / Pier E Street	A	*9.9*
12	Ocean Boulevard / Golden Shore Street	A	0.570
13	Ocean Boulevard / Magnolia Avenue	B	0.693
MD Peak Hour			
1	Terminal Island Freeway / Ocean Boulevard	D	0.833
2	Pier S Avenue / Ocean Boulevard	C	0.700
3	Pier S Avenue / New Dock Street	A	0.350
4	Navy Way / Seaside Avenue	A	0.414
5	Pico Avenue / Pier B Street and 9th Street	A	0.455
6	Pico Avenue / Pier C Street	A	0.340
7	Terminal Island Freeway SB Off-Ramp / New Dock	A	*9.1*
8	Terminal Island Freeway NB On-Ramp / New Dock	A	*7.6*
9	Pico Avenue / Pier D Street	B	*11.3*
10	Pico Avenue / Broadway	B	*11.2*
11	Pico Avenue / Pier E Street	B	*11.8*
12	Ocean Boulevard / Golden Shore Street	A	0.569
13	Ocean Boulevard / Magnolia Avenue	A	0.575
PM Peak Hour			
1	Terminal Island Freeway / Ocean Boulevard	E	0.912
2	Pier S Avenue / Ocean Boulevard	D	0.824
3	Pier S Avenue / New Dock Street	A	0.356
4	Navy Way / Seaside Avenue	A	0.581
5	Pico Avenue / Pier B Street and 9th Street	A	0.494
6	Pico Avenue / Pier C Street	A	0.343
7	Terminal Island Freeway SB Off-Ramp / New Dock	A	*9.3*
8	Terminal Island Freeway NB On-Ramp / New Dock	A	*7.9*
9	Pico Avenue / Pier D Street	B	*10.7*
10	Pico Avenue / Broadway	B	*10.5*
11	Pico Avenue / Pier E Street	B	*11.3*
12	Ocean Boulevard / Golden Shore Street	A	0.593
13	Ocean Boulevard / Magnolia Avenue	B	0.601

LOS – Level of Service; NB – northbound; SB – southbound

* V/C (volume-to-capacity ratio) is reported for signalized intersections, and average stopped delay in seconds is reported for unsignalized intersections in italics.

Source: Iteris, 2009.

The determination of potential adverse effects on roadway study segments is based on whether a segment is forecast to operate at LOS F with the bridge replacement alternatives, and if LOS F were forecast, whether the vehicle density (vehicles per mile per lane) during the peak hours with the Bridge Replacement Alternatives would be worse (higher) than with the No Action/ Rehabilitation Alternatives. A higher density is an indicator of a worse LOS F condition.

Construction Impacts

Rehabilitation Alternative

The work associated with the Rehabilitation Alternative would be limited to nighttime closures of one lane at a time on the Gerald Desmond Bridge and its approaches. The existing concrete median barrier would be removed for the construction period, and four lanes (two in each direction) would be maintained during the nighttime construction period. During the daytime, the existing lane configuration would be maintained. Rehabilitation of single-lane ramps may require some ramp closures during the nighttime hours. A TMP would be prepared for the Rehabilitation Alternative to address signing for the temporary lane closures, hours of closure, placement of traffic cones and other temporary channelizing devices, and other elements of traffic management during the construction period. The construction activity associated with the Rehabilitation Alternative is not expected to have adverse traffic effects, and construction detour routes would not be required under this alternative. Traffic volumes at night are light and not sufficient to warrant detours.

Bridge Replacement Alternatives

This section summarizes the plan for staged construction of the proposed Bridge Replacement Alternatives, including an identification of the detours necessary during their construction. The construction stages of the two Bridge Replacement Alternatives (the North-side Alignment and the South-side Alignment) would be the same in terms of their potential impacts on traffic. A traffic analysis is presented of the detour routes included in the stages of construction of the Bridge Replacement Alternatives. The discussion includes an identification of the construction-related traffic effects that are anticipated under the proposed Bridge Replacement Alternatives.

Each construction stage is anticipated to last approximately 1-year; however, it is expected that the latter part of each stage would overlap the beginning of the next stage. Demolition of the existing bridge would take place in the fifth stage of the project following the four construction stages. As part of the required TMP for the Bridge Replacement Alternatives, coordination with the construction activities associated with the Schuyler Heim Bridge replacement project and proposed SR 47 improvements would occur, as necessary, to minimize traffic effects during the potentially overlapping construction phases of the projects.

First Stage. The first stage would include construction of temporary pavement widening along Pico Avenue and widening of ramps and intersections as required.

Second Stage. During the second stage, the SB-to-WB SR 710 connector would be closed. SB traffic would be directed to Pico Avenue from SB SR 710 at the existing Pico Avenue off-ramp. Vehicles would then travel south on Pico Avenue to the existing WB Ocean Boulevard on-ramp. Widening is proposed at both ramps to accommodate the detoured traffic. During this stage of construction, Pico Avenue would be modified to provide three SB lanes and two NB lanes. Other changes along the corridor are also proposed, as will be discussed later.

During both the second and third stages of construction, traffic entering Pier T from WB Ocean Boulevard would have to use the Terminal Island Freeway interchange to make a U-turn and access the EB Pier T off-ramp because the WB Pier T off-ramp ramp would be removed from service during those stages of construction.

Third and Fourth Stages. During the third and fourth stages, the new WB portion of the bridge and connector roadways would be open, and traffic would be directed to the new facility. EB traffic crossing the bridge to travel north on SR 710 would be directed to the Pico Avenue off-ramp to travel NB on Pico Avenue. Vehicles would access SR 710 using the existing Pico Avenue on-ramp located north of C Street. During these final stages, Pico Avenue would be restriped to provide three NB lanes and two SB lanes.

Traffic Analysis of Detours

An analysis was conducted for the entire project area, especially the Terminal Island Freeway interchange and Pico Avenue, to determine if the proposed construction phasing plan would be feasible and to identify what modifications would be required to accommodate projected traffic volumes on detour routes. The analysis was conducted for only the AM and PM peak hours because they represent the higher and more critical peaks. Stage

1 requires no analysis because the existing travel lane configuration would be maintained.

Table 2.1.5-7 shows that the additional traffic diverted to the detour routes in construction Stage 2 is expected to result in poor LOS (E or F) during either the AM or PM peak hour at four intersections along the detour routes:

- Ocean Boulevard and SR 47 (North Intersection);
- Ocean Boulevard and SR 47 (South Intersection);
- Pico Avenue and Pier B Street/9th Street; and
- Pico Avenue and Pier D Street.

Table 2.1.5-8 shows that the additional traffic diverted to the detour routes in construction Stages 3 and 4 is expected to result in poor LOS (E or F) during either the AM or PM peak hour at five intersections along the detour routes:

- Ocean Boulevard and SR 47 (North Intersection);
- Ocean Boulevard and SR 47 (South Intersection);
- Pico Avenue and Pier B Street/9th Street;
- Pico Avenue and Pier D Street; and
- Pico Avenue and Pier E Street.

Adverse Traffic Effects during Construction of the Bridge Replacement Alternatives

LOS E or F at an intersection on a detour route is considered an adverse traffic effect of construction. This is a more stringent criterion than stated above, but it provides a conservative estimate of potential adverse effects of construction on detour routes. Five intersections on detour routes would have adverse traffic effects during construction. The affected intersections are discussed below.

Table 2.1.5-7
Bridge Replacement Alternatives: Detour Route Level of Service – Construction Stage 2

Intersection	Without Mitigation			
	AM Peak Hour		PM Peak Hour	
	LOS	Delay[1]	LOS	Delay[1]
1a. Ocean Boulevard and SR -47 (North Intersection)	D	50.2	E	64.6
1b. Ocean Boulevard and SR -47 (South Intersection)	D	38.6	F	131.3
2a. Ocean Boulevard and Pier S Avenue (North Intersection)	C	27.9	C	26.3
2b. Ocean Boulevard and Pier S Avenue (South Intersection)	C	26.8	C	23.8
5. Pico Avenue and Pier B Street / 9th Street	F	206.0	E	59.2
6. Pico Avenue and Pier C Street	A	7.7	A	6.4
9. Pico Avenue and Pier D Street[2]	F	428.9	F	227.8
11. Pico Avenue and Pier E Street[2]	B	11.9	C	18.2

[1] Delay is in seconds per vehicle.

[2] Existing 4-way stop intersection.

Source: Iteris, 2009.

Table 2.1.5-8
Bridge Replacement Alternatives: Detour Route Level of Service – Construction Stages 3 and 4

Intersection	Without Mitigation			
	AM Peak Hour		PM Peak Hour	
	LOS	Delay[1]	LOS	Delay[1]
1a. Ocean Boulevard and SR 47 (North Intersection)	D	50.2	E	64.6
1b. Ocean Boulevard and SR 47 (South Intersection)	D	38.6	F	131.3
2a. Ocean Boulevard and Pier S Avenue (North Intersection)	C	27.9	C	26.3
2b. Ocean Boulevard and Pier S Avenue (South Intersection)	C	26.8	C	23.8
5. Pico Avenue and Pier B Street/9th Street	F	389.9	F	383.5
6. Pico Avenue and Pier C Street	A	3.2	A	3.8
9. Pico Avenue and Pier D Street[2]	F	450.9	F	418.3
11. Pico Avenue and Pier E Street[2]	F	OVRFL[3]	F	OVRFL[3]

[1] Delay is in seconds per vehicle.

[2] Existing 4-way stop intersection.

[3] V/C ratio too high to calculate delay. Delay would be excessive.

Source: Iteris, 2009.

- Ocean Boulevard and SR 47 North Intersection would operate at LOS E during the PM peak hour during construction Stages 2, 3, and 4.

The LOS E during the PM peak hour at this intersection is an adverse temporary effect attributed to construction detour traffic associated with the Bridge Replacement Alternatives. Additional lanes at the intersection were investigated as mitigation. Due to ROW constraints and lack of available land for additional lanes, it was determined that there is no feasible mitigation to address this temporary adverse effect of the Bridge Replacement Alternatives upon the operating condition at the Terminal Island Freeway interchange. The effect attributed to the Bridge Replacement Alternatives is considered a temporary, adverse, and unavoidable effect. This temporary condition would occur during a portion of the construction period, amounting to approximately 18 months of the planned 4-year construction period.

- Ocean Boulevard and SR 47 South Intersection would operate at LOS F during the PM peak hour during construction Stages 2, 3, and 4.

The LOS F during the PM peak hour at this intersection is an adverse temporary effect attributed to construction detour traffic associated with the Bridge Replacement Alternatives. Additional lanes at the intersection were investigated as mitigation. Due to ROW constraints and lack of available land for additional lanes, it was determined that there is no feasible mitigation to address this temporary adverse effect of the Bridge Replacement Alternatives upon the operating condition at the Terminal Island Freeway interchange. The effect attributed to the Bridge Replacement Alternatives is considered a temporary, adverse, and unavoidable effect. This temporary condition would occur during a portion of the construction period, amounting to approximately 18 months of the planned 4-year construction period.

- Pico Avenue and Pier B Street/9th Street intersection would operate at LOS E or F during both the AM and PM peak hours during construction Stages 2, 3, and 4.

The LOS E and F during the AM and PM peak hours at this intersection is an adverse temporary effect attributed to construction detour traffic associated with the Bridge Replacement Alternatives. Two sets of mitigations are proposed at this intersection for the different construction stages of a Bridge Replacement Alternative. One set would be implemented during construction Stage 2 and another set during construction Stages 3 and 4. The mitigations proposed for Stage 2 and for Stages 3 and 4 of a Bridge Replacement Alternative are shown in Tables 2.1.5-9 and 2.1.5-10, respectively.

The proposed mitigation measures listed in Tables 2.1.5-9 and 2.1.5-10 would be implemented as part of the TMP required for the project. Prior to construction, the TMP will be submitted to the Port and Caltrans for approval. The TMP, at a minimum, will include detour routes, flagmen, traffic controls, signing, and traffic lane closure scheduling to minimize impacts. The TMP will be implemented after approval.

The mitigations proposed for Stage 2 would mitigate the temporary adverse effect and provide an acceptable LOS B during peak hours.

During Stages 3 and 4, the diverted traffic on NB Pico Avenue must turn left onto the ramp to access NB SR 710. To improve the projected operating conditions at this intersection, the conflicting traffic movements (SB through volumes from Pier B Street and WB-to-SB left turns from 9th Street) must be rerouted to eliminate the conflict with the NB left-turning traffic from Pico Avenue accessing the ramp. All feasible mitigation measures have been proposed for Stages 3 and 4. The mitigation measures would reduce delay, but LOS F and E would remain during the AM and PM peak hours, respectively. This is considered a temporary and unavoidable adverse effect during Stages 3 and 4 of a Bridge Replacement Alternative. This temporary condition would occur during a portion of the construction period, amounting to approximately 22 months of the planned 4-year construction period.

- Pico Avenue and Pier D Street intersection would operate at LOS F during both the AM and PM peak hours during construction Stages 2, 3, and 4.

The LOS F during the AM and PM peak hours at this intersection is an adverse temporary effect attributed to construction detour traffic associated with the Bridge Replacement Alternatives. Two sets of mitigations are proposed at the intersection of Pico Avenue and Pier D Street for the different construction stages of a Bridge Replacement Alternative. One set would be implemented during construction Stage 2 and another set during construction Stages 3 and 4. The mitigations proposed for Stage 2 and for Stages 3 and 4 of a Bridge Replacement Alternative are shown in Tables 2.1.5-9 and 2.1.5-10, respectively.

Table 2.1.5-9
Bridge Replacement Alternatives: Detour Route Level of Service with Mitigation – Construction Stage 2

Intersection	With Mitigation				Mitigation Notes
	AM Peak Hour		PM Peak Hour		
	LOS	Delay[1]	LOS	Delay[1]	
5. Pico Avenue and Pier B Street/9th Street	B	19.4	B	11.4	**TC-1** - Add dual NB right-turn lanes - Restripe EBTR to EBR. Provide one (1) EBT - Continue two (2) SR 710 SB off-ramp lanes to Pico Avenue
9. Pico Avenue/Pier D Street[2]	D	47.7	C	26.2	**TC-3** - Signalize

LOS – level of service; NB – northbound; SB – southbound; EBT – eastbound through; EBTR – eastbound through/right; EBR – eastbound right
[1] Delay is in seconds per vehicle.
[2] Existing 4-way stop intersection.
Source: Iteris, 2009.

Table 2.1.5-10
Bridge Replacement Alternatives: Detour Route Level of Service with Mitigation – Construction Stages 3 and 4

Intersection	With Mitigation				Mitigation Notes
	AM Peak Hour		PM Peak Hour		
	LOS	Delay[1]	LOS	Delay[1]	
5. Pico Avenue and Pier B Street/9th Street	F	91.9	E	78.7	**TC-2** - Remove NB-SB split signal phasing - Restripe NBTL to NBL - Widen SB approach Provide two (2) LT lanes and one (1) TR lane - Continue two (2) on-ramp lanes to NB SR 710
9. Pico Avenue/Pier D Street[2]	E	58.6	D	41.7	**TC-3** -Signalize
11. Pico Avenue/Pier E Street[2]	B	16.5	B	14.7	**TC-4** - Signalize - Restripe NBTR to NBR to provide one (1) NBT - Add dual free-flow WB right-turn lanes - Continue two (2) EB Ocean Boulevard off-ramp lanes to Pico Avenue

LOS – level of service; EB – eastbound;; NB – northbound; SB – southbound; WB – westbound; NBTL – northbound through/left; NBL – northbound left; LT – left through; TR – through right; NBTR – northbound through/right; NBR – northbound right; NBT – northbound through
[1] Delay is in seconds per vehicle.
[2] Existing 4-way stop intersection.
Source: Iteris, 2009.

The proposed mitigation measures listed in Tables 2.1.5-9 and 2.1.5-10 would be implemented as part of the TMP referenced above.

The mitigations proposed for Stage 2 would mitigate the adverse effect and provide acceptable LOS C or D during peak hours.

The Pier D Street intersection with Pico Avenue provides egress for all trucks from Piers D and E. The exiting volumes, combined with the large through volumes on NB Pico Avenue, result in the poor operating conditions at this intersection. All feasible mitigation measures have been proposed for Stages 3 and 4. The mitigation measures would reduce delay, but LOS E would remain

during the AM peak hour. This is considered a temporary and unavoidable adverse effect during Stages 3 and 4 of a Bridge Replacement Alternative. This temporary condition would occur during a portion of the construction period, amounting to approximately 22 months of the planned 4-year construction period.

- Pico Avenue and Pier E Street would operate at LOS F during both the AM and PM peak hours during construction Stages 3 and 4.

The LOS F during the AM and PM peak hours at this intersection is an adverse temporary effect attributed to construction detour traffic associated with the Bridge Replacement Alternatives. A set of mitigations is proposed at this intersection to be implemented under the Bridge Replacement Alternatives. The proposed mitigations are shown in Table 2.1.5-10. The proposed mitigations would mitigate the adverse effect under the Bridge Replacement Alternative condition and provide an acceptable LOS B during peak hours.

The proposed mitigation measures listed in Table 2.1.5-10 would be implemented as part of the TMP referenced above.

Operational Impacts

For this analysis, the future traffic conditions are assumed the same for both the No Action Alternative and the Rehabilitation Alternative. This is because the Rehabilitation Alternative would have the same number of traffic lanes on the bridge and ramps/connectors as the No Action Alternative, and the design of roadways and intersections in the project area would be the same as with the No Action Alternative.

It is assumed in this analysis that for the Bridge Replacement Alternatives future traffic conditions would be the same for both the North-side Alignment Alternative and the South-side Alignment Alternative. This is because both the North-side and South-side Alignment Alternatives would have the same number of traffic lanes on the bridge and ramps/connectors. Because these two new bridge alignment options are spaced so close to each other, it is anticipated that the design and traffic operations on roadways and intersections in the project area would be the same with both alignment alternatives.

Year 2015 is the year in which the proposed project is scheduled to be open to traffic if one of the build options is implemented. Year 2030 is the design horizon year for the proposed project build alternatives; therefore, traffic analyses were conducted for the following four future conditions:

- Year 2015 without the proposed new bridge or with rehabilitation of the existing bridge, referred to as the "Year 2015 No Action/ Rehabilitation Alternatives;"
- Year 2015 with the proposed new bridge alternatives, referred to as the "Year 2015 Bridge Replacement Alternatives" (which includes both the North-side and South-side Alignment Alternatives);
- Year 2030 without the proposed new bridge or with rehabilitation of the existing bridge, referred to as the "Year 2030 No Action/ Rehabilitation Alternatives;" and
- Year 2030 with the proposed new bridge alternatives, referred to as the "Year 2030 Bridge Replacement Alternatives" (which includes both the North-side and South-side Alignment Alternatives).

All roadway study segments in the future conditions were analyzed as multi-lane highway segments because signals were removed from Ocean Boulevard (at Pier S Avenue and the Terminal Island Freeway) with the recent construction of the Terminal Island Freeway interchange.

