

PACIFIC ELECTRIC ROW/ WEST SANTA ANA BRANCH CORRIDOR

ALTERNATIVES ANALYSIS REPORT



CONNECTING COMMUNITIES BETWEEN LOS ANGELES AND ORANGE COUNTIES

February 7, 2013



SOUTHERN CALIFORNIA
ASSOCIATION OF GOVERNMENTS



WEST SANTA ANA BRANCH

PACIFIC ELECTRIC ROW / WEST SANTA ANA BRANCH CORRIDOR

ALTERNATIVES ANALYSIS REPORT

CONNECTING COMMUNITIES BETWEEN THE LOS ANGELES AND ORANGE COUNTIES



WEST SANTA ANA BRANCH

TABLE OF CONTENTS

1.0 PURPOSE AND NEED

1.1 Corridor Description.....	1-1
1.1.1 Activity Centers and Destinations.....	1-4
1.1.2 Demographic Characteristics	1-4
1.1.3 Economic Trends.....	1-6
1.1.4 Travel Markets and Characteristics.....	1-7
1.2 Corridor Transportation System	1-8
1.3 Mobility Problem	1-10
1.3.1 Freeway and Arterial Congestion.....	1-10
1.3.2 Transit System Constraints	1-11
1.3.3 Regional Transit System Connectivity.....	1-11
1.4 Purpose and Need.....	1-12

2.0 ALTERNATIVES CONSIDERED

2.1 Previous Study Efforts	2-1
2.2 Screening and Selection Process.....	2-3
2.2.1 Conceptual Set of Alternatives	2-5
2.2.2 Initial Set of Alternatives.....	2-7
2.2.3 Final Set of Alternatives	2-10
2.3 Definition of Final Alternatives	2-10
2.3.1 No Build Alternative	2-11
2.3.2 Transportation System Management Alternative	2-15
2.3.3 Bus Rapid Transit Alternative.....	2-17
Operational Description.....	2-17
Vertical Configuration	2-19
Service Configurations	2-19
Stations	2-22
Station Parking	2-23
2.3.4 Guideway Alternatives	2-24
Operational Description.....	2-24
Vertical Configuration	2-27
Service Configurations	2-29
Stations	2-29
Station Parking	2-37
2.3.5 Alignment Alternative Challenges.....	2-38
2.3.6 Final Screening Evaluation Criteria	2-49

3.0 TRANSPORTATION ANALYSIS

3.1 Affected Environment	3-1
3.2 Traffic	3-2
3.2.1 Freeway Network	3-2
3.2.1.1 Existing and Future Conditions	3-4
3.2.1.2 Future System Improvements	3-7
3.2.2 Arterial Network	3-8
3.2.2.1 Existing and Future Conditions	3-8
3.2.2.2 Future System Improvements	3-10
3.2.3 Highway System Impacts	3-10
3.2.3.1 Impacts by Alignment Alternative	3-11
3.3 Transit	3-34
3.3.1 Existing Transit Service	3-34
3.3.2 Future Transit Improvements	3-35
3.3.2.1 Operating Assumptions and Plans	3-35
3.3.2.2 Ridership Projections	3-48
3.4 Other Modes	3-55
3.4.1 Existing Pedestrian and Bicycle System	3-55
3.4.2 Future Pedestrian and Bicycle System Improvements	3-58
3.4.3 Pedestrian and Bicycle Impacts	3-58
3.4.3.1 Pedestrian Impacts	3-59
3.4.3.2 Bicycle Impacts	3-60
3.5 Summary of Transportation Impacts	3-60

4.0 ENVIRONMENTAL CONSIDERATIONS

4.1 Land Use and Economic Development	4-1
4.1.1 Affected Environment	4-1
4.1.2 Applicable Laws and Regulations	4-2
4.1.3 Evaluation Methodology	4-2
4.1.4 Land Use and Economic Development Assessment	4-3
4.2 Acquisition	4-32
4.2.1 Affected Environment	4-32
4.2.2 Applicable Laws and Regulations	4-33
4.2.3 Evaluation Methodology	4-33
4.2.4 Real Estate and Acquisitions Assessment	4-33
4.3 Visual and Aesthetics	4-34
4.3.1 Affected Environment	4-34
4.3.2 Applicable Laws and Regulations	4-35
4.3.3 Evaluation Methodology	4-36
4.3.4 Assessment of Visual and Aesthetics	4-36