Traffic Forecasting Model

In addition to the existing (year 2005) traffic conditions, the traffic LOS analysis was conducted for the years 2015 and 2030 for the Bridge Replacement Alternatives (which includes both the North-side Alignment and South-side Alignment Alternatives for the proposed new bridge) and the No Action/Rehabilitation Alternatives (which represents the traffic conditions that would occur with the existing bridge configuration if no action is taken or if the existing bridge is rehabilitated and not replaced with a new bridge). A traffic forecasting model was used as part of the study to forecast future traffic volumes with and without the proposed new bridge in the years 2015 and 2030. The project is expected to be opened to traffic in year 2015, and year 2030 is the project horizon (design) year.

Appendix G provides details about the traffic model development methodology and model validation.

Year 2015 and 2030 Traffic Volume Forecasts

Year 2015 No Action/Rehabilitation Alternatives – Traffic Volumes

The ADT volumes forecast for the Gerald Desmond Bridge in year 2015 with the No Action/ Rehabilitation Alternatives is 77,000 vpd, which includes approximately 30 percent trucks. The increase in truck percentage over the existing

condition of 25 percent is principally attributable to growth in TEU throughput at the Ports. Exhibit 2.1.5-6 shows the forecast 2015 peak-hour traffic volumes on study roadway segments in the traffic study area with the No Action/Rehabilitation Alternatives.

Year 2015 Bridge Replacement Alternatives – Traffic Volumes

The ADT volumes forecast for the bridge in year 2015 with the Bridge Replacement Alternatives is 87,000 vpd, which includes approximately 30 percent trucks. Exhibit 2.1.5-7 shows the forecast 2015 peak-hour traffic volumes on study roadway segments in the traffic study area with the Bridge Replacement Alternatives.

Year 2030 No Action/Rehabilitation Alternatives – Traffic Volumes

The ADT volumes forecast for the Gerald Desmond Bridge in year 2030 with the No Action/Rehabilitation Alternatives is 125,000 vpd, which includes approximately 44 percent trucks. Exhibit 2.1.5-8 shows the forecast 2030 peak-hour traffic volumes on study roadway segments in the traffic study area with the No Action/Rehabilitation Alternatives.

Year 2030 Bridge Replacement Alternatives – Traffic Volumes

The ADT volumes forecast for the bridge in year 2030 with the Bridge Replacement Alternatives is 136,000 vpd, which includes approximately 44 percent trucks. Exhibit 2.1.5-9 shows the forecast 2030 peak-hour traffic volumes on study roadway segments in the traffic study area with the Bridge Replacement Alternatives.

Future Traffic Operations

The proposed Bridge Replacement Alternatives provide a new bridge with grades of approximately 5 percent (compared to existing grades of 5.5 to 6.0 percent) carrying three lanes in each direction across the bridge and on the roadways approaching and leaving the bridge in both directions. The Bridge Replacement Alternatives also include reconstruction of direct connectors between Ocean Boulevard and SR 710 in both directions and other improvements more fully shown in Exhibit 1-6 (North-side Alignment) and Exhibit 1-7 (South-side Alignment). The Bridge Replacement Alternatives would construct the new bridge either just north or just south of the existing bridge and require some modifications to nearby circulation and access. The proposed new bridge would include left and right shoulders in both directions.

Nearby Circulation

As a result of implementation of the Bridge Replacement Alternatives, some modifications to the area's circulation system and access would also be implemented. The Bridge Replacement Alternatives would not change traffic circulation patterns in the vicinity of the Horseshoe Ramps interchange because this interchange would provide the same connections to Pier T Avenue as the existing interchange. The following circulation system modifications would be similar for both the North-side Alignment and the South-side Alignment options with the Bridge Replacement Alternatives:

- Access to the LBGS would require modification of the existing access road from Pier T Avenue to allow bridge construction, but the general location and length of the route would not change.
- Construction of approach roadways to the proposed new bridge with the Bridge Replacement Alternatives would require a realignment of a section of West Broadway west of the Tidelands Warehouse. This realigned section of West Broadway, which is not a public through route, would link with Pico Avenue approximately 300 ft (91 m) south of its existing location.
- Circulation would be modified at the WB Ocean Boulevard ramps from Pico Avenue. The location of the WB off-ramp to Pico Avenue would remain unchanged; however, the WB Ocean Boulevard on-ramp from Pico Avenue would be reconfigured by locating the ramp intersection with Pico Avenue approximately 460 ft (140 m) north of its existing location. The reconfigured on-ramp would loop to the north and east over Pico Avenue and continue looping to the south and west to join the ramp from SB SR 710 before entering WB Ocean Boulevard. The effect of this ramp redesign would be to slightly increase the distance for trips using the ramps compared to the existing "diamond" configuration of the WB ramps.

Daily Traffic Comparisons

Total ADT is useful in determining overall vehicle movement on the area roadway network and in assessing the redistribution of traffic among various origins and destinations; however, peak-hour traffic is used to analyze operations and determine the expected performance of project improvements and their potential effects. Operational analysis is presented below.

Table 2.1.5-11 shows the existing and forecast ADT volumes on the segments of Ocean Boulevard between the Horseshoe Ramps and SR 710. The following observations are based on averaging the volumes for all of the study conditions in years 2005, 2015, and 2030.

Total daily traffic is expected to grow by approximately 29 percent from 59,700 vpd to 77,070 vpd between years 2005 and 2015 with the No Action/Rehabilitation Alternatives.

The improvements provided by the Bridge Replacement Alternatives would potentially draw an estimated 13 percent more vehicles (86,730 vpd) to the new bridge in year 2015 than the vehicle volume projected under the No Action/ Rehabilitation Alternatives (77,070 vpd). Because this project does not add any vehicle trips, the additional traffic on the new bridge, approximately 9,660 vpd, would be redistributed to the new bridge from other roadways and would not constitute an increase in the number of trips within the region.

Total daily traffic is expected to increase by approximately 62 percent, from 77,070 vpd to 124,670 vpd, between years 2015 and 2030 with the No Action/Rehabilitation Alternatives.

The improvements provided by the proposed Bridge Replacement Alternatives would potentially draw an estimated nine percent more vehicles (135,930 vpd) to the new bridge in year 2030 than the vehicle volume projected under the No Action/ Rehabilitation Alternatives (124,670 vpd). Because this project does not add any vehicle trips, the additional traffic on the new bridge, approximately 11,260 vpd, would be redistributed to the new bridge from other roadways and would not constitute an increase in trips within the region.

Analysis of Future Traffic Operations

Future traffic operations for the four conditions identified above were analyzed. Table 2.1.5-12 presents the results of the years 2015 and 2030 peak-hour LOS analysis of the eight roadway study segments, along with the existing (year 2005) LOS for comparison purposes. Table 2.1.5-13 presents the results of the years 2015 and 2030 peak-hour LOS analysis at the ramp junctions. Table 2.1.5-14 presents the results of the years 2015 and 2030 peak-hour LOS analysis at the study intersections, along with the existing (year 2005) LOS for comparison purposes.

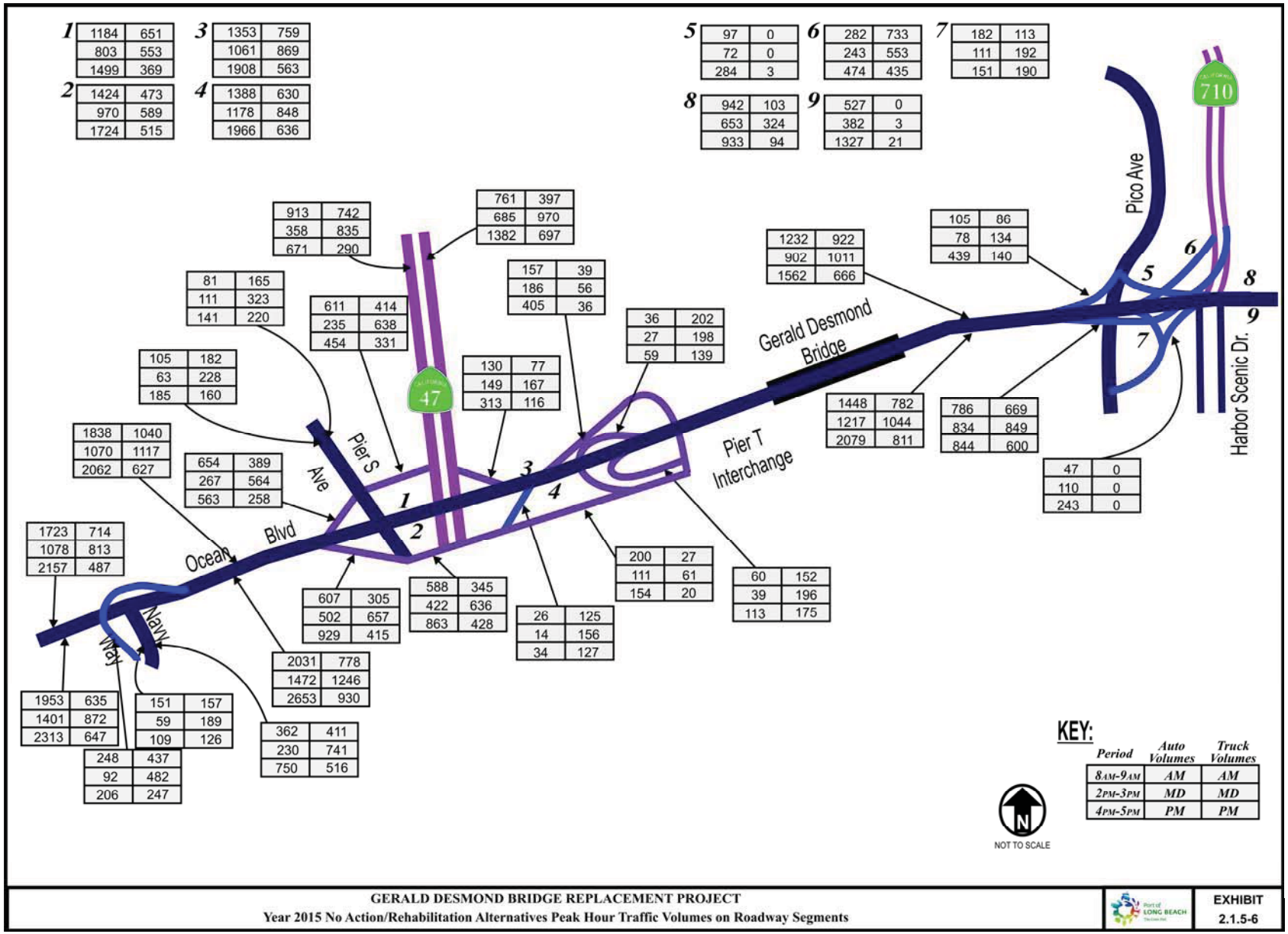
Year 2015 No Action/Rehabilitation Alternatives – Traffic Operations. With the No Action/ Rehabilitation Alternatives, the existing Gerald Desmond Bridge structure and interchanges within the project limits would remain in place; however, the future traffic conditions with the No Action/Rehabilitation Alternatives would be affected by other planned improvements in the traffic study area, which would affect traffic patterns at the project site. One recently completed transportation network improvement is the replacement of the existing at-grade intersections along Ocean Boulevard at SR 47 and Pier S Avenue. This project implemented grade-separated split-diamond interchanges and resulted in Ocean Boulevard becoming a restricted-access facility east of Navy Way. Other planned improvements, including transportation and land development projects that would affect traffic patterns in the traffic study area, are included among the cumulative projects identified in Section 2.4

Table 2.1.5-11
Daily Traffic Volumes on Ocean Boulevard between Terminal Island Interchange and SR 710

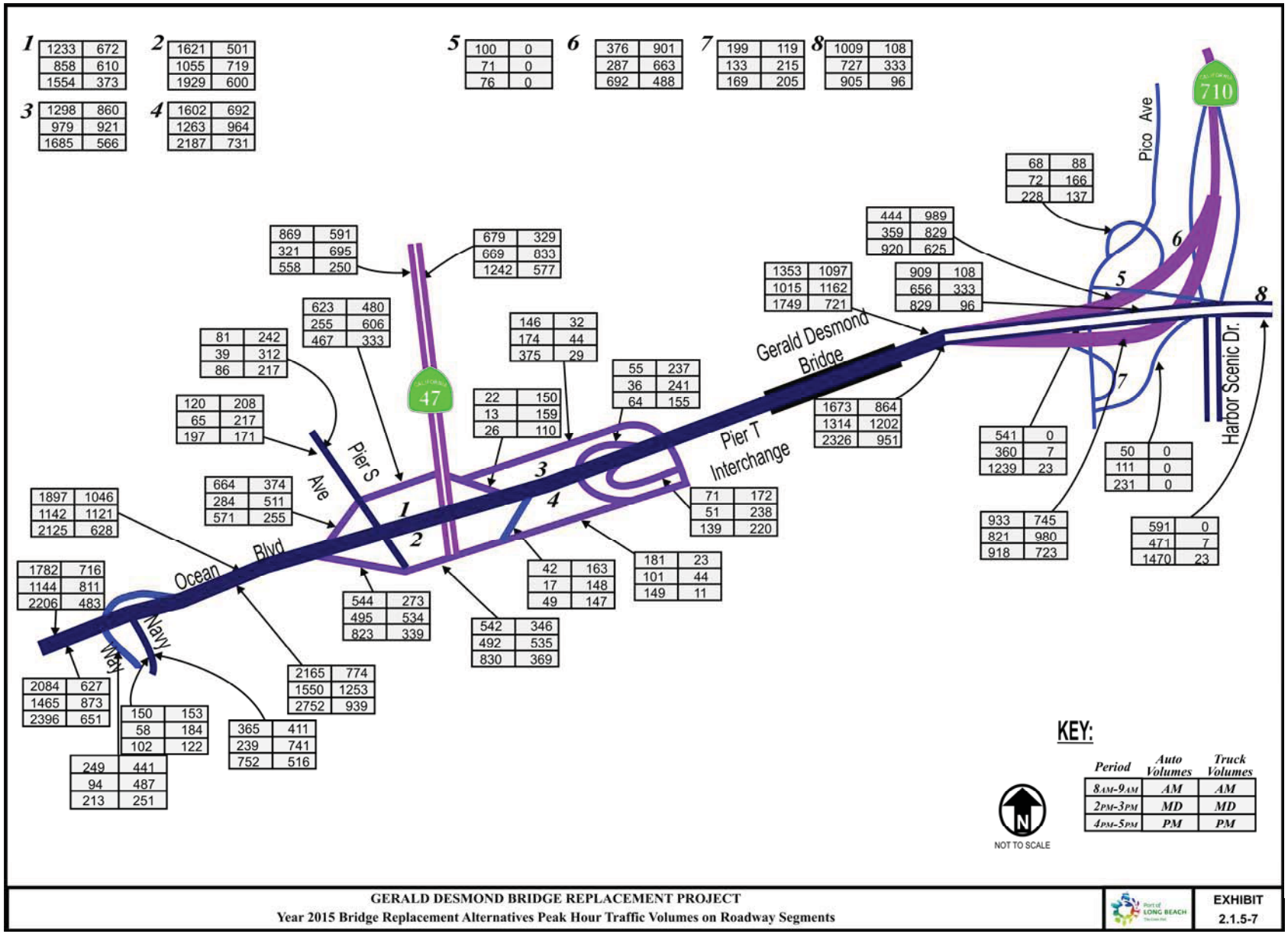
Segment of Ocean Boulevard	Existing	2015 No Action/ Rehabilitation Alternatives	2015 Bridge Replacement Alternatives	2030 No Action/ Rehabilitation Alternatives	2030 Bridge Replacement Alternatives
EB from Horseshoe Ramps to SR 710	34,100	40,870	46,070	62,170	68,850
WB from SR 710 to Horseshoe Ramps	25,600	36,200	40,660	62,500	67,080
TOTAL – SR 710 to Horseshoe Ramps – Bridge	**59,700**	**77,070**	**86,730**	**124,670**	**135,930**

EB – eastbound; WB – westbound

Source: Iteris, 2009.


1
1184 651
803 553
1499 369
2
1424 473
970 589
1724 515
3
1353 759
1061 869
1908 563
4
1388 630
1178 848
1966 636
5
97 0
72 0
284 3
6
282 733
243 553
474 435
7
182 113
111 192
151 190
8
942 103
653 324
933 94
9
527 0
382 3
1327 21
913 742
358 835
671 290
761 397
685 970
1382 697
81 165
111 323
141 220
611 414
235 638
454 331
157 39
186 56
405 36
36 202
27 198
59 139
1232 922
902 1011
1562 666
105 86
78 134
439 140
105 182
63 228
185 160
130 77
149 167
313 116
1838 1040
1070 1117
2062 627
654 389
267 564
563 258
1448 782
1217 1044
2079 811
786 669
834 849
844 600
47 0
110 0
243 0
1723 714
1078 813
2157 487
607 305
502 657
929 415
588 345
422 636
863 428
200 27
111 61
154 20
60 152
39 196
113 175
26 125
14 156
34 127
2031 778
1472 1246
2653 930
1953 635
1401 872
2313 647
151 157
59 189
109 126
362 411
230 741
750 516
248 437
92 482
206 247
47
710
Pico Ave
Gerald Desmond Bridge
Harbor Scenic Dr.
Pier S Ave
Pier T Interchange
Ocean Blvd
Navy Way
KEY:
Period
Auto Volumes
Truck Volumes
8AM-9AM
AM
AM
2PM-3PM
MD
MD
4PM-5PM
PM
PM
NOT TO SCALE
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Year 2015 No Action/Rehabilitation Alternatives Peak Hour Traffic Volumes on Roadway Segments
EXHIBIT
2.1.5-6

This page intentionally left blank.