4.4 Cultural Resources	4-44
4.4.1 Affected Environment.....	4-44
4.4.2 Applicable Laws and Regulations.....	4-45
4.4.3 Evaluation Methodology.....	4-46
4.4.4 Cultural Resources Assessment	4-46
4.5 Air Quality	4-55
4.5.1 Affected Environment.....	4-55
4.5.2 Applicable Laws and Regulations.....	4-57
4.5.3 Evaluation Methodology.....	4-59
4.5.4 Air Quality Assessment	4-59
4.6 Climate Change	4-61
4.6.1 Affected Environment.....	4-61
4.6.2 Applicable Laws and Regulations.....	4-62
4.6.3 Evaluation Methodology.....	4-63
4.6.4 Climate Change and Emissions Assessment	4-64
4.7 Energy	4-66
4.7.1 Affected Environment.....	4-66
4.7.2 Applicable Laws and Regulations.....	4-66
4.7.3 Evaluation Methodology.....	4-67
4.7.4 Energy Assessment	4-67
4.8 Noise and Vibration	4-68
4.8.1 Affected Environment.....	4-69
4.8.2 Applicable Laws and Regulations.....	4-69
4.8.3 Evaluation Methodology.....	4-71
4.8.4 Noise and Vibration Assessment	4-75
4.9 Parks and Recreation Resources	4-79
4.9.1 Affected Environment.....	4-79
4.9.2 Applicable Laws and Regulations.....	4-79
4.9.3 Evaluation Methodology.....	4-80
4.9.4 Parklands and Recreation Assessment	4-80
4.10 Safety and Security	4-86
4.10.1 Affected Environment.....	4-86
4.10.2 Applicable Laws and Regulations.....	4-86
4.10.3 Evaluation Methodology.....	4-87
4.10.4 Safety and Security Assessment.....	4-87
4.11 Environmental Justice	4-97
4.11.1 Affected Environment.....	4-97
4.11.2 Applicable Laws and Regulations.....	4-98
4.11.3 Evaluation Methodology.....	4-99
4.11.4 Environmental Justice Assessment.....	4-101

4.12 Summary of Environmental Impacts and Benefits	4-107
--	-------

5.0 COST ANALYSIS

5.1 Capital Cost Analytical Overview	5-1
5.2 Capital Costs.....	5-2
5.2.1 Vehicle Requirements	5-2
5.2.2 Storage and Maintenance Facilities.....	5-4
5.2.3 Capital Costs.....	5-5
5.3 Operating and Maintenance Costs	5-14
5.4 Financial Feasibility Analysis	5-15
5.4.1 Sources and Uses of Funds Analysis.....	5-15
5.4.2 Additional Capital and Operating Funding Requirements	5-18

6.0 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

6.1 Public Involvement and Agency Coordination Efforts	6-1
6.1.1 Conceptual Screening Efforts.....	6-3
6.1.2 Initial Alternatives Screening Efforts.....	6-7
6.1.3 Final Alternatives Screening Efforts.....	6-13
6.2 Summary of Public and Agency Comments	6-16
6.2.1 Themes Identified During Conceptual Alternatives Screening	6-16
6.2.2 Comments Received During Initial Screening.....	6-20
6.2.3 Comments Received During Final Screening	6-24

7.0 COMPARISON OF ALTERNATIVES AND RECOMMENDATIONS

7.1 Purpose and Need.....	7-1
7.2 Evaluation Criteria.....	7-3
7.3 Alternatives Considered.....	7-4
7.4 Public Input	7-9
7.5 Mobility Improvements	7-10
7.6 Cost-Effectiveness/Sustainability.....	7-18
7.7 Land Use/Economic Plan Support.....	7-23
7.8 Project Feasibility.....	7-25
7.9 Environmental and Community Impacts	7-26
7.10 Comparative Summary	7-29
7.11 Discussion/Comparison of Alignment Alternatives	7-34
7.12 Recommended Alternatives	7-39
7.12.1 Summary of Project Findings	7-39
7.12.2 Public Input	7-40
7.12.3 Final Recommendations	7-41