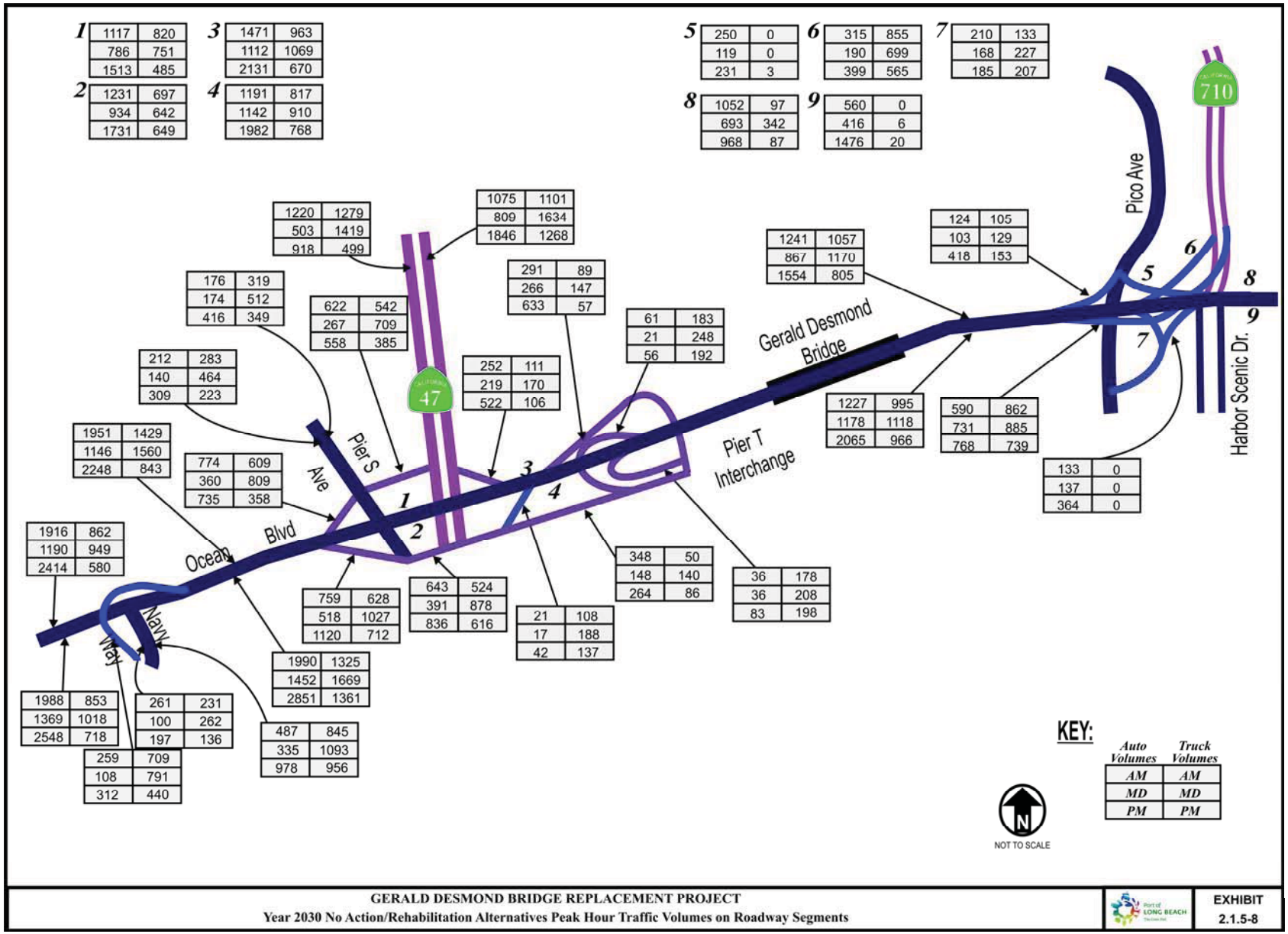


GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Year 2015 Bridge Replacement Alternatives Peak Hour Traffic Volumes on Roadway Segments

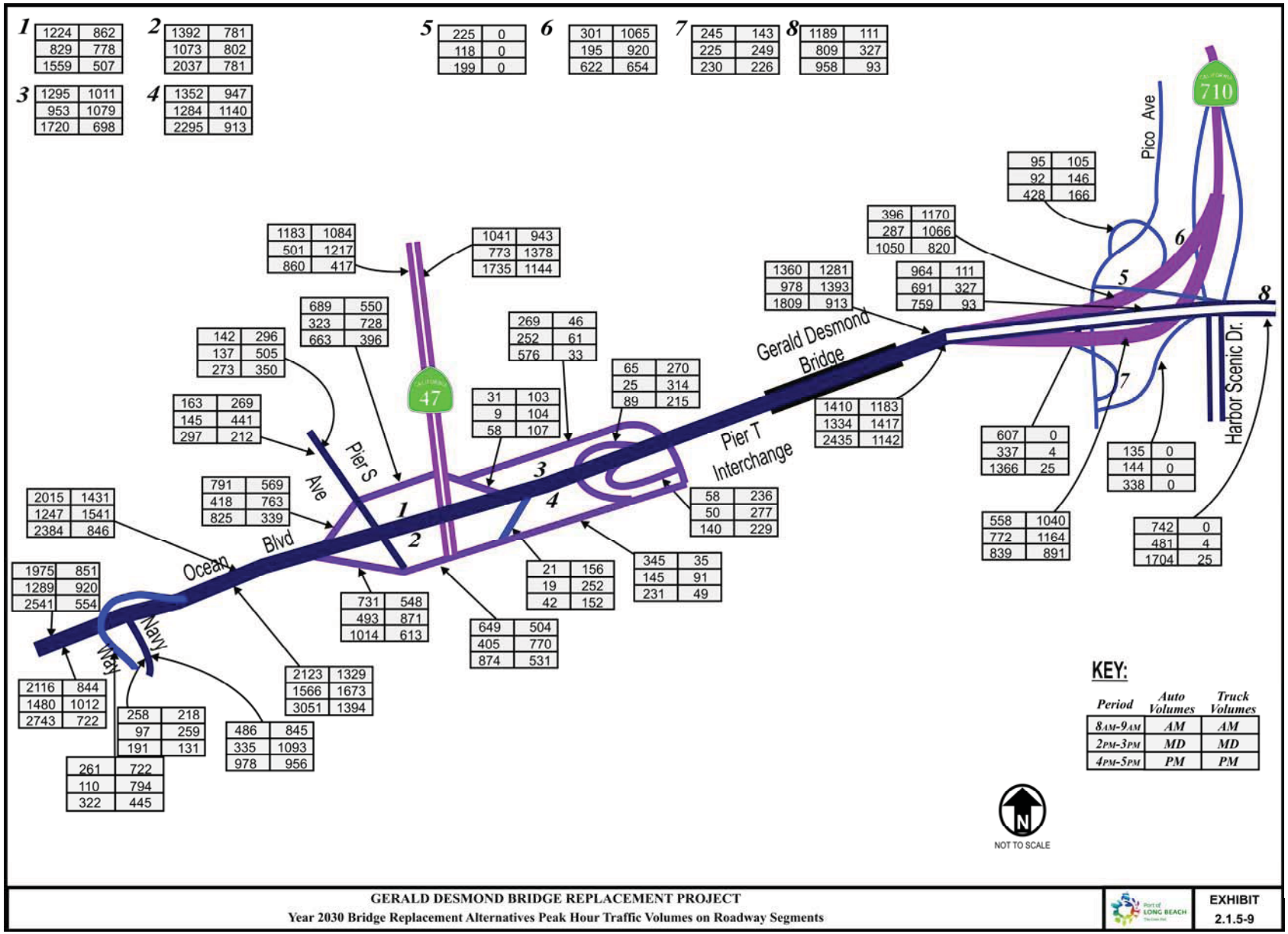
Port of LONG BEACH

EXHIBIT 2.1.5-7

This page intentionally left blank.


1
1117 820
786 751
1513 485
2
1231 697
934 642
1731 649
3
1471 963
1112 1069
2131 670
4
1191 817
1142 910
1982 768
5
250 0
119 0
231 3
6
315 855
190 699
399 565
7
210 133
168 227
185 207
8
1052 97
693 342
968 87
9
560 0
416 6
1476 20
710
Pico Ave
Gerald Desmond Bridge
Harbor Scenic Dr.
Pier T Interchange
Pier S Ave
Ocean Blvd
Navy Way
47
1220 1279
503 1419
918 499
1075 1101
809 1634
1846 1268
176 319
174 512
416 349
622 542
267 709
558 385
291 89
266 147
633 57
61 183
21 248
56 192
1241 1057
867 1170
1554 805
124 105
103 129
418 153
212 283
140 464
309 223
252 111
219 170
522 106
1227 995
1178 1118
2065 966
590 862
731 885
768 739
133 0
137 0
364 0
1951 1429
1146 1560
2248 843
774 609
360 809
735 358
1916 862
1190 949
2414 580
348 50
148 140
264 86
36 178
36 208
83 198
759 628
518 1027
1120 712
643 524
391 878
836 616
21 108
17 188
42 137
1990 1325
1452 1669
2851 1361
1988 853
1369 1018
2548 718
261 231
100 262
197 136
259 709
108 791
312 440
487 845
335 1093
978 956
KEY:
Auto Volumes
Truck Volumes
AM
MD
PM
AM
MD
PM
N
NOT TO SCALE
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Year 2030 No Action/Rehabilitation Alternatives Peak Hour Traffic Volumes on Roadway Segments
Port of LONG BEACH
EXHIBIT
2.1.5-8

This page intentionally left blank.


1
1224 862
829 778
1559 507
2
1392 781
1073 802
2037 781
3
1295 1011
953 1079
1720 698
4
1352 947
1284 1140
2295 913
5
225 0
118 0
199 0
6
301 1065
195 920
622 654
7
245 143
225 249
230 226
8
1189 111
809 327
958 93
710
Pico Ave
95 105
92 146
428 166
396 1170
287 1066
1050 820
964 111
691 327
759 93
1360 1281
978 1393
1809 913
Gerald Desmond Bridge
Harbor Scenic Dr.
607 0
337 4
1366 25
135 0
144 0
338 0
742 0
481 4
1704 25
558 1040
772 1164
839 891
1410 1183
1334 1417
2435 1142
1183 1084
501 1217
860 417
1041 943
773 1378
1735 1144
689 550
323 728
663 396
269 46
252 61
576 33
65 270
25 314
89 215
142 296
137 505
273 350
163 269
145 441
297 212
31 103
9 104
58 107
47
Pier S Ave
Pier T Interchange
58 236
50 277
140 229
791 569
418 763
825 339
2015 1431
1247 1541
2384 846
Ocean Blvd
1975 851
1289 920
2541 554
345 35
145 91
231 49
21 156
19 252
42 152
731 548
493 871
1014 613
649 504
405 770
874 531
Navy Way
2116 844
1480 1012
2743 722
258 218
97 259
191 131
261 722
110 794
322 445
2123 1329
1566 1673
3051 1394
486 845
335 1093
978 956
KEY:
Period
Auto Volumes
Truck Volumes
8AM-9AM
AM
AM
2PM-3PM
MD
MD
4PM-5PM
PM
PM
N
NOT TO SCALE
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Year 2030 Bridge Replacement Alternatives Peak Hour Traffic Volumes on Roadway Segments
Port of LONG BEACH
EXHIBIT
2.1.5-9

This page intentionally left blank.

Table 2.1.5-12
Years 2015 and 2030 Forecast Peak-Hour LOS on Roadway Segments

				Year 2005		Year 2015				Year 2030			
				Existing		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives	
	Segment	From	To	Speed* or Vehicle Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
AM Peak Hour													
1	EB Ocean Blvd	Navy Way	Pier S Avenue	38*	A	19.3	C	20.2	C	115.1	F	25.6	C
	WB Ocean Blvd	Pier S Avenue	Navy Way	30.4*	B	19.8	C	23.7	C	24.6	C	25.4	C
2	EB Ocean Blvd	Pier S Avenue	Terminal Island Freeway	10.6*	F	17.4	B	20.8	C	22.7	C	23.0	C
	WB Ocean Blvd	Terminal Island Freeway	Pier S Avenue	9.4*	F	16.6	B	19.8	C	19.0	C	20.8	C
3	EB Ocean Blvd	Terminal Island Freeway	Horseshoe Ramps	29.6*	B	17.8	B	21.4	C	18.1	C	23.7	C
	WB Ocean Blvd	Horseshoe Ramps	Terminal Island Freeway	14.4*	E	12.7	B	41.3	E	15.8	B	34.0	D
4	EB Gerald Desmond Bridge	Upgrade	Crest	17.0	B	23.3	C	24.8	C	23.2	C	29.5	D
	EB Gerald Desmond Bridge	Crest	Downgrade	21.8	C	28.6	D	21.3	C	27.7	D	24.3	C
5	WB Gerald Desmond Bridge	Upgrade	Crest	20.2	C	60.9	F	22.3	C	79.2	F	25.4	C
	WB Gerald Desmond Bridge	Crest	Downgrade	20.1	C	27.0	D	19.9	C	30.5	D	22.2	C
6	NB Connector	EB Ocean Blvd	NB SR 710	13.8	B	16.2	B	10.1	A	11.9	B	9.3	A
	SB Connector	SB SR 710	WB Ocean Blvd	17.4	B	25.7	C	17.8	B	30.6	D	19.6	C
7	SR 710 NB	NB Connector	NB SR 710 Mainline	14.2	B	15.9	B	10.1	A	11.1	B	9.1	A
	SR 710 SB	SB SR 710 Mainline	SB Connector	9.2	A	13.8	B	17.4	B	16.3	B	19.1	C
8	EB Ocean Blvd	NB Connector	Downtown	4.6	A	5.3	A	13.4	B	7.8	A	15.0	B
	WB Ocean Blvd	Downtown	SB Connector	6.6	A	7.3	A	16.0	B	5.8	A	17.0	B

Table 2.1.5-12
Years 2015 and 2030 Forecast Peak-Hour LOS on Roadway Segments

	Segment	From	To	Year 2005		Year 2015				Year 2030			
				Existing		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives	
				Speed* or Vehicle Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
MD Peak Hour													
1	EB Ocean Blvd	Navy Way	Pier S Avenue	37.6*	A	22.0	C	23.0	C	175.3	F	165.8	F
	WB Ocean Blvd	Pier S Avenue	Navy Way	31.8*	B	18.4	C	22.0	C	19.3	C	22.8	C
2	EB Ocean Blvd	Pier S Avenue	Terminal Island Freeway	14*	E	16.5	B	21.0	C	17.3	B	19.2	C
	WB Ocean Blvd	Terminal Island Freeway	Pier S Avenue	9.2*	F	14.6	B	18.0	B	17.7	B	19.7	C
3	EB Ocean Blvd	Terminal Island Freeway	Horseshoe Ramps	29.5*	B	16.7	B	21.0	C	12.7	B	15.2	B
	WB Ocean Blvd	Horseshoe Ramps	Terminal Island Freeway	13.7*	E	12.8	B	47.0	F	127.7	F	47.6	F
4	EB Gerald Desmond Bridge	Upgrade	Crest	18.8	C	28.2	D	28.0	D	19.3	C	21.9	C
	EB Gerald Desmond Bridge	Crest	Downgrade	23.1	C	30.1	D	22.0	C	22.2	C	17.2	B
5	WB Gerald Desmond Bridge	Upgrade	Crest	19.4	C	52.0	F	21.0	C	70.8	F	24.5	C
	WB Gerald Desmond Bridge	Crest	Downgrade	19.0	C	25.4	C	19.0	C	29.6	D	21.4	C
6	NB Connector	EB Ocean Blvd	NB SR 710	16.0	B	18.0	B	13.0	B	11.8	B	8.8	A
	SB Connector	SB SR 710	WB Ocean Blvd	10.7	A	26.2	D	17.0	B	31.1	D	20.0	C
7	SR 710 NB	NB Connector	NB SR 710 Mainline	17.4	B	18.1	C	13.0	B	11.3	B	9.0	A
	SR 710 SB	SB SR 710 Mainline	SB Connector	6.5	A	14.7	B	16.0	B	16.9	B	20.0	C
8	EB Ocean Blvd	NB Connector	Downtown	1.8	A	3.3	A	9.0	A	4.3	A	7.3	A
	WB Ocean Blvd	Downtown	SB Connector	6.6	A	5.0	A	12.0	B	4.4	A	12.2	B

Table 2.1.5-12
Years 2015 and 2030 Forecast Peak-Hour LOS on Roadway Segments

Segment		From	To	Year 2005		Year 2015				Year 2030			
				Existing		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives	
				Speed* or Vehicle Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
PM Peak Hour													
1	EB Ocean Blvd	Navy Way	Pier S Avenue	36.1*	A	24.4	C	24.8	C	178.0	F	156.0	F
	WB Ocean Blvd	Pier S Avenue	Navy Way	33.8*	B	20.3	C	24.0	C	26.0	D	29.0	D
2	EB Ocean Blvd	Pier S Avenue	Terminal Island Freeway	9.7*	F	20.0	C	24.3	C	21.3	C	29.4	D
	WB Ocean Blvd	Terminal Island Freeway	Pier S Avenue	9.3*	F	22.9	C	24.8	C	23.4	C	28.2	D
3	EB Ocean Blvd	Terminal Island Freeway	Horseshoe Ramps	29.7*	B	20.4	C	24.6	C	16.4	B	25.2	D
	WB Ocean Blvd	Horseshoe Ramps	Terminal Island Freeway	12.7*	E	18.6	C	17.9	B	20.9	C	20.4	C
4	EB Gerald Desmond Bridge	Upgrade	Crest	20.2	C	26.7	D	29.2	D	20.7	C	28.8	D
	EB Gerald Desmond Bridge	Crest	Downgrade	25.7	C	32.9	D	24.7	C	26.1	C	24.3	C
5	WB Gerald Desmond Bridge	Upgrade	Crest	18.9	C	56.3	F	22.0	C	109.1	F	25.5	C
	WB Gerald Desmond Bridge	Crest	Downgrade	19.5	C	28.9	D	20.2	C	32.6	D	23.2	C
6	NB Connector	EB Ocean Blvd	NB SR 710	13.2	B	16.7	B	14.1	B	10.2	A	9.5	A
	SB Connector	SB SR 710	WB Ocean Blvd	14.4	B	20.4	C	14.3	B	23.4	C	16.0	B
7	SR 710 NB	NB Connector	NB SR 710 Mainline	13.8	B	16.2	B	13.7	B	9.5	A	9.1	A
	SR 710 SB	SB SR 710 Mainline	SB Connector	8.3	A	10.6	A	13.7	B	11.8	B	15.6	B
8	EB Ocean Blvd	NB Connector	Downtown	8.5	A	7.3	A	13.6	B	8.8	A	16.0	B
	WB Ocean Blvd	Downtown	SB Connector	6.9	A	8.6	A	20.8	C	7.9	A	19.4	C

LOS - Level of Service ; NB - Northbound; SB - Southbound; EB - Eastbound; WB - Westbound

* In the existing year 2005 condition, Segments 1-3 are analyzed as arterial segments because of the presence of traffic signals on Ocean Boulevard at the Terminal Island Freeway, Pier S Avenue, and Navy Way. The LOS for arterials is determined by speed (in mph). All other segments are analyzed as multi-lane highways whose LOS is determined by vehicle density (vehicles per lane per mile).

Source: Iteris, 2009.

Table 2.1.5-13
Years 2015 and 2030 Forecast Peak-Hour LOS at Ramp Junctions

Ramp Location	AM Peak		MD Peak		PM Peak	
	Density (pc/mi/ln)	LOS[1]	Density (pc/mi/ln)	LOS[1]	Density (pc/mi/ln)	LOS[1]
Year 2015 No Action/Rehabilitation Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	16.8	B	16.0	B	17.7	B
Horseshoe Off-Ramp to Pier T Avenue	24.9	C	23.3	C	24.5	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	16.9	B	17.8	B	20.2	C
Ocean Boulevard to SR 710/Downtown Diverge	14.2	B	15.6	B	20.0	B
Ocean Boulevard to Pico Avenue Off-Ramp	6.9	A	5.6	A	13.7	B
Year 2015 Bridge Replacement Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp to Ocean Boulevard	17.0	B	14.4	B	16.4	B
Off-Ramp to Pier T Avenue	21.5	C	20.3	C	20.4	C
EB Ocean Boulevard						
On-Ramp from Pier T Avenue	18.9	B	19.8	B	22.9	C
Ocean Boulevard / SR 710 Diverge	22.5	C	24.6	C	25.8	C
Ocean Boulevard to Pico Avenue	17.6	B	20.3	C	18.0	B
Year 2030 No Action/Rehabilitation Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	17.9	B	17.0	B	18.6	B
Horseshoe Off-Ramp to Pier T Avenue	26.8	C	25.0	C	26.2	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	17.4	B	18.2	B	21.3	C
Ocean Boulevard to SR 710/Downtown Diverge	15.0	B	16.2	B	21.9	C
Ocean Boulevard to Pico Avenue Off-Ramp	6.9	A	6.6	A	13.8	B
Year 2030 Bridge Replacement Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp to Ocean Boulevard	18.8	B	16.7	B	19.6	B
Off-Ramp to Pier T Avenue	23.1	C	22.0	C	22.5	C
EB Ocean Boulevard						
On-Ramp from Pier T Avenue	20.1	C	21.5	C	24.7	C
Ocean Boulevard / SR 710 Diverge	24.0	C	27.6	C	28.6	D
Ocean Boulevard to Pico Avenue	18.9	B	23.5	C	20.3	C

EB – eastbound; LOS – level of service; pc/mi/ln – passenger cars per mile per lane; WB – westbound

[1] LOS criteria for freeway weaving areas are in density (pc/mi/ln). Density ranges for different LOS types: LOS A, 0 – 10; LOS B, 10.1 – 20; LOS C, 20.1 – 28; LOS D, 28.1 – 35; LOS E, 35.1 – 43; LOS F, > 43.

Source: Iteris, 2009.

Table 2.1.5-14
Years 2015 and 2030 Forecast Peak-Hour LOS at Intersections

Intersection		Year 2005			Year 2015						Year 2030					
		Existing			No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives			No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives		
		LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*
AM Peak Hour																
1	Terminal Island Freeway/ Ocean Blvd	C		0.792	B		0.661	B		0.648	F		1.255	F		1.130
2	Pier S Ave/Ocean Blvd	C		0.709	B		0.681	B		0.679	F		1.110	F		1.008
3	Pier S Ave/New Dock St	A		0.327	A		0.328	A		0.352	B		0.678	A		0.591
4	Navy Way/Seaside Ave	A		0.474	C		0.735	C		0.776	E		0.904	E		0.931
5	Pico Avenue/ Pier B Street & 9th Street	A		0.428	B		0.606	A		0.594	C		0.766	C		0.708
6	Pico Avenue/Pier C Street	A		0.309	A		0.376	A		0.378	A		0.442	A		0.446
7	Terminal Island Freeway SB Off-Ramp/New Dock St	B	*10.8*		B	*12.2*		B	*10.8*		F	*95.1*		E	*48.2*	
	Analyzed as signalized	A		0.217	A		0.441	A		0.339	E		0.913	C		0.793
8	Terminal Island Freeway NB On-Ramp/New Dock St	A	*7.4*		A	*9.1*		A	*8.9*		C	*15.9*		B	*13.9*	
9	Pico Avenue/Pier D Street[a]	B	*10.1*		C	*23.3*		A		0.492	F	*55.1*		B		0.630
10	Pico Avenue/Broadway	B	*10.6*		B	*10.6*		B	*10.3*		B	*11.9*		B	*11.9*	
11	Pico Avenue/Pier E Street[a]	A	*9.9*		B	*12.4*		A		0.331	C	*18.7*		A		0.465
12	Ocean Blvd/Golden Shore Street	A		0.570	B		0.628	B		0.637	B		0.658	B		0.670
13	Ocean Blvd/Magnolia Ave	B		0.693	E		0.907	E		0.929	E		0.982	F		1.099

Table 2.1.5-14
Years 2015 and 2030 Forecast Peak-Hour LOS at Intersections

Intersection		Year 2005			Year 2015						Year 2030					
		Existing			No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives			No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives		
		LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*
MD Peak Hour																
1	Terminal Island Freeway/ Ocean Blvd	D		0.833	E		0.966	D		0.899	F		1.471	F		1.304
2	Pier S Ave/Ocean Blvd	C		0.700	C		0.761	B		0.656	F		1.274	F		1.202
3	Pier S Ave/New Dock St	A		0.350	A		0.420	A		0.432	D		0.843	C		0.739
4	Navy Way/Seaside Ave	A		0.414	C		0.753	C		0.768	D		0.854	D		0.875
5	Pico Avenue/ Pier B Street & 9th Street	A		0.455	A		0.594	B		0.613	D		0.897	B		0.640
6	Pico Avenue/Pier C Street	A		0.340	A		0.309	A		0.306	A		0.385	A		0.381
7	Terminal Island Freeway SB Off-Ramp/New Dock St	A	*9.1*		B	*13.3*		B	*12.1*		E	*47.3*		D	*29.6*	
	Analyzed as signalized	A		0.215	A		0.448	A		0.396	D		0.895	C		0.794
8	Terminal Island Freeway NB On-Ramp/New Dock St	A	*7.6*		B	*11.9*		B	*11.1*		D	*30.6*		C	*22.5*	
9	Pico Avenue/Pier D Street[a]	B	*11.3*		C	*19.2*		A		0.432	E	*42.0*		A		0.529
10	Pico Avenue/Broadway	B	*11.2*		A	*9.8*		A	*9.9*		B	*10.7*		B	*11.3*	
11	Pico Avenue/Pier E Street[a]	B	*11.8*		B	*14.0*		A		0.410	C	23.9		A		0.559
12	Ocean Blvd/Golden Shore Street	A		0.569	B		0.691	C		0.708	C		0.733	C		0.735
13	Ocean Blvd/Magnolia Ave	A		0.575	C		0.741	C		0.785	D		0.869	E		0.912

Table 2.1.5-14
Years 2015 and 2030 Forecast Peak-Hour LOS at Intersections

Intersection		Year 2005			Year 2015						Year 2030					
		Existing			No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives			No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives		
		LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*	LOS	*Del/ Veh**	V/C Ratio*
PM Peak Hour																
1	Terminal Island Freeway/ Ocean Blvd	E		0.912	D		0.865	D		0.813	F		1.181	F		1.170
2	Pier S Ave/Ocean Blvd	D		0.824	B		0.650	A		0.597	F		1.114	F		1.011
3	Pier S Ave/New Dock St	A		0.356	A		0.337	A		0.337	B		0.684	A		0.588
4	Navy Way/Seaside Ave	A		0.581	E		0.914	E		0.935	F		1.091	F		1.125
5	Pico Avenue/ Pier B Street & 9th Street	A		0.494	A		0.575	A		0.588	B		0.688	B		0.625
6	Pico Avenue/Pier C Street	A		0.343	A		0.306	A		0.308	A		0.402	A		0.402
7	Terminal Island Freeway SB Off-Ramp/New Dock St	A	*9.3*		B	*10.5*		B	*10.3*		C	*15.4*		C	*15.3*	
	Analyzed as signalized	A		0.253	A		0.385	A		0.356	B		0.626	A		0.554
8	Terminal Island Freeway NB On-Ramp/New Dock St	A	*7.9*		B	*10.8*		B	*10.1*		D	*32.7*		C	*21.7*	
9	Pico Avenue/Pier D Street[a]	B	*10.7*		C	*15.5*		A		0.399	E	*36.8*		A		0.543
10	Pico Avenue/Broadway	B	*10.5*		A	*9.3*		A	*10.0*		B	*10.3*		B	*11.4*	
11	Pico Avenue/Pier E Street[a]	B	*11.3*		C	*18.9*		A		0.582	E	*47.6*		C		0.782
12	Ocean Blvd/Golden Shore Street	A		0.593	B		0.693	C		0.719	C		0.739	D		0.801
13	Ocean Blvd/Magnolia Ave	B		0.601	C		0.771	C		0.765	D		0.865	E		0.930

Notes:

LOS - Level of Service ; NB - Northbound; SB - Southbound; N/A - Not Applicable

* Volume-to-capacity (V/C) ratio is reported for signalized intersections and average stopped delay per vehicle (Del/Veh) in seconds is reported for unsignalized intersections *in italics*.

[a] This intersection is currently stop-sign controlled, and a traffic signal would be added at this intersection to accommodate construction detour routing required under the Bridge Replacement Alternatives (signal would be in place by year 2015); therefore, this intersection has been analyzed as a signalized intersection in the 2015 and 2030 future years under the Bridge Rehabilitation Alternatives. There would be no signal installed at this intersection under the No Action/Rehabilitation Alternatives, so this intersection has been analyzed as an unsignalized (stop-sign controlled) intersection in the 2015 and 2030 future years under the No Action/Rehabilitation Alternatives.

Source: Iteris, 2009.

(Cumulative Impacts) of this document. The additional vehicular trips generated by planned transportation and land development projects are included in the traffic forecasting model used for this study (refer to Appendix G for details on the development of the traffic forecasting model).

Two potential transportation improvement projects are not included among the improvements included in the traffic forecasting model. These projects were not defined at the time that the traffic forecasting model was specified. These projects are truck lanes on SR 710 and I-710 and the SR 47 Expressway improvements, including the direct "flyover" connector ramp serving traffic from EB Ocean Boulevard to NB SR 47. These projects are included in a sensitivity traffic analysis presented in Section 2.4.4.3, which explicitly addresses the traffic effects of these two projects, as well as the effects of all other cumulative projects.

In general, in year 2015 with the No Action/ Rehabilitation Alternatives, peak-hour operating conditions are forecast to be acceptable LOS D or better in the traffic study area except that:

- LOS F would occur during all peak hours on the WB upgrade of the Gerald Desmond Bridge (Segment 5) where three lanes transition to two at the crest of the bridge;
- LOS E conditions would occur at the Terminal Island Freeway signalized intersection with the Ocean Boulevard ramps (Intersection 1) during the MD peak hour;
- LOS E is forecast for the PM peak hour at the intersection of Navy Way and Seaside Avenue (Intersection 4); and
- LOS E would occur during the AM peak hour at the signalized intersection of Ocean Boulevard and Magnolia Avenue (Intersection 13).

Year 2015 Bridge Replacement Alternatives – Traffic Operations. Both the North-side and South-side Alignment Alternatives would provide a new bridge with grades of approximately 5 percent carrying three lanes in each direction across the bridge and on the roadways approaching and leaving the bridge in both directions. Outside the limits of the proposed project site, the roadway network with the Year 2015 Bridge Replacement Alternatives would be the same as described under the Year 2015 No Action/Rehabilitation Alternatives.

In general, in year 2015 with the Bridge Replacement Alternatives, peak-hour operating conditions are forecast to be acceptable LOS A to D in the traffic study area, except that:

- WB Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway (Segment 3) during the AM and MD peak hours is forecast to operate at LOS E and F, respectively;
- LOS E is forecast for the PM peak hour at the intersection of Navy Way and Seaside Avenue (Intersection 4); and
- LOS E would occur during the AM peak hour at the signalized intersection of Ocean Boulevard and Magnolia Avenue (Intersection 13).

Year 2030 No Action/Rehabilitation Alternatives – Traffic Operations. The Year 2030 No Action/ Rehabilitation Alternatives roadway network would be the same as described under the Year 2015 No Action/Rehabilitation Alternatives. In general, in year 2030 with the No Action/Rehabilitation Alternatives, peak-hour operating conditions are forecast to be acceptable LOS D or better in the traffic study area, except that:

- LOS F would occur on EB Ocean Boulevard between Navy Way and Pier S Avenue (Segment 1) during all peak hours;
- LOS F would occur on WB Ocean Boulevard between the Horseshoe Ramps and the Terminal Island Freeway (Segment 3) during the MD peak hour;
- LOS F would occur during all peak hours on the WB upgrade of the Gerald Desmond Bridge (Segment 5) where three lanes transition to two at the crest of the bridge; and
- Intersection LOS is forecast to be LOS E or LOS F during one or more of the three peak hours analyzed at the following locations:
  - Terminal Island Freeway and Ocean Boulevard (Intersection 1);
  - Pier S Avenue and Ocean Boulevard (Intersection 2);
  - Navy Way and Seaside Avenue (Intersection 4);
  - Terminal Island Freeway SB Off-Ramp and New Dock (Intersection 7);
  - Pico Avenue and Pier D Street (Intersection 9);
  - Pico Avenue and Pier E Street (Intersection 11); and
  - Ocean Boulevard and Magnolia Avenue (Intersection 13).

Year 2030 Bridge Replacement Alternatives – Traffic Operations. The roadway network with the Bridge Replacement Alternatives would be the same in year 2030 as in year 2015. In general, in year 2030 with the Bridge Replacement Alternatives, peak-hour operating conditions are forecast to be acceptable LOS A to D, except that:

- EB Ocean Boulevard from Navy Way to Pier S Avenue (Segment 1) is forecast to operate at LOS F in the MD and PM peak hours;
- WB Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway (Segment 3) is forecast to operate at LOS F during the MD peak hour;
- Intersection LOS is forecast to be LOS E or LOS F during one or more of the three peak hours analyzed at the following locations:
  - Terminal Island Freeway and Ocean Boulevard (Intersection 1);
  - Pier S Avenue and Ocean Boulevard (Intersection 2);
  - Navy Way and Seaside Avenue (Intersection 4);
  - Terminal Island Freeway SB Off-Ramp and New Dock (Intersection 7); and
  - Ocean Boulevard and Magnolia Avenue (Intersection 13).
- The unsignalized intersection of the Terminal Island Freeway SB Off-Ramp with New Dock Street (intersection 7) is forecast to operate at LOS E in the AM peak hour. Because of the forecast LOS E condition, this intersection was reanalyzed for the AM peak hour as a signalized intersection as stated in the Evaluation Criteria section above. With a future signal in place, this intersection would operate at an acceptable LOS C during the AM peak hour.

Adverse Effects to Traffic during Operation of the Bridge Replacement Alternatives

The process used to determine potential direct adverse traffic effects of the Bridge Replacement Alternatives involves comparisons of the future No Action/Rehabilitation Alternatives in years 2015 and 2030 to the future Bridge Replacement Alternatives in years 2015 and 2030. The traffic volumes and traffic operations analysis presented for the future No Action/Rehabilitation Alternatives and the future Bridge Replacement Alternatives include cumulative projects (i.e., those projects presented in Table 2.4-1 and other transportation and land development projects used in the travel demand forecasting model to emulate year 2015 and 2030 land use forecasts for the southern California region). (See Appendix G for more information on the travel demand forecasting model.)

The direct project effects were determined by comparing the future No Action/Rehabilitation Alternatives with the future Bridge Replacement Alternatives. The comparison quantifies the difference in traffic operations at study intersections and on study roadway segments between the future without the project (No Action/ Rehabilitation Alternatives) and the future with the project (Bridge Replacement Alternatives). If the amount of change expected in traffic operations exceeds the criteria identified in Section 2.1.5.3 above, then mitigation for the direct project effect was proposed. The comparison was made independently for the two future years (2015 and 2030), and direct project effects were identified separately for each year. (See Section 2.4.4.3 regarding cumulative effects on traffic.)

There are no criteria for determining adverse effects in ramp junction (i.e., merge and diverge) areas. A review of LOS conditions for ramp merge and diverge locations indicates that in years 2015 and 2030 these locations would operate at acceptable LOS A to D with both the No Action/ Rehabilitation Alternatives and Bridge Replacement Alternatives (refer to Table 2.1.5-13); therefore, no direct adverse effects of the proposed Bridge Replacement Alternatives to traffic are anticipated in the ramp junction areas.

Intersection Analysis:

As shown in Table 2.1.5-15, the comparison of the No Action/Rehabilitation Alternatives to the Bridge Replacement Alternatives for the 13 study intersections shows adverse effects attributed to operation of the Bridge Replacement Alternatives in 2015 and 2030 at Navy Way/Seaside Avenue (Intersection 4) and Ocean Boulevard/Magnolia Avenue (Intersection 13).

Navy Way/Seaside Avenue. The intersection of Navy Way and Seaside Avenue exceeds the City of Los Angeles criteria for adverse effects at an intersection in years 2015 and 2030. LOS C is expected at this intersection during the **AM peak hour in year 2015** under the Bridge Replacement Alternative conditions. The V/C ratio is 0.041 higher under the Bridge Replacement Alternative conditions than under the No Action/Rehabilitation Alternatives, which exceeds the threshold criterion of an increase of 0.040 in the V/C ratio for a build condition LOS C. LOS E is expected at this intersection during the **PM peak hour in year 2015** under the Bridge

Replacement Alternative conditions. The V/C ratio is 0.021 higher under the Bridge Replacement Alternative conditions than under the No Action/Rehabilitation Alternatives, which exceeds the threshold criterion of an increase of 0.010 in the V/C ratio for a build condition LOS E or F.

During the **AM peak hour in year 2030**, LOS E is expected under the Bridge Replacement Alternative conditions at the intersection of Navy Way and Seaside Avenue. The V/C ratio is 0.027 higher under the Bridge Replacement Alternative conditions than under the No Action/Rehabilitation Alternatives, which exceeds the threshold criterion of an increase of 0.010 in the V/C ratio for a build condition LOS E. During the **MD peak hour in year 2030,** LOS D is expected under the Bridge Replacement Alternative conditions. The V/C ratio is 0.021 higher under the Bridge Replacement Alternative conditions than under the No Action/ Rehabilitation Alternatives, which exceeds the threshold criterion of an increase of 0.020 in the V/C ratio for a build condition LOS D. During the **PM peak hour in year 2030**, LOS F is expected under the Bridge Replacement Alternative conditions. The V/C ratio is 0.034 higher under the Bridge Replacement Alternative conditions than under the No Action/Rehabilitation Alternatives, which exceeds the threshold criterion of an increase of 0.010 in the V/C ratio for a build condition LOS F.

An additional left-turn lane from NB Navy Way to WB Seaside Avenue is proposed to mitigate the adverse effect at this intersection. Table 2.1.5-16 shows that the proposed mitigation would result in V/C ratios under the Bridge Replacement Alternative that are less than the V/C ratios under the No Action/Rehabilitation Alternatives; therefore, the proposed mitigation removes the adverse effect under the Bridge Replacement Alternatives.

Ocean Boulevard/Magnolia Avenue. The intersection of Ocean Boulevard and Magnolia Avenue in downtown Long Beach exceeds the City of Long Beach criteria for adverse effects at an intersection in years 2015 and 2030. LOS E is expected at this intersection during the **AM peak hour in year 2015** under the Bridge Replacement Alternative conditions. The V/C ratio is 0.022 higher under the Bridge Replacement Alternative conditions than under the No Action/Rehabilitation Alternatives, which exceeds the threshold criterion of an increase of 0.020 in the V/C ratio for a build condition LOS E. During **all three peak hours in year 2030**, LOS E or F is expected at this intersection under the Bridge Replacement Alternative conditions. The V/C ratio is higher under the Bridge Replacement Alternative conditions than under the No Action/Rehabilitation Alternatives by 0.117, 0.043, and 0.065 during the AM, MD, and PM peak hours, respectively. All of these increases in the V/C ratio exceed the threshold criterion of an increase of 0.010 in the V/C ratio for a build condition LOS E or F.