TABLES

Table 2.1 Summary of Conceptual Screening Results.....	2-6
Table 2.2 Existing Transit Systems used for Initial Screening Efforts.....	2-8
Table 2.3 Initial Screening Results Summary	2-9
Table 2.4 Approved Transportation Improvements in the Corridor Study Area (2035).....	2-11
Table 2.5 Transportation System Management (TSM) Alternative Projects (2035).....	2-15
Table 2.6 BRT Alternatives: Proposed Stations.....	2-22
Table 2.7 BRT Alternatives: Proposed Station Parking	2-23
Table 2.8 Guideway Alternatives: Number of Stations.....	2-36
Table 2.9 Guideway Alternatives: Proposed Stations.....	2-36
Table 2.10 Guideway Alternatives: Proposed Station Parking	2-38
Table 2.11 Final Screening Evaluation Criteria.....	2-50
Table 3.1 Level of Service Definition.....	3-4
Table 3.2 Corridor Study Area Freeways Operating at Level of Service E or F	3-5
Table 3.3 Project Vertical Configurations	3-14
Table 3.4 Intersections Impact Determination Criteria	3-19
Table 3.5 Northern Connection Area: Summarized Impacted Intersections.....	3-22
Table 3.6 Northern Connection Area: Impacted Intersections.....	3-23
Table 3.7 Northern Connection Area: Proposed Street System Changes.....	3-25
Table 3.8 PEROW/WSAB Area: Summarized Impacted Intersections	3-26
Table 3.9 PEROW/WSAB Area: Intersection Impacts	3-26
Table 3.10 PEROW/WSAB Area: Proposed Street System Changes	3-28
Table 3.11 Southern Connection Area: Impacted Intersections.....	3-30
Table 3.12 Southern Connection Area: Intersection Impacts	3-31
Table 3.13 Southern Connection Area: Proposed Street System Changes.....	3-34
Table 3.14 Service Frequency	3-39
Table 3.15 Alternative Definition and Resulting Operational Information.....	3-41
Table 3.16 BRT Alternatives: Run Times	3-42
Table 3.17 Guideway Alternatives: Run Times	3-43
Table 3.18 LRT West Bank 3 Alternative: All Grade-Separated System Travel Times	3-44
Table 3.19 LRT West Bank 3: Skip Stop System Travel Times	3-44
Table 3.20 Travel Times for Minimum Operable Segments in Los Angeles County	3-45
Table 3.21 Forecast Ridership (2035)	3-48
Table 3.22 Comparison of Forecast Ridership based on Metro Blue Line Operating Speed (2035)	3-50
Table 3.23 Annual Corridor Daily Boardings (2035).....	3-51
Table 3.24 Peak and Off-Peak Boarding Access (2035)	3-51
Table 3.25 Guideway Alternatives: Mode of Access (2035)	3-52
Table 3.26 Forecasted Most Active Stations by Alternative and County (2035)	3-52
Table 3.27 Sensitive Test: Entirely Grade-Separated LRT Alternative (2035).....	3-53

Table 3.28 Low Speed Maglev Alternatives: Private Fare (2035)	3-54
Table 3.29 Ridership Projections for Minimal Operable Segments in Los Angeles County.....	3-54
Table 3.30 Summary of Bikeways Crossing the PEROW/WSAB Corridor	3-56
Table 4.1 BRT Alternatives: Proposed Stations.....	4-4
Table 4.2 Guideway Alternatives: Proposed Stations.....	4-5
Table 4.3 Summary of Transit Supportive Land Use Plans	4-31
Table 4.4 Possible Property Acquisitions (Parcels)	4-34
Table 4.5 Cultural Resources Adjacent to the Alternatives	4-46
Table 4.6 State and Federal Ambient Air Quality Standards	4-56
Table 4.7 Background Air Quality Data (2007-2009)	4-57
Table 4.8 Daily Emissions Summary (lb/day)	4-60
Table 4.9 Annual Emissions Summary (MTCO ₂).....	4-64
Table 4.10 Air Quality and Climate Change Benefits – Comparative Summary	4-65
Table 4.11 Transportation Energy Intensity.....	4-68
Table 4.12 FTA Land-Use Categories and Noise Metrics	4-70
Table 4.13 Project-Noise and Vibration-Screening Distances (feet) ¹	4-70
Table 4.14 Number of Noise-Sensitive Land Uses Identified within the FTA/FRA Screening Distances .	4-76
Table 4.15 Number of Vibration-Sensitive Land Uses Identified within the FTA/FRA Screening Distances	4-77
Table 4.16 Summary of Noise- and Vibration-Sensitive Land Uses Identified within the FTA/FRA Screening Distances	4-78
Table 4.17 Parklands and Recreational Facilities	4-81
Table 4.18 Los Angeles County Schools Near Proposed Alternatives.....	4-89
Table 4.19 Orange County Schools Near Proposed Alternatives.....	4-94
Table 4.20 2008 U.S. Department of HHS Poverty Guidelines	4-98
Table 4.21 Los Angeles County – Demographic Characteristics	4-100
Table 4.22 Environmental Justice Populations in the Corridor Study Area	4-101
Table 4.23 Summary of Environmental Impacts.....	4-107
Table 5.1 Fleet Requirements for TSM and BRT Alternatives.....	5-2
Table 5.2 Fleet Requirements for Guideway Alternatives.....	5-3
Table 5.3 Order of Magnitude Capital Costs (FY 2010 dollars).....	5-6
Table 5.4 Capital Cost Breakdown (FY 2010 dollars)	5-8
Table 5.5 Estimated Capital Cost Per Mile (FY 2010 dollars)	5-9
Table 5.6 Estimated Capital Cost Per County (FY 2010 dollars).....	5-10
Table 5.7 Capital Cost for Possible Minimal Operable Segments (FY 2010 dollars)	5-12
Table 5.8 Street Car and LRT Alignments: Definition of Vertical Configuration	5-13
Table 5.9 Estimated Capital Cost for 100% Grade-Separated Systems (FY 2010)	5-13
Table 5.10 Estimated Annual O & M Costs (FY 2010 dollars)	5-14
Table 5.11 Capital Funding Requirements: FY2011 to FY2040 (Year of Expenditure, Millions)	5-18
Table 5.12 Summary of Cash Flow Analysis	5-19