The expected intersection LOS and changes in V/C ratio are presented in Table 2.1.5-13. One cause of the increase in the V/C ratio is the increased volume traveling through the intersection because the congestion-relief benefits of the Bridge Replacement Alternatives are expected to redistribute traffic to the bridge and approach roadways to avoid other more-congested roadways.

Conversion of the #2 SB through lane on the Magnolia Avenue approach to Ocean Boulevard to a shared through/right-turn lane, along with associated signalization improvements, has been identified as one potential way to mitigate the adverse effect at this intersection. Table 2.1.5-17 shows that the identified restriping and signalization improvements would result in V/C ratios under the Bridge Replacement Alternative condition that are lower than under the No Action/Rehabilitation Alternatives; therefore, restriping and signalization improvements remove the adverse effect under the Bridge Replacement Alternatives. The Port will coordinate with the Long Beach City Traffic Engineer and provide funding for restriping and/or signalization improvements at the intersection of Ocean Boulevard and Magnolia Avenue as mitigation for the effect of a Bridge Replacement Alternative at the intersection.

Roadway Segment Analysis:

As shown in Table 2.1.5-18, the comparison of the study roadway segments in 2015 and 2030 for the Bridge Replacement Alternatives to the No Action/ Rehabilitation Alternatives shows an adverse effect at WB Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange (Segment 3) during the MD peak hour in 2015 and no adverse effect on any roadway segment in 2030.

WB Segment of Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway Interchange. This segment of Ocean Boulevard is forecast to operate at LOS F during the **MD peak hour in year 2015** under the Bridge Replacement Alternative condition with a density of 47.0 vehicles per lane per mile, as shown in Table 2.1.5-18. In year 2015 under the No Action/ Rehabilitation Alternatives, this segment is forecast to operate at LOS B, with a density of 12.8; therefore, an adverse effect is found under the Bridge Replacement Alternative condition in year

Table 2.1.5-15 Project Effects at Study Intersections

	Intersection	Year 2015								Year 2030							
		No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives			No Action/Rehab Alts. vs. 2015 Bridge Replace Alts.		No Action/ Rehabilitation Alternatives			Bridge Replacement Alternatives			No Action/Rehab Alts. vs. 2030 Bridge Replace Alts.	
		LOS	*Del/Veh**	V/C Ratio*	LOS	*Del/Veh**	V/C Ratio*	Difference	Adverse Effect[b]	LOS	*Del/Veh**	V/C Ratio*	LOS	*Del/Veh**	V/C Ratio*	Difference	Adverse Effect[b]
AM Peak Hour																	
1	Terminal Island Freeway/Ocean Boulevard	B		0.661	B		0.648	-0.013	No	F		1.255	F		1.130	-0.125	No
2	Pier S Avenue/Ocean Boulevard	B		0.681	B		0.679	-0.002	No	F		1.110	F		1.008	-0.102	No
3	Pier S Avenue/New Dock Street	A		0.328	A		0.352	0.024	No	B		0.678	A		0.591	-0.087	No
4	Navy Way/Seaside Avenue	C		0.735	C		0.776	0.041	Yes	E		0.904	E		0.931	0.027	Yes
5	Pico Avenue/Pier B Street & 9th Street	B		0.606	A		0.594	-0.012	No	C		0.766	C		0.708	-0.058	No
6	Pico Avenue/Pier C Street	A		0.376	A		0.378	0.002	No	A		0.442	A		0.446	0.004	No
7	Terminal Island Freeway SB Off-Ramp/New Dock St	B	*12.2*		B	*10.8*				F	*95.1*		E	*48.2*			
	analyzed as a signal (see Note B, City of Long Beach)	A		0.441	A		0.339	-0.102	No	E		0.913	C		0.793	-0.120	No
8	Terminal Island Freeway NB On-Ramp/New Dock St	A	*9.1*		A	*8.9*		*-0.2*	No	C	*15.9*		B	*13.9*		*-2.0*	No
9	Pico Avenue/Pier D Street[a]	C	*23.3*		A		0.492	*N/A*	No	F	*55.1*		B		0.630	*N/A*	No
10	Pico Avenue/Broadway	B	*10.6*		B	*10.3*		*-0.3*	No	B	*11.9*		B	*11.9*		*0.0*	No
11	Pico Avenue/Pier E Street[a]	B	*12.4*		A		0.331	*N/A*	No	C	*18.7*		A		0.465	*N/A*	No
12	Ocean Boulevard/Golden Shore Street	B		0.628	B		0.637	0.009	No	B		0.658	B		0.670	0.012	No
13	Ocean Boulevard/Magnolia Avenue	E		0.907	E		0.929	0.022	Yes	E		0.982	F		1.099	0.117	Yes
MD Peak Hour																	
1	Terminal Island Freeway/Ocean Boulevard	E		0.966	D		0.899	-0.067	No	F		1.471	F		1.304	-0.167	No
2	Pier S Avenue/Ocean Boulevard	C		0.761	B		0.656	-0.105	No	F		1.274	F		1.202	-0.072	No
3	Pier S Avenue/New Dock Street	A		0.420	A		0.432	0.012	No	D		0.843	C		0.739	-0.104	No
4	Navy Way/Seaside Avenue	C		0.753	C		0.768	0.015	No	D		0.854	D		0.875	0.021	Yes
5	Pico Avenue/Pier B Street & 9th Street	A		0.594	B		0.613	0.019	No	D		0.897	B		0.640	-0.257	No
6	Pico Avenue/Pier C Street	A		0.309	A		0.306	-0.003	No	A		0.385	A		0.381	-0.004	No
7	Terminal Island Freeway SB Off-Ramp/New Dock St	B	*13.3*		B	*12.1*		*-1.2*	No	E	*47.3*		D	*29.6*		*-17.7*	No
	analyzed as a signal (see Note B, City of Long Beach)	A		0.448	A		0.396	-0.052	No	D		0.895	C		0.794	-0.101	No
8	Terminal Island Freeway NB On-Ramp/New Dock St	B	*11.9*		B	*11.1*		*-0.8*	No	D	*30.6*		C	*22.5*		*-8.1*	No
9	Pico Avenue/Pier D Street[a]	C	*19.2*		A		0.432	*N/A*	No	E	*42.0*		A		0.529	*N/A*	No
10	Pico Avenue/Broadway	A	*9.8*		A	*9.9*		*0.1*	No	B	*10.7*		B	*11.3*		*0.6*	No
11	Pico Avenue/Pier E Street[a]	B	*14.0*		A		0.410	*N/A*	No	C	*23.9*		A		0.559	*N/A*	No
12	Ocean Boulevard/Golden Shore Street	B		0.691	C		0.708	0.017	No	C		0.733	C		0.735	0.002	No
13	Ocean Boulevard/Magnolia Avenue	C		0.741	C		0.785	0.044	No	D		0.869	E		0.912	0.043	Yes
PM Peak Hour																	
1	Terminal Island Freeway/Ocean Boulevard	D		0.865	D		0.813	-0.052	No	F		1.181	F		1.170	-0.011	No
2	Pier S Avenue/Ocean Boulevard	B		0.650	A		0.597	-0.053	No	F		1.114	F		1.011	-0.103	No
3	Pier S Avenue/New Dock Street	A		0.337	A		0.337	0.000	No	B		0.684	A		0.588	-0.096	No
4	Navy Way/Seaside Avenue	E		0.914	E		0.935	0.021	Yes	F		1.091	F		1.125	0.034	Yes
5	Pico Avenue/Pier B Street & 9th Street	A		0.575	A		0.588	0.013	No	B		0.688	B		0.625	-0.063	No
6	Pico Avenue/Pier C Street	A		0.306	A		0.308	0.002	No	A		0.402	A		0.402	0.000	No
7	Terminal Island Freeway SB Off-Ramp/New Dock St	B	*10.5*		B	*10.3*		*-0.2*	No	C	*15.4*		C	*15.3*		*-0.1*	No
	analyzed as a signal (see Note B, City of Long Beach)	A		0.385	A		0.356	-0.029	No	B		0.626	A		0.554	-0.072	No
8	Terminal Island Freeway NB On-Ramp/New Dock St	B	*10.8*		B	*10.1*		*-0.7*	No	D	*32.7*		C	*21.7*		*-11.0*	No
9	Pico Avenue/Pier D Street[a]	C	*15.5*		A		0.399	*N/A*	No	E	*36.8*		A		0.543	*N/A*	No
10	Pico Avenue/Broadway	A	*9.3*		A	*10.0*		*0.7*	No	B	*10.3*		B	*11.4*		*1.1*	No
11	Pico Avenue/Pier E Street[a]	C	*18.9*		A		0.582	*N/A*	No	E	*47.6*		C		0.782	*N/A*	No
12	Ocean Boulevard/Golden Shore Street	B		0.693	C		0.719	0.026	No	C		0.739	D		0.801	0.062	No
13	Ocean Boulevard/Magnolia Avenue	C		0.771	C		0.765	-0.006	No	D		0.865	E		0.930	0.065	Yes

Notes: LOS - Level of Service ; NB - Northbound; SB - Southbound; N/A - Not Applicable

* Volume-to-capacity (V/C) ratio is reported for signalized intersections and average stopped delay per vehicle (Del/Veh) in seconds is reported for unsignalized intersections *in italics*. "Difference" is the change in the applicable V/C ratio or Del/Veh.

a This intersection is currently stop-sign controlled and a traffic signal would be added at this intersection to accommodate construction detour routing required under the Bridge Replacement Alternatives (signal would be in place by year 2015). Therefore, this intersection has been analyzed as a signalized intersection in the 2015 and 2030 future years under the Bridge Rehabilitation Alternatives. There would be no signal installed at this intersection under the No Action/Rehabilitation Alternatives, so this intersection has been analyzed as an unsignalized (stop sign controlled) intersection in the 2015 and 2030 future years under the No Action/Rehabilitation Alternatives.

b **Criteria and Thresholds Used to Determine Adverse Effect:**

- City of Long Beach, signalized intersections (applies to intersections #1-3, #5-6, and #12-13): Adverse effect would occur where the Build condition (Bridge Replacement Alternatives) would result in LOS E or F and the intersection V/C ratio increases by more than 0.020 over the No Build (No Action/Rehabilitation Alternatives) condition or the existing condition.
- City of Long Beach, unsignalized intersections (applies to intersections #7-11): The City has no established criteria for determination of adverse effects at unsignalized intersections. If the Build condition has an LOS E or F at an unsignalized intersection, then the intersection must be reanalyzed using the signalized intersection method and criteria to identify any adverse effects. This analysis assumes that there would be an adverse effect under the No Action/Rehabilitation Alternatives if LOS E or F is forecast for an unsignalized intersection in year 2015 or 2030. For comparisons of intersections which are unsignalized under the No Action/Rehabilitation Alternatives and signalized under the Bridge Replacement Alternatives, this analysis assumes that there would be an adverse effect if the Bridge Replacement Alternatives would result in LOS E or F at the future signalized intersection.
- City of Los Angeles (applies to signalized intersection #4): Adverse effect would occur where the final (future) LOS is E or F and an increase in V/C of 0.01 or greater would occur as a result of the project; for LOS D, an increase of 0.02 or greater; or for LOS C, an increase of 0.04 or greater.

Yes Highlight indicates locations with adverse effect where threshold criteria for an adverse effect have been exceeded and the effect is directly attributable to the proposed Bridge Replacement Alternatives.

Source: Iteris, 2009.

This page intentionally left blank.

Table 2.1.5-16
Intersection Effects With and Without Mitigation at Navy Way/Seaside Avenue

Peak Hour		Year 2005		Year 2015				Year 2030			
		Existing		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives	
		LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
AM	Navy Way/ Seaside Avenue	A	0.474	C	0.735	C	0.776	E	0.904	E	0.931
	with Additional NB Left-Turn Lane					C	0.734			D	0.863
MD	Navy Way/ Seaside Avenue	A	0.414	C	0.753	C	0.768	D	0.854	D	0.875
	with Additional NB Left-Turn Lane					C	0.716			D	0.807
PM	Navy Way/ Seaside Avenue	A	0.581	E	0.914	E	0.935	F	1.091	F	1.125
	with Additional NB Left-Turn Lane					D	0.874			F	1.029

LOS – level of service; NB – northbound; V/C – volume-to-capacity ratio
Source: Iteris, 2009.

Table 2.1.5-17
Intersection Effects With and Without Mitigation at Ocean Boulevard/Magnolia Avenue

Peak Hour		Year 2005		Year 2015				Year 2030			
		Existing		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replacement Alternatives	
		LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
AM	Ocean Blvd/ Magnolia Avenue	B	0.693	E	0.907	E	0.929	E	0.982	F	1.099
	with proposed restriping and signalization					C	0.769			E	0.931
MD	Ocean Blvd/ Magnolia Avenue	A	0.575	C	0.741	C	0.785	D	0.869	E	0.912
	with proposed restriping and signalization					B	0.657			D	0.812
PM	Ocean Blvd/ Magnolia Avenue	B	0.601	C	0.771	C	0.765	D	0.865	E	0.930
	with proposed restriping and signalization					B	0.649			C	0.791

LOS – level of service; V/C – volume-to-capacity ratio
Source: Iteris, 2009.

2015 due to the forecast LOS F and increased vehicle density that would occur along this WB segment of Ocean Boulevard.

The better LOS and lower density predicted along this WB segment of Ocean Boulevard under the No Action/Rehabilitation Alternatives than under the Bridge Replacement Alternatives is a result of the existing lane configuration that is reduced from three lanes to two at the crest of the Gerald Desmond Bridge. The existing lane configuration causes an increase in traffic congestion on WB Ocean Boulevard, which limits the volume of vehicles that can flow into the WB segment of Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange, thereby providing a relatively low density and better LOS than would be experienced under the Bridge Replacement Alternative condition. The proposed Bridge Replacement Alternatives include three through lanes in each direction on the bridge, thus eliminating the existing transition from three to two lanes at the crest of the bridge, and thereby allowing a higher volume and density of traffic to flow into the WB segment of Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange. It is predicted that this increase in traffic flow under the Bridge Replacement Alternative condition would strain the Terminal Island Freeway interchange, resulting in an increased traffic queue (traffic backup). The queue would cause traffic on WB Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange to operate poorly at LOS F.

During the **MD peak hour in year 2030,** the WB segment of Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange is forecast to operate at LOS F under both the No Action/Rehabilitation Alternatives and the Bridge Replacement Alternative conditions, with vehicle densities of 127.0 and 47.6, respectively. Because the density is lower under the Bridge Replacement Alternative condition, traffic operations are forecast to be better under the Bridge Replacement Alternative condition; therefore, no adverse effect under the Bridge Replacement Alternative condition would occur in year 2030. The finding of an adverse effect in year 2015 and no adverse effect in year 2030 under the Bridge Replacement Alternative condition results from a deterioration of operating conditions under the No Action/ Rehabilitation Alternatives attributable to local and regional traffic growth between years 2015 and 2030. Operating conditions under the No Action/ Rehabilitation Alternatives deteriorate on this segment because traffic from Pier T destined for Ocean Boulevard west of the Terminal Island Freeway and for the Terminal Island Freeway itself uses this segment of the Ocean Boulevard mainline. Under the Bridge Replacement Alternatives, traffic operations do not deteriorate substantially because traffic from Pier T does not use the Ocean Boulevard mainline between the Horseshoe Ramps and the Terminal Island Freeway; traffic from Pier T uses the parallel Ocean Boulevard service road and enters the Ocean Boulevard mainline west of Pier S Street.

Because the adverse effect is expected in year 2015 but not in year 2030, the adverse effect is considered temporary. A grade-separated “flyover” ramp serving traffic from EB Ocean Boulevard to NB SR 47 is proposed as a component of the Schuyler Heim Bridge Replacement and SR 47 Expressway project. The proposed construction schedule shows completion of the flyover in 2015 (Caltrans, 2007a). Operation of the flyover in conjunction with either of the Bridge Replacement Alternatives would relieve the strain on the Terminal Island Freeway interchange and result in improved LOS on WB Ocean Boulevard, and there would be no adverse effect of the Bridge Replacement Alternatives on WB Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange. The effect of the proposed Bridge Replacement Alternatives in conjunction with the reasonable foreseeable construction of the SR 47 Flyover under Schuyler Heim Bridge Replacement and SR 47 Expressway project would be a cumulative benefit to traffic operations on the WB segment of Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange, as discussed in Section 2.4.4.3.

If the flyover is not implemented prior to opening one of the Bridge Replacement Alternatives, then there would be a temporary unavoidable adverse effect of the Bridge Replacement Alternatives on the WB segment of Ocean Boulevard from the Horseshoe Ramps to the Terminal Island Freeway interchange that would exist until the flyover is constructed or until 2030, as discussed above.

Sensitivity Analysis for Year 2035 Traffic Forecasts

This section summarizes the analysis and findings of year 2035 traffic conditions. The rate of growth in traffic along the Ocean Boulevard corridor within the study area would be 0.5 percent annually or a total of 2.5 percent for the 5 years from year 2030 to 2035. The growth rate was developed using traffic projections from the latest Port Area Model, which is based on the SCAG 2008 RTP model, with refinements made in the port area, and uses the forecasts recited in the comment.

Table 2.1.5-18 Project-Related Effects on Roadway Segments

Segment		From	To	Year 2015						Year 2030					
				No Action/ Rehab. Alts.		Bridge Replace Alternatives		No Action/Rehab. Alternatives vs. 2015 Bridge Replace Alts.		No Action/ Rehab. Alts.		Bridge Replace Alternatives		No Action/Rehab. Alternatives vs. 2030 Bridge Replace Alternatives	
				Density	LOS	Density	LOS	Density Difference	Adverse Effect[a]	Density	LOS	Density	LOS	Density Difference	Adverse Effect[a]
AM Peak Hour															
1	EB Ocean Boulevard	Navy Way	Pier S Avenue	19.3	C	20.2	C	1.0	No	115.1	F	25.6	C	-89.5	No
	WB Ocean Boulevard	Pier S Avenue	Navy Way	19.8	C	23.7	C	3.9	No	24.6	C	25.4	C	0.8	No
2	EB Ocean Boulevard	Pier S Avenue	Terminal Island Freeway	17.4	B	20.8	C	3.3	No	22.7	C	23.0	C	0.3	No
	WB Ocean Boulevard	Terminal Island Freeway	Pier S Avenue	16.6	B	19.8	C	3.1	No	19.0	C	20.8	C	1.8	No
3	EB Ocean Boulevard	Terminal Island Freeway	Horseshoe Ramps	17.8	B	21.4	C	3.6	No	18.1	C	23.7	C	5.6	No
	WB Ocean Boulevard	Horseshoe Ramps	Terminal Island Freeway	12.7	B	41.3	E	28.6	No	15.8	B	34.0	D	18.2	No
4	EB Gerald Desmond Bridge	Upgrade	Crest	23.3	C	24.8	C	1.5	No	23.2	C	29.5	D	6.2	No
	EB Gerald Desmond Bridge	Crest	Downgrade	28.6	D	21.3	C	-7.3	No	27.7	D	24.3	C	-3.5	No
5	WB Gerald Desmond Bridge	Upgrade	Crest	60.9	F	22.3	C	-38.6	No	79.2	F	25.4	C	-53.8	No
	WB Gerald Desmond Bridge	Crest	Downgrade	27.0	D	19.9	C	-7.1	No	30.5	D	22.2	C	-8.3	No
6	NB Connector	EB Ocean Boulevard	NB I-710	16.2	B	10.1	A	-6.1	No	11.9	B	9.3	A	-2.6	No
	SB Connector	SB I-710	WB Ocean Boulevard	25.7	C	17.8	B	-7.9	No	30.6	D	19.6	C	-11.0	No
7	I-710 NB	NB Connector	NB I-710 Mainline	15.9	B	10.1	A	-5.8	No	11.1	B	9.1	A	-2.0	No
	I-710 SB	SB I-710 Mainline	SB Connector	13.8	B	17.4	B	3.6	No	16.3	B	19.1	C	2.8	No
8	EB Ocean Boulevard	NB Connector	Downtown	5.3	A	13.4	B	8.1	No	7.8	A	15.0	B	7.2	No
	WB Ocean Boulevard	Downtown	SB Connector	7.3	A	16.0	B	8.7	No	5.8	A	17.0	B	11.2	No
MD Peak Hour															
1	EB Ocean Boulevard	Navy Way	Pier S Avenue	22.0	C	23.0	C	1.0	No	175.3	F	165.8	F	-9.5	No
	WB Ocean Boulevard	Pier S Avenue	Navy Way	18.4	C	22.0	C	3.6	No	19.3	C	22.8	C	3.6	No
2	EB Ocean Boulevard	Pier S Avenue	Terminal Island Freeway	16.5	B	21.0	C	4.5	No	17.3	B	19.2	C	1.8	No
	WB Ocean Boulevard	Terminal Island Freeway	Pier S Avenue	14.6	B	18.0	B	3.4	No	17.7	B	19.7	C	2.0	No
3	EB Ocean Boulevard	Terminal Island Freeway	Horseshoe Ramps	16.7	B	21.0	C	4.3	No	12.7	B	15.2	B	2.5	No
	WB Ocean Boulevard	Horseshoe Ramps	Terminal Island Freeway	12.8	B	47.0	F	34.2	**Yes**	127.7	F	47.6	F	-80.1	No
4	EB Gerald Desmond Bridge	Upgrade	Crest	28.2	D	28.0	D	-0.2	No	19.3	C	21.9	C	2.6	No
	EB Gerald Desmond Bridge	Crest	Downgrade	30.1	D	22.0	C	-8.1	No	22.2	C	17.2	B	-5.0	No
5	WB Gerald Desmond Bridge	Upgrade	Crest	52.0	F	21.0	C	-31.0	No	70.8	F	24.5	C	-46.3	No
	WB Gerald Desmond Bridge	Crest	Downgrade	25.4	C	19.0	C	-6.4	No	29.6	D	21.4	C	-8.2	No
6	NB Connector	EB Ocean Boulevard	NB I-710	18.0	B	13.0	B	-5.0	No	11.8	B	8.8	A	-3.0	No
	SB Connector	SB I-710	WB Ocean Boulevard	26.2	D	17.0	B	-9.2	No	31.1	D	20.0	C	-11.1	No
7	I-710 NB	NB Connector	NB I-710 Mainline	18.1	C	13.0	B	-5.1	No	11.3	B	9.0	A	-2.3	No
	I-710 SB	SB I-710 Mainline	SB Connector	14.7	B	16.0	B	1.3	No	16.9	B	20.0	C	3.1	No
8	EB Ocean Boulevard	NB Connector	Downtown	3.3	A	9.0	A	5.7	No	4.3	A	7.3	A	3.0	No
	WB Ocean Boulevard	Downtown	SB Connector	5.0	A	12.0	B	7.0	No	4.4	A	12.2	B	7.8	No
PM Peak Hour															
1	EB Ocean Boulevard	Navy Way	Pier S Avenue	24.4	C	24.8	C	0.4	No	178.0	F	156.0	F	-21.9	No
	WB Ocean Boulevard	Pier S Avenue	Navy Way	20.3	C	24.0	C	3.8	No	26.0	D	29.0	D	3.0	No
2	EB Ocean Boulevard	Pier S Avenue	Terminal Island Freeway	20.0	C	24.3	C	4.3	No	21.3	C	29.4	D	8.1	No
	WB Ocean Boulevard	Terminal Island Freeway	Pier S Avenue	22.9	C	24.8	C	2.0	No	23.4	C	28.2	D	4.8	No
3	EB Ocean Boulevard	Terminal Island Freeway	Horseshoe Ramps	20.4	C	24.6	C	4.2	No	16.4	B	25.2	C	8.8	No
	WB Ocean Boulevard	Horseshoe Ramps	Terminal Island Freeway	18.6	C	17.9	B	-0.8	No	20.9	C	20.4	C	-0.5	No
4	EB Gerald Desmond Bridge	Upgrade	Crest	26.7	D	29.2	D	2.4	No	20.7	C	28.8	D	8.1	No
	EB Gerald Desmond Bridge	Crest	Downgrade	32.9	D	24.7	C	-8.2	No	26.1	D	24.3	C	-1.8	No
5	WB Gerald Desmond Bridge	Upgrade	Crest	56.3	F	22.0	C	-34.3	No	109.1	F	25.5	C	-83.6	No
	WB Gerald Desmond Bridge	Crest	Downgrade	28.9	D	20.2	C	-8.7	No	32.6	D	23.2	C	-9.5	No
6	NB Connector	EB Ocean Boulevard	NB I-710	16.7	B	14.1	B	-2.6	No	10.2	A	9.5	A	-0.7	No
	SB Connector	SB I-710	WB Ocean Boulevard	20.4	C	14.3	B	-6.1	No	23.4	C	16.0	B	-7.4	No
7	I-710 NB	NB Connector	NB I-710 Mainline	16.2	B	13.7	B	-2.5	No	9.5	A	9.1	A	-0.4	No
	I-710 SB	SB I-710 Mainline	SB Connector	10.6	A	13.7	B	3.2	No	11.8	B	15.6	B	3.8	No
8	EB Ocean Boulevard	NB Connector	Downtown	7.3	A	13.6	B	6.3	No	8.8	A	16.0	B	7.2	No
	WB Ocean Boulevard	Downtown	SB Connector	8.6	A	20.8	C	12.2	No	7.9	A	19.4	C	11.5	No

Notes: LOS - Level of Service ; NB - Northbound; SB - Southbound; EB - Eastbound; WB - Westbound

* In the existing year 2005 condition, segments 1-3 are analyzed as arterial segments because of presence of traffic signals on Ocean Boulevard at the TI Freeway, Pier S Avenue, & Navy Way. The LOS for arterials is determined by speed (in miles-per-hour). All other segments are analyzed as multi-lane highways whose LOS is determined by vehicle density (vehicles per lane per mile).

a Criteria and Thresholds Used to Determine Adverse Effect:

- Adverse effect would occur where the Build condition (Bridge Replacement Alternatives) would result in LOS F and the vehicle density is greater in the No Build (No Action/Rehabilitation Alternatives) condition or the existing condition.

Yes(1) - Density comparison not available, but increased density assumed based on deterioration of LOS.

Yes Highlight indicates locations with adverse effect where threshold criteria for an adverse effect have been exceeded and the effect is directly attributable to the proposed Bridge Replacement Alternatives.

Source: Iteris, 2009.

This page intentionally left blank.

Using the 2.5 percent growth rate, the roadway segment densities for year 2030 were adjusted upward to reflect a 2.5 percent increase. Similarly, the densities developed for the ramp junction analyses were adjusted upward. The roadway segment densities for years 2005, 2015, 2030, and 2035 for both the No Action/Rehabilitation and Bridge Replacement Alternatives are presented in Table 2.1.5-19. The table also shows the roadway segment results with and without the EB-to-NB SR 47 flyover ramp analyzed in the traffic study.

The results show that the only reduction in LOS to a condition worse than LOS D would be on the EB uphill side of the Gerald Desmond Bridge for the PM peak hour in the Bridge Replacement Alternative with the SR 47 flyover ramp, which is projected to operate at LOS E, even though the density value increased by only 0.8 pc/mi/ln from 2030 to 2035.

The higher densities on this roadway segment are related to the convergence of EB through traffic, the on-ramp from the SR 47 interchange, and the on-ramp from Pier T all occurring on an uphill grade; however, the results indicate that the proposed design can adequately accommodate the projected year 2035 traffic.

For the ramp junction analysis, as shown in Table 2.1.5-20, none of the ramp junctions are projected to operate at a level worse than LOS C in year 2035.

In summary, none of the roadway segments or ramp junctions are expected to operate at a failing level of service (LOS F). With a Bridge Replacement Alternative and the SR 47 flyover ramp in place, only one roadway segment would operate at LOS E; therefore, the findings and conclusions reached for year 2030 still apply for year 2035. No additional impacts would be created using year 2035 forecast traffic volumes.

Nonrecurring Congestion

The Bridge Replacement Alternatives of the proposed project would have the benefit of reducing nonrecurring congestion in the project area caused by automobile crashes, disabled vehicles, work zones, adverse weather events, and planned special events. The addition of standard-width left- and right-side shoulders on the bridge and its approaches would provide adequate room for emergency response vehicles, roadway maintenance vehicles, and disabled automobiles without causing major congestion or requiring roadway closures.

To better understand the potential effects caused by a nonrecurring incident, a computer simulation of a nonrecurring incident on the existing Gerald Desmond Bridge was conducted for the Bridge Replacement Alternatives and the No Action/ Rehabilitation Alternatives conditions in year 2030. The CORSIM program was used to conduct the simulation. The analysis compares the duration of restricted traffic operations resulting from an accident or other nonrecurring incident.

One difference between the Bridge Replacement Alternatives and the No Action/Rehabilitation Alternatives conditions is the inclusion of a third lane on the downhill side of the bridge with the Bridge Replacement Alternatives. For this reason, the simulation included an incident on that portion of the bridge to comparatively estimate the amount of time that would elapse before traffic operations would return to pre-incident levels. The incident was assumed to block the EB right lane on the downhill side of the bridge. The incident itself was assumed to last 1-hour during the PM peak travel period. With the No Action/ Rehabilitation Alternatives condition, the incident was assumed to block the right lane for the full hour and then be cleared from the area. With the Bridge Replacement Alternatives condition, the incident was assumed to block the right lane for 10 minutes and then moved to the shoulder for the next 50 minutes, at which time it would be cleared from the area.

Exhibit 2.1.5-10 shows summary graphs of travel speed in each lane approaching the incident for 1-hour before the incident occurred, 1-hour during the incident, and 1-hour after the incident was cleared from the bridge for the No Action/ Rehabilitation Alternatives and the Bridge Replacement Alternatives conditions. Each graph shows the plotted mean speed for each 5-minute increment during the 3-hour period and a smoothed speed curve. A nearly horizontal line links pre- and post-incident speed and illustrates likely speeds with no incident.

The No Action/Rehabilitation Alternatives condition results show that the average vehicle travel speed would decrease from approximately 45 to 50 miles per hour (mph) before the incident in both lanes to 20 to 25 mph after the incident occurs. Speeds would remain slow for the whole hour of the incident plus an additional 25 to 30 minutes after the incident is cleared from the area, or a total duration of 85 to 90 minutes after the incident occurred. The Bridge Replacement Alternatives condition results show that the average vehicle travel speed would return to pre-incident levels approximately 20 minutes after the incident is moved to the shoulder, or a total duration of 30 minutes after the incident occurred; therefore, over 1-hour of incident-related delay could be saved as a result of implementing the Bridge Replacement Alternatives.

Effects to Nonrecurring Congestion from the Long-Term Operation of the Bridge Replacement Alternatives

Nonrecurring congestion due to incidents such as crashes and disabled vehicles would not be worse under the Bridge Replacement Alternatives than under the No Action/Rehabilitation Alternatives. Rather, such nonrecurring congestion is likely to be reduced by the presence of shoulders on the new bridge that would be implemented under the Bridge Replacement Alternatives; therefore, it is concluded that the proposed Bridge Replacement Alternatives would have a beneficial effect upon nonrecurring congestion.

Bridge Bicycle and Pedestrian Access

The Bridge Replacement alternatives of the proposed project would transform Ocean Boulevard, which is currently a city street, into a state highway that would be a limited-access extension of the SR 710 freeway as far west as the Terminal Island Freeway. Bicycle access to/ from downtown Long Beach across the new bridge via Ocean Boulevard would be permitted only at on- and off-ramps (see Exhibit 2.1.5-13).

Terminal Island is an industrial area within the Harbor District where there is currently no residential, retail, or public recreational facilities. Since the closing of the Naval Shipyard and the opening of the Pier T container terminal, there has been low demand from nonmotorized traffic (e.g., pedestrians or bicycles) on Ocean Boulevard over the Gerald Desmond Bridge, despite a patchwork of sidewalks that exist along the roadway. In addition, Terminal Island does not include any designated bicycle route.

The finished roadway improvements of the Bridge Replacement Alternatives would include standard, full-width paved inside and outside shoulders for emergency vehicle breakdown and motorist safety. No designated bike routes or pedestrian sidewalks are included in the project plans. Both pedestrians and cyclists can utilize the regularly scheduled bus service equipped with bicycle racks provided by the Los Angeles Department of Transportation to travel between downtown Long Beach, Terminal Island, and San Pedro. A designated bike route exists to the north of the Port on Anaheim Street at the northern edge of the Harbor District.

Of the other two bridges that provide access to Terminal Island, neither the Schuyler Heim Bridge nor the Vincent Thomas Bridge provides shoulders or walkways for nonmotorized traffic. The current bicycle master plans for the cities of Long Beach and Los Angeles do not include any designated bike routes in the Harbor Districts, including Terminal Island (refer to Exhibits 2.1.5-11 and 2.1.5-12 for the maps of the bicycle master plans for the cities of Long Beach and Los Angeles). In June 2006, the Los Angeles County Metropolitan Transportation Authority (MTA) adopted two bicycle planning documents: *Metro Bicycle Transportation Strategic Plan* (Strategic Plan) and *Bicycle Transportation Account Compliance* (BTA) document. These two plans replace the Countywide Bicycle Policy Document and six area bicycle plans. The Strategic Plan and BTA document are consistent with Metro's Long Range Transportation Plan. The BTA document fulfills a Caltrans requirement by consolidating information into one countywide document that each City and the County can adopt as their local bicycle plan. The Strategic Plan was designed for use by local agencies to plan bicycle facilities around transit and set priorities to improve regional mobility. One aspect of the Strategic Plan is to identify gaps in the inter-jurisdictional bike network. The Strategic Plan identifies an Ocean Boulevard Corridor connecting the Harbor bike lanes in San Pedro to the LA River Bike Trail terminus in the City of Long Beach, as recommended by "LA City/Stakeholders." As previously discussed, the proposed project is within the Cities of Long Beach and Los Angeles, and there are no proposed or designated bike routes in City plans within the Port of Long Beach.

Federal regulation requires the inclusion of nonmotorized routes in roadway improvement projects only if the facility already includes an existing major nonmotorized route. The existing Gerald Desmond Bridge has a pedestrian walkway, but it is not considered a "major nonmotorized route." The Port addressed this issue in January 2004 in consideration of federal statute Title 23, section 217, as amended by the Transportation Equity Act for the 21st Century (TEA-21) and SAFETEA-LU, which states, "The Secretary shall not approve any project or take any regulatory action that will sever an existing major nonmotorized route or adversely affect the safety of nonmotorized traffic and light motorcycles, unless a reasonable alternate route exists or is established. [1202(c)]."

Based on a memorandum dated January 6, 2004, which discusses coordination with the MTA Bikeway Modal Lead and Gateway Cities Team Planner, the MTA staff determined that a bikeway or a pedestrian walkway is not required for this project. Additional considerations regarding bikeway and pedestrian access are presented below.

Table 2.1.5-19
CORSIM Highway Link Analysis Comparison Summary
Years 2015, 2030, and 2035

AM Peak Hour				Without Eastbound Ocean Boulevard to Northbound SR 47 Flyover Ramp												With Eastbound Ocean Boulevard to Northbound SR 47 Flyover Ramp									
				Existing 2005		Year 2015				Year 2030				Year 2035				Year 2015				Year 2030				Year 2035			
						No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives	
	Segment	From	To	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
1	EB Ocean Blvd.	Navy Way	Pier S Avenue	*	*	19.3	C	20.2	C	115.1	F	25.6	C	118.0	F	26.3	D	13.6	B	15.4	B	16.4	B	17.8	B	16.8	B	18.3	C
	WB Ocean Blvd.	Pier S Avenue	Navy Way	*	*	19.8	C	23.7	C	24.6	C	25.4	C	25.3	C	26.1	D	18.9	C	21.4	C	24.1	C	25.4	C	24.7	C	26.1	D
2	EB Ocean Blvd.	Pier S Avenue	Terminal Island Freeway	*	*	17.4	B	20.8	C	22.7	C	23.0	C	23.3	C	23.6	C	17.9	B	20.5	C	19.2	C	21.8	C	19.6	C	22.4	C
	WB Ocean Blvd.	Terminal Island Freeway	Pier S Avenue	*	*	16.6	B	19.8	C	19.0	C	20.8	C	19.5	C	21.4	C	16.9	B	17.9	B	18.8	C	20.3	C	19.2	C	20.8	C
3	EB Ocean Blvd.	Terminal Island Freeway	Horseshoe Ramps	*	*	17.8	B	21.4	C	18.1	C	23.7	C	18.5	C	24.3	C	18.3	C	21.0	C	18.7	C	22.3	C	19.2	C	22.9	C
	WB Ocean Blvd.	Horseshoe Ramps	Terminal Island Freeway	*	*	12.7	B	41.3	E	15.8	B	34.0	D	16.2	B	34.9	D	13.1	B	14.1	B	15.9	B	15.5	B	16.3	B	15.9	B
4	EB Gerald Desmond Bridge	Upgrade	Crest	17.0	B	23.3	C	24.8	C	23.2	C	29.5	D	23.8	C	30.2	D	24.7	C	23.9	C	28.6	D	28.9	D	29.3	D	29.6	D
	EB Gerald Desmond Bridge	Crest	Downgrade	21.8	C	28.6	D	21.3	C	27.7	D	24.3	C	28.4	D	24.9	C	28.9	D	20.5	C	31.1	D	23.4	C	31.9	D	24.0	C
5	WB Gerald Desmond Bridge	Upgrade	Crest	20.2	C	60.9	F	22.3	C	79.2	F	25.4	C	81.2	F	26.0	D	59.6	F	21.9	C	91.1	F	25.6	C	93.4	F	26.2	D
	WB Gerald Desmond Bridge	Crest	Downgrade	20.1	C	27.0	D	19.9	C	30.5	D	22.2	C	31.2	D	22.7	C	27.2	D	19.9	C	31.0	D	22.3	C	31.8	D	22.9	C
6	NB Connector	EB Ocean Blvd.	NB I-710	13.8	B	16.2	B	10.1	A	11.9	B	9.3	A	12.2	B	9.5	A	16.3	B	9.9	A	14.2	B	11.3	B	14.5	B	11.6	B
	SB Connector	SB I-710	WB Ocean Blvd.	17.4	B	25.7	C	17.8	B	30.6	D	19.6	C	31.4	D	20.1	C	26.0	D	17.9	B	30.4	D	19.8	C	31.2	D	20.3	C
7	I-710 NB	NB Connector	NB I-710 Mainline	14.2	B	15.9	B	10.1	A	11.1	B	9.1	A	11.3	B	9.3	A	15.9	B	9.9	A	13.3	B	11.0	B	13.6	B	11.3	B
	I-710 SB	SB I-710 Mainline	SB Connector	9.2	A	13.8	B	17.4	B	16.3	B	19.1	C	16.7	B	19.5	C	13.8	B	17.4	B	16.3	B	19.2	C	16.7	B	19.7	C
8	EB Ocean Blvd.	NB Connector	Downtown	4.6	A	5.3	A	13.4	B	7.8	A	15.0	B	8.0	A	15.4	B	4.8	A	12.9	B	7.2	A	12.8	B	7.4	A	13.1	B
	WB Ocean Blvd.	Downtown	SB Connector	6.6	A	7.3	A	16.0	B	5.8	A	17.0	B	5.9	A	17.4	B	7.3	A	16.0	B	5.8	A	17.1	B	5.9	A	17.5	B

This page intentionally left blank.

Table 2.1.5-19
CORSIM Highway Link Analysis Comparison Summary
Years 2015, 2030, and 2035

MD Peak Hour				Without Eastbound Ocean Boulevard to Northbound SR 47 Flyover Ramp												With Eastbound Ocean Boulevard to Northbound SR 47 Flyover Ramp									
				Existing 2005		Year 2015				Year 2030				Year 2035				Year 2015				Year 2030				Year 2035			
						No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives	
	Segment	From	To	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
1	EB Ocean Blvd.	Navy Way	Pier S Avenue	*	*	22.0	C	23.0	C	175.3	F	165.8	F	179.6	F	169.9	F	13.8	B	15.9	B	54.4	F	15.2	B	55.8	F	15.5	B
	WB Ocean Blvd.	Pier S Avenue	Navy Way	*	*	18.4	C	22.0	C	19.3	C	22.8	C	19.7	C	23.4	C	17.8	B	21.2	C	17.6	B	24.5	C	18.0	B	25.1	C
2	EB Ocean Blvd.	Pier S Avenue	Terminal Island Freeway	*	*	16.5	B	21.0	C	17.3	B	19.2	C	17.8	B	19.7	C	16.5	B	20.6	C	22.3	C	22.6	C	22.8	C	23.1	C
	WB Ocean Blvd.	Terminal Island Freeway	Pier S Avenue	*	*	14.6	B	18.0	B	17.7	B	19.7	C	18.2	C	20.2	C	13.8	B	16.3	B	20.9	C	18.2	C	21.4	C	18.6	C
3	EB Ocean Blvd.	Terminal Island Freeway	Horseshoe Ramps	*	*	16.7	B	21.0	C	12.7	B	15.2	B	13.0	B	15.6	B	16.7	B	20.0	C	17.2	B	19.0	C	17.6	B	19.5	C
	WB Ocean Blvd.	Horseshoe Ramps	Terminal Island Freeway	*	*	12.8	B	47.0	F	127.7	F	47.6	F	130.9	F	48.8	F	12.3	B	13.0	B	151.3	F	14.3	B	155.1	F	14.6	B
4	EB Gerald Desmond Bridge	Upgrade	Crest	18.8	C	28.2	D	28.0	D	19.3	C	21.9	C	19.7	C	22.4	C	26.5	D	26.3	D	27.8	D	27.5	D	28.5	D	28.2	D
	EB Gerald Desmond Bridge	Crest	Downgrade	23.1	C	30.1	D	22.0	C	22.2	C	17.2	B	22.8	C	17.6	B	28.8	D	20.7	C	27.8	D	20.7	C	28.5	D	21.2	C
5	WB Gerald Desmond Bridge	Upgrade	Crest	19.4	C	52.0	F	21.0	C	70.8	F	24.5	C	72.6	F	25.1	C	58.3	F	20.9	C	88.0	F	24.9	C	90.2	F	25.6	C
	WB Gerald Desmond Bridge	Crest	Downgrade	19.0	C	25.4	C	19.0	C	29.6	D	21.4	C	30.4	D	21.9	C	25.4	C	18.5	C	89.5	F	21.3	C	91.8	F	21.8	C
6	NB Connector	EB Ocean Blvd.	NB I-710	16.0	B	18.0	B	13.0	B	11.8	B	8.8	A	12.0	B	9.0	A	18.0	B	13.0	B	14.8	B	11.8	B	15.2	B	12.1	B
	SB Connector	SB I-710	WB Ocean Blvd.	10.7	A	26.2	D	17.0	B	31.1	D	20.0	C	31.9	D	20.5	C	25.7	C	16.8	B	46.5	F	20.0	C	47.6	F	20.5	C
7	I-710 NB	NB Connector	NB I-710 Mainline	17.4	B	18.1	C	13.0	B	11.3	B	9.0	A	11.6	B	9.2	A	18.3	C	13.8	B	14.3	B	12.0	B	14.6	B	12.3	B
	I-710 SB	SB I-710 Mainline	SB Connector	6.5	A	14.7	B	16.0	B	16.9	B	20.0	C	17.3	B	20.5	C	14.5	B	16.7	B	23.3	C	20.0	C	23.9	C	20.5	C
8	EB Ocean Blvd.	NB Connector	Downtown	1.8	A	3.3	A	9.0	A	4.3	A	7.3	A	4.4	A	7.5	A	3.1	A	8.7	A	4.7	A	8.1	A	4.8	A	8.3	A
	WB Ocean Blvd.	Downtown	SB Connector	6.6	A	5.0	A	12.0	B	4.4	A	12.2	B	4.5	A	12.5	B	5.0	A	11.6	B	4.4	A	12.1	B	4.5	A	12.4	B

This page intentionally left blank.

Table 2.1.5-19
CORSIM Highway Link Analysis Comparison Summary
Years 2015, 2030, and 2035

PM Peak Hour				Without Eastbound Ocean Boulevard to Northbound SR 47 Flyover Ramp														With Eastbound Ocean Boulevard to Northbound SR 47 Flyover Ramp									
						Year 2015				Year 2030				Year 2035				Year 2015				Year 2030				Year 2035			
				Existing 2005		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives		No Action/ Rehabilitation Alternatives		Bridge Replace Alternatives	
	Segment	From	To	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
1	EB Ocean Blvd.	Navy Way	Pier S Avenue	*	*	24.4	C	24.8	C	178.0	F	156.0	F	182.4	F	159.9	F	15.5	B	16.9	B	21.2	C	22.8	C	21.7	C	23.4	C
	WB Ocean Blvd.	Pier S Avenue	Navy Way	*	*	20.3	C	24.0	C	26.0	D	29.0	D	26.7	D	29.8	D	20.6	C	24.5	C	26.4	D	29.2	D	27.1	D	29.9	D
2	EB Ocean Blvd.	Pier S Avenue	Terminal Island Freeway	*	*	20.0	C	24.3	C	21.3	C	29.4	D	21.9	C	30.1	D	19.3	C	23.1	C	28.2	D	28.0	D	28.9	D	28.7	D
	WB Ocean Blvd.	Terminal Island Freeway	Pier S Avenue	*	*	22.9	C	24.8	C	23.4	C	28.2	D	24.0	C	28.9	D	23.1	C	24.7	C	23.8	C	28.2	D	24.4	C	28.9	D
3	EB Ocean Blvd.	Terminal Island Freeway	Horseshoe Ramps	*	*	20.4	C	24.6	C	16.4	B	25.2	C	16.8	B	25.9	C	19.8	C	23.3	C	24.8	C	29.5	D	25.5	C	30.2	D
	WB Ocean Blvd.	Horseshoe Ramps	Terminal Island Freeway	*	*	18.6	C	17.9	B	20.9	C	20.4	C	21.5	C	20.9	C	18.8	C	18.0	B	20.8	C	20.7	C	21.3	C	21.2	C
4	EB Gerald Desmond Bridge	Upgrade	Crest	20.2	C	26.7	D	29.2	D	20.7	C	28.8	D	21.2	C	29.5	D	24.1	C	28.2	D	35.2	E	35.0	D	36.1	E	35.8	E
	EB Gerald Desmond Bridge	Crest	Downgrade	25.7	C	32.9	D	24.7	C	26.1	D	24.3	C	26.8	D	24.9	C	30.4	D	23.2	C	39.4	E	28.1	D	40.4	E	28.8	D
5	WB Gerald Desmond Bridge	Upgrade	Crest	18.9	C	56.3	F	22.0	C	109.1	F	25.5	C	111.8	F	26.1	D	44.5	E	22.0	C	101.5	F	26.1	D	104.0	F	26.8	D
	WB Gerald Desmond Bridge	Crest	Downgrade	19.5	C	28.9	D	20.2	C	32.6	D	23.2	C	33.5	D	23.7	C	28.8	D	20.3	C	31.9	D	23.2	C	32.7	D	23.7	C
6	NB Connector	EB Ocean Blvd.	NB I-710	13.2	B	16.7	B	14.1	B	10.2	A	9.5	A	10.4	A	9.7	A	16.1	B	13.8	B	14.0	B	11.9	B	14.3	B	12.2	B
	SB Connector	SB I-710	WB Ocean Blvd.	14.4	B	20.4	C	14.3	B	23.4	C	16.0	B	24.0	C	16.3	B	20.4	C	14.3	B	23.4	C	16.1	B	24.0	C	16.5	B
7	I-710 NB	NB Connector	NB I-710 Mainline	13.8	B	16.2	B	13.7	B	9.5	A	9.1	A	9.7	A	9.3	A	15.8	B	13.4	B	12.9	B	11.6	B	13.2	B	11.9	B
	I-710 SB	SB I-710 Mainline	SB Connector	8.3	A	10.6	A	13.7	B	11.8	B	15.6	B	12.1	B	16.0	B	10.6	A	13.7	B	11.8	B	15.7	B	12.1	B	16.1	B
8	EB Ocean Blvd.	NB Connector	Downtown	8.5	A	7.3	A	13.6	B	8.8	A	16.0	B	9.0	A	16.4	B	6.6	A	12.4	B	11.6	B	17.7	B	11.9	B	18.1	C
	WB Ocean Blvd.	Downtown	SB Connector	6.9	A	8.6	A	20.8	C	7.9	A	19.4	C	8.1	A	19.9	C	8.6	A	20.8	C	7.9	A	19.3	C	8.1	A	19.8	C

Notes:
Analysis is for multi-lane highway sections that were not grade-separated highway sections in 2005 are not presented in this analysis comparison.
* Level Of Service (LOS) criteria for traffic operations on multi-lane highways are based on density (pc/mi/ln) and free-flow speed. For a free-flow speed of 45 mph, the density ranges for different LOS types: LOS A, 0 – 11; LOS B, >11 – 18; LOS C, >18 – 26; LOS D, >26 – 35; LOS E, >35 – 45; LOS F, >45.
Source: Iteris, Inc.; 2009.

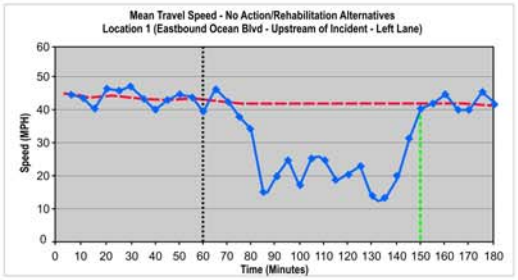
This page intentionally left blank.

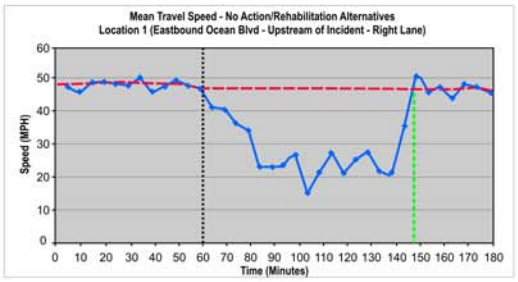
Table 2.1.5-20
Year 2015, 2030, and 2035 Forecast Peak-Hour LOS at Ramp Junctions

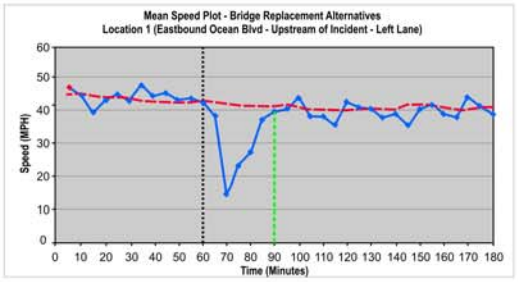
Ramp Location	AM Peak		MD Peak		PM Peak	
	Density (pc/mi/ln)	LOS[1]	Density (pc/mi/ln)	LOS[1]	Density (pc/mi/ln)	LOS[1]
Year 2015 No Action/Rehabilitation Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	16.8	B	16.0	B	17.7	B
Horseshoe Off-Ramp to Pier T Avenue	24.9	C	23.3	C	24.5	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	16.9	B	17.8	B	20.2	C
Ocean Boulevard to SR 710/Downtown Diverge	14.2	B	15.6	B	20.0	B
Ocean Boulevard to Pico Avenue Off-Ramp	6.9	A	5.6	A	13.7	B
Year 2015 Bridge Replacement Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	17.0	B	14.4	B	16.4	B
Horseshoe Off-Ramp to Pier T Avenue	21.5	C	20.3	C	20.4	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	18.9	B	19.8	B	22.9	C
Ocean Boulevard to SR 710/Downtown Diverge	22.5	C	24.6	C	25.8	C
Ocean Boulevard to Pico Avenue Off-Ramp	17.6	B	20.3	C	18.0	B
Year 2030 No Action/Rehabilitation Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	17.9	B	17.0	B	18.6	B
Horseshoe Off-Ramp to Pier T Avenue	26.8	C	25.0	C	26.2	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	17.4	B	18.2	B	21.3	C
Ocean Boulevard to SR 710/Downtown Diverge	15.0	B	16.2	B	21.9	C
Ocean Boulevard to Pico Avenue Off-Ramp	6.9	A	6.6	A	13.8	B
Year 2030 Bridge Replacement Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	18.8	B	16.7	B	19.6	B
Horseshoe Off-Ramp to Pier T Avenue	23.1	C	22.0	C	22.5	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	20.1	C	21.5	C	24.7	C
Ocean Boulevard to SR 710/Downtown Diverge	24.0	C	27.6	C	28.6	D
Ocean Boulevard to Pico Avenue Off-Ramp	18.9	B	23.5	C	20.3	C
Year 2035 No Action/Rehabilitation Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	18.3	B	17.4	B	19.1	B
Horseshoe Off-Ramp to Pier T Avenue	27.5	C	25.6	C	26.9	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	17.8	B	18.7	B	21.8	C
Ocean Boulevard to SR 710/Downtown Diverge	15.4	B	16.6	B	22.4	C
Ocean Boulevard to Pico Avenue Off-Ramp	7.1	A	6.8	A	14.1	B
Year 2035 Bridge Replacement Alternatives						
WB Ocean Boulevard						
Pico Avenue On-Ramp Merge to Ocean Boulevard	19.3	B	17.1	B	20.1	C
Horseshoe Off-Ramp to Pier T Avenue	23.7	C	22.6	C	23.1	C
EB Ocean Boulevard						
Horseshoe On-Ramp from Pier T Avenue	20.6	C	22.0	C	25.3	C
Ocean Boulevard to SR 710/Downtown Diverge	24.6	C	28.3	D	29.3	D
Ocean Boulevard to Pico Avenue Off-Ramp	19.4	B	24.1	C	20.8	C

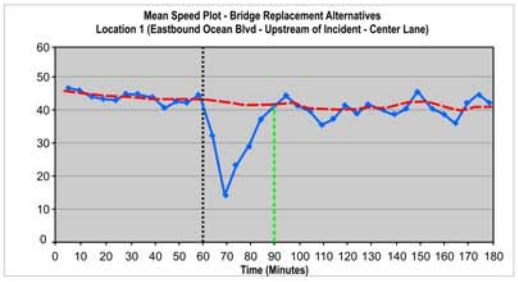
EB – eastbound; LOS – level of service; pc/mi/ln – passenger cars per mile per lane; WB – westbound
[1] LOS criteria for ramp junction areas are in density (pc/mi/ln). Density ranges for different LOS types: LOS A, 0 – 10; LOS B, 10.1 – 20; LOS C, 20.1 – 28; LOS D, 28.1 – 35; LOS E, 35.1 – 43; LOS F, > 43.

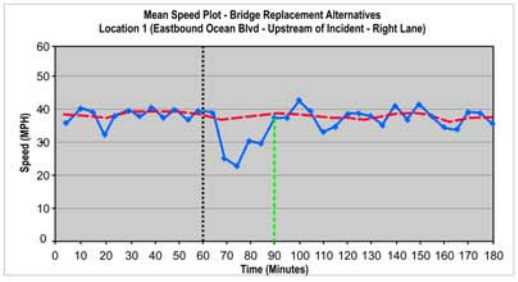
This page intentionally left blank.







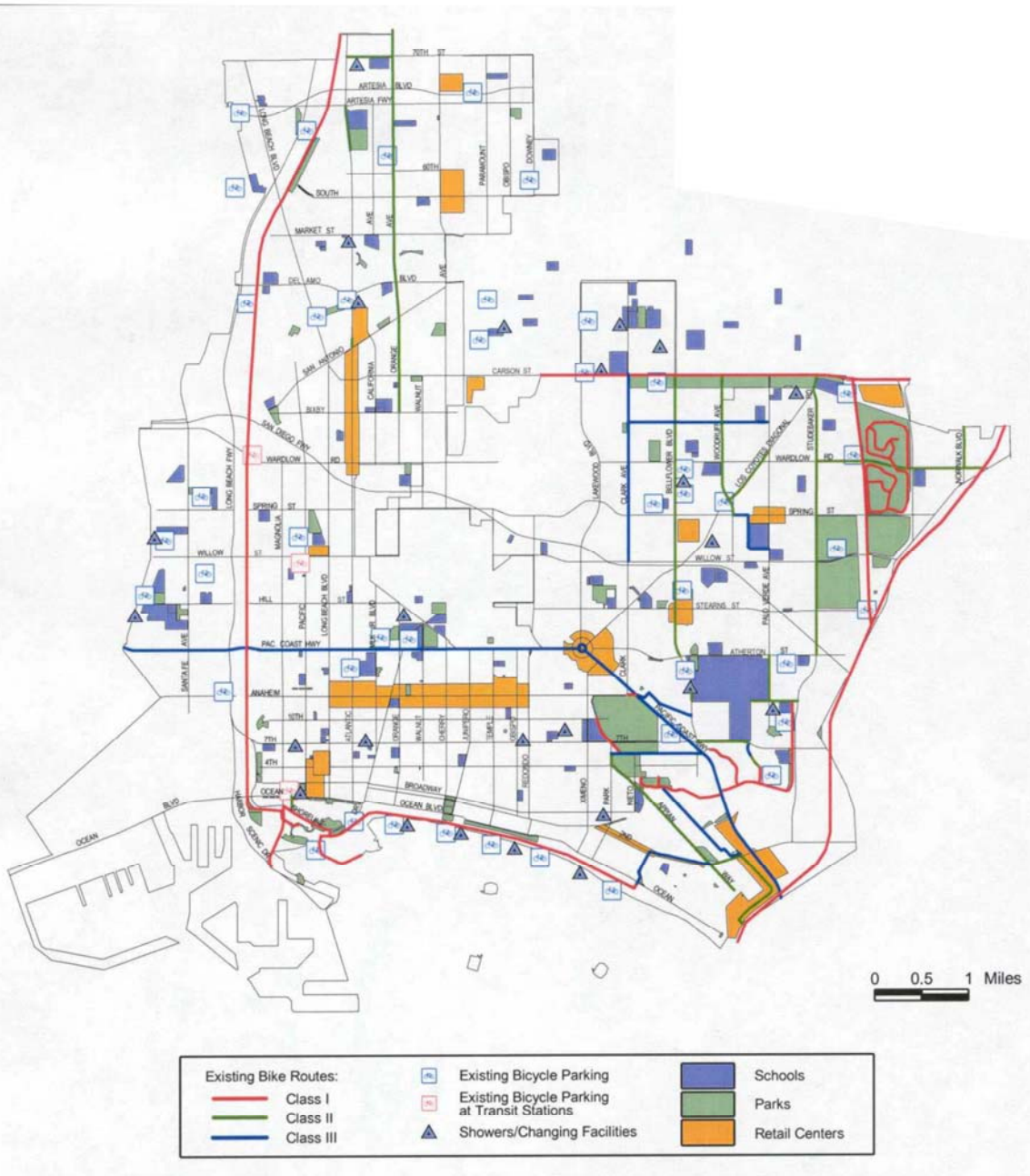




GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Non-Recurring Congestion Incident Simulation - Year 2030

EXHIBIT 2.1.5-10

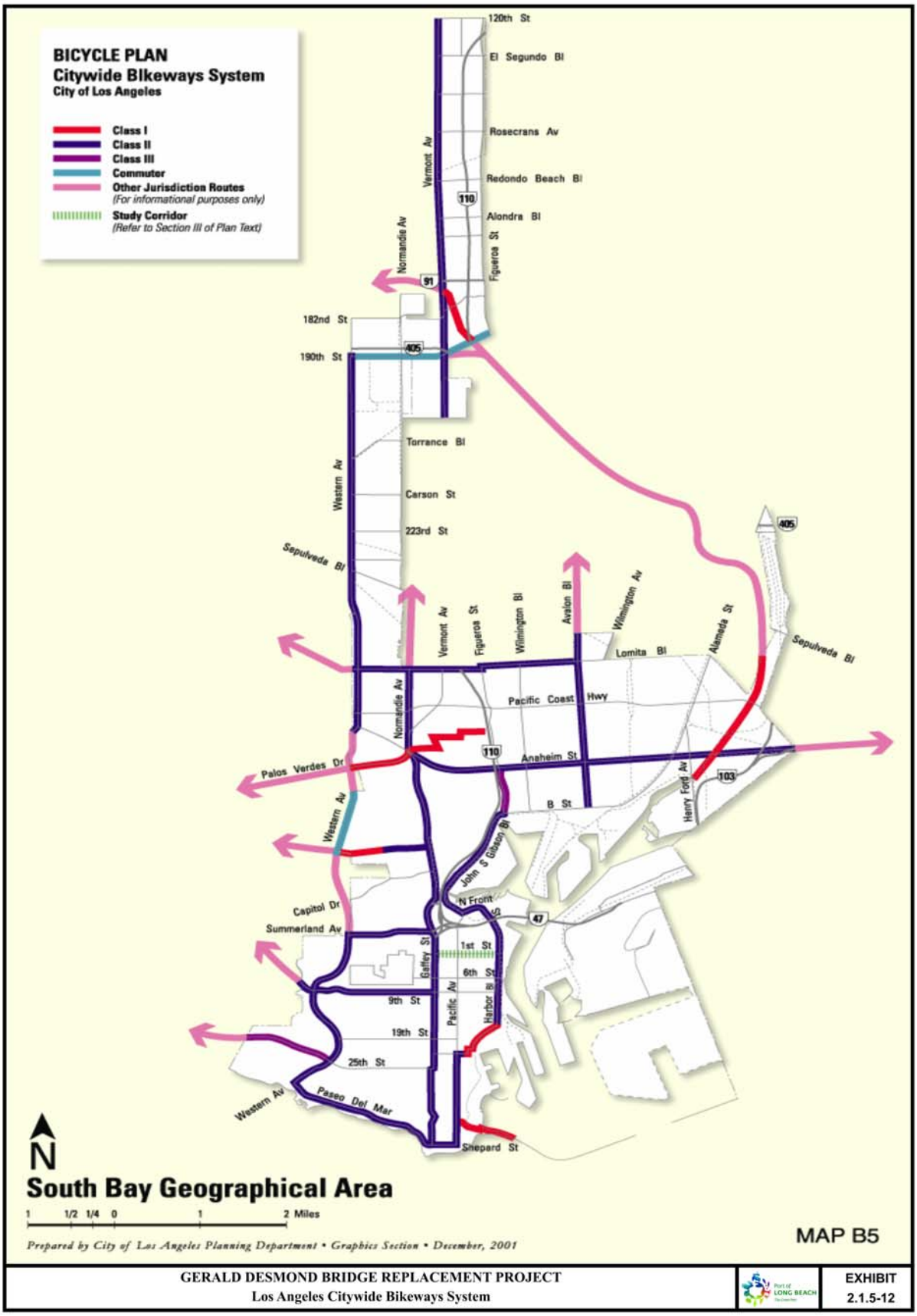
This page intentionally left blank.



GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Long Beach Bicycle Master Plan - Existing Bikeway Facilities

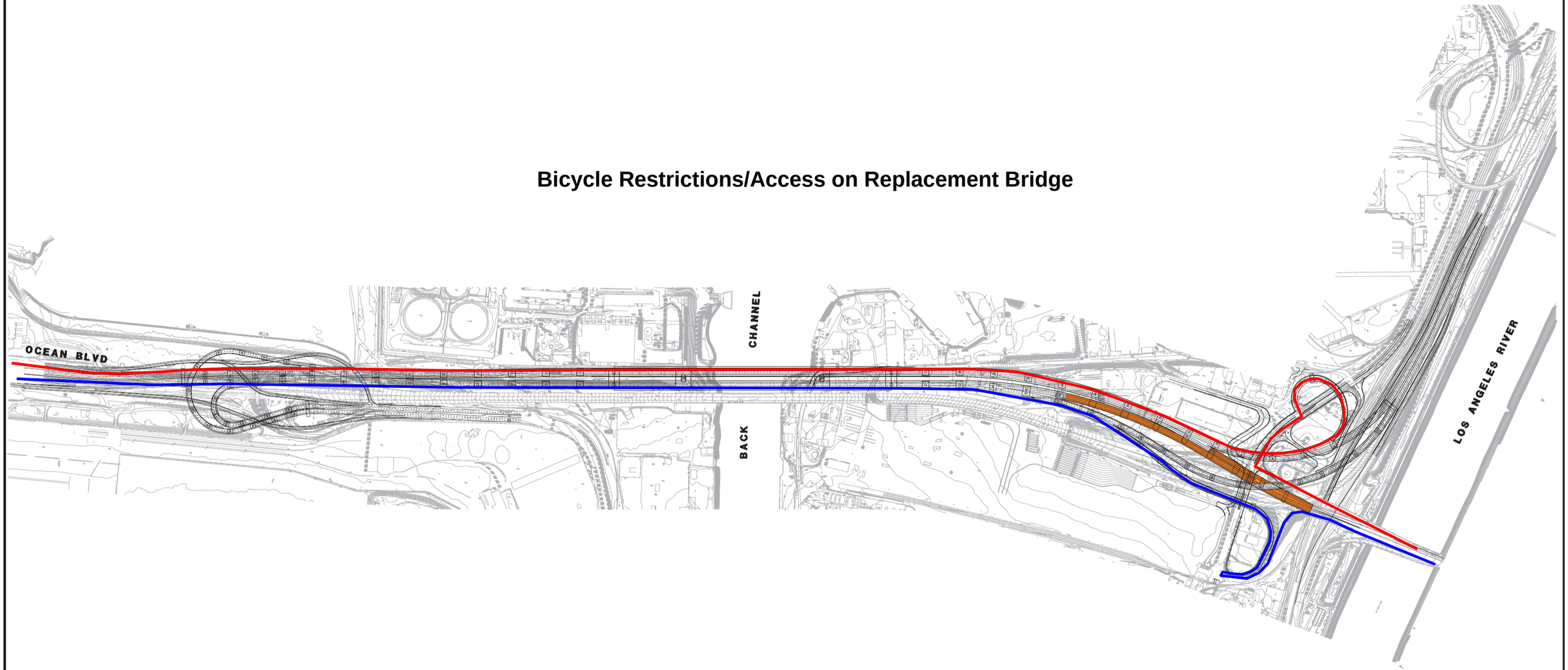
EXHIBIT 2.1.5-11

This page intentionally left blank.


BICYCLE PLAN
Citywide Bikeways System
City of Los Angeles
Class I
Class II
Class III
Commuter
Other Jurisdiction Routes
(For informational purposes only)
Study Corridor
(Refer to Section III of Plan Text)
120th St
El Segundo Bl
Rosecrans Av
Redondo Beach Bl
Alondra Bl
Vermont Av
Normandie Av
Figueroa St
182nd St
190th St
Torrance Bl
Western Av
Carson St
223rd St
Sepulveda Bl
Vermont Av
Figueroa St
Wilmington Bl
Avalon Bl
Wilmington Av
Lomita Bl
Alameda St
Pacific Coast Hwy
Normandie Av
Palos Verdes Dr
Anaheim St
Western Av
B St
Henry Ford Av
John S Gibson Bl
N Front St
Capitol Dr
Summerland Av
Gaffey St
1st St
6th St
9th St
Pacific Av
Harbor Bl
19th St
25th St
Western Av
Paseo Del Mar
Shepard St
405
91
110
47
103
N
South Bay Geographical Area
1 1/2 1/4 0 1 2 Miles
Prepared by City of Los Angeles Planning Department • Graphics Section • December, 2001
MAP B5
GERALD DESMOND BRIDGE REPLACEMENT PROJECT
Los Angeles Citywide Bikeways System
Port of LONG BEACH
EXHIBIT
2.1.5-12

This page intentionally left blank.

Bicycle Restrictions/Access on Replacement Bridge



Legend

- **Bicycles Prohibited**
- **East Bound Access**
- **West Bound Access**

N
W
E
S

1:4000

EXHIBIT 2.1.5-13

MARK	DATE	BY	REVISIONS

DRAWN DWP DATE 03/28/08
DESIGNED _____ P.E. NO. _____
PROJ. MGR. _____ P.E. NO. _____
SECT. HEAD _____ P.E. NO. C-_____

ASS'T CHIEF HARBOR ENGR. P.E. NO. C-25677 DATE .....
CHIEF HARBOR ENGINEER P.E. NO. C-43065 DATE .....

Port of LONG BEACH
The Green Port

GERALD DESMOND BRIDGE REPLACEMENT PROJECT

North-Side Bridge Replacement Alternative Alignment

SCALE
SHEET _____ OF _____
SPECIFICATION NUMBER _____
DRAWING NUMBER _____

This page intentionally left blank.

Designated Bicycle Routes

Though there is no designated bike route planned for the proposed new bridge, the California Vehicle Code (CVC) stipulates that nonmotorized vehicles (i.e., bicycles) be allowed to travel along roadways unless specifically prohibited by Caltrans or local authorities. Bicyclists would be prohibited from using the two ramps connecting Ocean Boulevard to downtown Long Beach for safety reasons, because they would be required to traverse the high-speed mainline SR 710 through lanes connected to the proposed bridge. Locations where bicyclists would be prohibited with the North-side Alignment Alternative are shown in Exhibit 2.1.5-13. Bicycle access would also be prohibited at the same ramp locations under the South-side Alignment Alternative. Under the Bridge Replacement Alternatives, bicyclists could use the Pico Avenue on- and off-ramps to Ocean Boulevard to travel to and from downtown Long Beach across the new bridge (see Exhibit 2.1.5-13).

The agency bicycle master plans previously discussed provide bicycle facilities on other roadways that avoid the heavy industrial traffic area of the Ports.

There are no existing or planned bike routes on Ocean Boulevard between downtown Long Beach and San Pedro.

Pedestrian Walkways

Additional considerations relative to pedestrian issues are as follows:

- The proposed new bridge with the Bridge Replacement Alternatives would become an extension of the SR 710 freeway, and pedestrian movements are typically not accommodated on freeway facilities. CVC 21960 allows Caltrans the discretion to prohibit or restrict the use of freeways to pedestrians, bicycles, and/or other nonmotorized traffic[5].
- Terminal Island is an industrial area and not a major pedestrian destination.
- There are no pedestrian facilities along Ocean Boulevard/Seaside Avenue on Terminal Island west of the Gerald Desmond Bridge. Pedestrian facilities have not been provided in recently completed projects along Ocean Boulevard between the Vincent Thomas Bridge and the Gerald Desmond Bridge.

Effects to Bicycle and Pedestrian Access from the Long-Term Operation of the Bridge Replacement Alternatives

With the Bridge Replacement Alternatives, there would be no adverse effects associated with the removal of pedestrian sidewalks or the change in bicycle access across the new bridge. Effects on pedestrians would be minimal because Terminal Island is an industrial area with no public recreational facilities and is not a pedestrian destination. Effects on cyclists would also be minimal because access is only modified, not eliminated, and a designated bike route is located on Anaheim Street parallel to Ocean Boulevard north of the Ports. In addition, Terminal Island is an industrial area with no other supporting bicycle infrastructure west of the bridge, and there are no planned or designated bike routes along Ocean Boulevard between downtown Long Beach and San Pedro. Future nonmotrized demand is anticipated to be low.

2.1.5.4 Avoidance, Minimization, and/or Mitigation Measures

Temporary Measures

North- and Southside Alignment Alternatives

All of the temporary mitigation measures to be implemented during construction of either of the Bridge Replacement Alternatives will be implemented in conjunction with a TMP to minimize traffic impacts during construction. The TMP will be submitted to and approved by the Port and Caltrans. The TMP, at a minimum, should include detour routes, flagmen, traffic controls, signing, traffic lane closure scheduling to minimize impacts, public notification, and coordination with emergency service providers. The TMP shall be implemented after approval.

TC-1 Prior to the start of construction Stage 2, the following improvements will be made to the intersection of Pico Avenue, Pier B Street, and 9th Street to mitigate the project's temporary adverse effect during construction at that intersection during Stage 2:

[5] CVC 21960(a): Caltrans and local authorities, by order, ordinance, or resolution, with respect to freeways, expressways, or designated portions thereof under their respective jurisdictions, to which vehicle access is completely or partially controlled, may prohibit or restrict the use of the freeways, expressways, or any portion thereof by pedestrians, bicycles, or other nonmotorized traffic or by any person operating a motor-driven cycle, motorized bicycle, or motorized scooter. A prohibition or restriction pertaining to bicycles, motor-driven cycles, or motorized scooters shall be deemed to include motorized bicycles; and no person may operate a motorized bicycle wherever that prohibition or restriction is in force. (Amended Sec. 6, Ch. 722, Stats. 1999. Effective January 1, 2000).

- Add dual NB right-turn lanes;
- Restripe EB through/right lane to a right-turn lane;
- Provide one (1) EB through lane; and
- Continue two (2) SR 710 SB off-ramp lanes to Pico Avenue.

TC-2 Prior to the start of construction Stages 3 and 4, the following improvements will be made to the intersection of Pico Avenue, Pier B Street, and 9th Street to mitigate the project's temporary adverse effect during construction at that intersection during Stages 3 and 4:

- Remove NB-SB split-signal phasing;
- Restripe NB through lane to a NB left-turn lane;
- Widen SB approach and provide two (2) left-turn lanes and one (1) through lane; and
- Continue two (2) on-ramp lanes to NB SR 710.

TC-3 Prior to the start of construction Stage 2, a traffic signal will be installed at the intersection of Pico Avenue and Pier D Street to mitigate the project's temporary adverse effect during construction at that intersection during Stages 2, 3, and 4. The traffic signal will be permanent and will not be removed after completion of construction of a Bridge Replacement Alternative.

TC-4 Prior to the start of construction Stages 3 and 4, the following improvements will be made to the intersection of Pico Avenue and Pier E Street to mitigate the project's temporary adverse effect during construction at that intersection during Stages 3 and 4:

- Permanently signalize the intersection (the signal will not be removed after completion of construction of a Bridge Replacement Alternative);
- Restripe NB through lane to a NB right-turn lane, providing a single NB through lane;
- Add dual free-flow WB right-turn lanes; and
- Continue two (2) EB Ocean Boulevard off-ramp lanes to Pico Avenue.

The *Middle Harbor Redevelopment Project Draft Environmental Impact Statement (DEIS)/Draft Environmental Impact Report (DEIR) and Application Summary Report (ASR)* prepared for the Port and USACE includes signalization of the Pico Avenue/Pier D Street and Pico Avenue/Pier E Street intersections. If these signals are implemented as part of that project prior to the start of construction Stage 2 for the Pico Avenue/ Pier D Street intersection and construction Stage 3 for the Pico Avenue/Pier E Street intersection, then that would remove the need for the signalization component of the proposed mitigations under TC-3 and TC-4, respectively.

Permanent Measures

North- and Southside Alignment Alternatives

TC-5 During the design phase of a Bridge Replacement Alternative, the Port shall add a third NB left-turn lane to mitigate the project effect at the Navy Way/ Seaside Avenue intersection.

POLA is currently considering two potential projects at the Navy Way/Seaside Avenue intersection. One project would provide grade separation of left turns and the other would implement a centerline barrier on Seaside Avenue that would eliminate left turns. Either project would remove the signal at the intersection, thereby eliminating the adverse effect of the proposed Bridge Replacement Alternatives at the intersection. If either of these projects or any other comparable project is implemented prior to construction of the Bridge Replacement Alternatives, then the adverse effect of the Bridge Replacement Alternatives at the intersection would be removed and the proposed mitigation measure would not be required.

TC-6 The Port will coordinate with the Long Beach City Traffic Engineer and provide funding for restriping and/or signalization improvements at the intersection of Ocean Boulevard and Magnolia Avenue as mitigation for the effect of a Bridge Replacement Alternative at the intersection.

Restriping and signalization improvements have been identified as one way to mitigate the adverse effect at this intersection. The Port will coordinate with the City of Long Beach on implementation of improvements at this intersection.