Table 6.1 Summary of Conceptual Screening Phase Outreach Efforts.....	6-7
Table 6.2 Summary of Initial Screening Phase Outreach Efforts	6-12
Table 6.3 Summary of Final Screening Phase Outreach Efforts.....	6-16
Table 7.1 Summary of Final Screening Evaluation Criteria	7-4
Table 7.2 Alternative Definition and Resulting Operational Information.....	7-8
Table 7.3 System Travel Times.....	7-12
Table 7.4 LRT West Bank 3 Alternative: All Grade-Separated System Travel Times	7-13
Table 7.5 LRT West Bank 3: Skip Stop System Travel Times	7-13
Table 7.6 Forecast Ridership (2035)	7-14
Table 7.7 Comparison of Forecast Ridership based on Metro Blue Line Operating Speed (2035)	7-16
Table 7.8 Sensitivity Test: Entirely Grade-Separated LRT Alternative (2035).....	7-17
Table 7.9 Low Speed Maglev Alternative: Private Fare (2035).....	7-17
Table 7.10 Ridership Projections for Minimum Operable Segments in Los Angeles County	7-18
Table 7.11 Capital Cost Breakdown (FY 2010 dollars)	7-20
Table 7.12 Estimated Annual O&M Costs (FY 2011 dollars)	7-21
Table 7.13 Cost-Effectiveness Indices (2035)	7-22
Table 7.14 Summary of Transit Supportive Land Use Plans	7-24
Table 7.15 Summary of Environmental Impacts.....	7-26
Table 7.16 Summary of Final Screening Results	7-35
Table 7.17 Overview of Northern Connection Area Alignment Options	7-37
Table 7.18 Overview of Southern Connection Area Alignment Options	7-39

FIGURES

Figure 1.1 Corridor	1-2
Figure 1.2 Corridor Activity Centers and Destinations	1-5
Figure 1.3 Corridor Transportation System	1-9
Figure 2.1 Corridor Study Area Previous Studies	2-2
Figure 2.2 Screening Process	2-4
Figure 2.3 Approved Highway Projects in Corridor Study Area (2035).....	2-12
Figure 2.4 Approved Transit System Projects (2035).....	2-14
Figure 2.5 TSM Alternative Projects (2035)	2-16
Figure 2.6 BRT Alternative: Northern Alignment Alternatives	2-18
Figure 2.7 BRT Alternative: Southern Alignment Alternatives	2-20
Figure 2.8 Typical BRT Operational Cross-Sections PEROW/WSAB Corridor	2-21
Figure 2.9 Guideway Alternatives: Northern Alignment Alternatives	2-26
Figure 2.10 Guideway Alternatives: Southern Alignment Alternatives	2-28
Figure 2.11 Typical Street Car Operational Cross-Sections PEROW/WSAB Corridor.....	2-30
Figure 2.12 Typical LRT Operational Cross-Sections Cesar Chavez Avenue Bridge	2-31
Figure 2.13 Typical Low Speed Maglev Operational Cross-Sections Los Angeles River	2-32

Figure 2.14 Vertical Configurations – North of the PEROW/WSAB Corridor.....	2-33
Figure 2.15 Vertical Configurations on the PEROW/WSAB Corridor	2-34
Figure 2.16 Vertical Configurations South of the PEROW/WSAB Corridor.....	2-35
Figure 2.17 Implementation Challenges and Constraints.....	2-42
Figure 2.18 Implementation Challenges and Constraints.....	2-47
Figure 3.1 Current Regional Highway System.....	3-3
Figure 3.2 Freeway Level of Service (2035)	3-6
Figure 3.3 Corridor Arterial System: Level of Service (2035).....	3-9
Figure 3.4 Intersection Types.....	3-15
Figure 3.5 Intersection Types.....	3-16
Figure 3.6 Intersection Types.....	3-17
Figure 3.7 Intersection Types.....	3-18
Figure 3.8 Northern Connection Area: Impacted Intersections	3-24
Figure 3.9 PEROW/WSAB Area: Impacted Intersections	3-27
Figure 3.10 Southern Connection Area: Impacted Intersections	3-32
Figure 3.11 Existing Rail Transit Service.....	3-36
Figure 3.12 Existing Los Angeles County Transit Service	3-37
Figure 3.13 Existing Orange County Transit Service	3-38
Figure 3.14 Corridor Guideway Station Spacing	3-46
Figure 3.15 Corridor Guideway Station Spacing	3-37
Figure 3.16 Existing Bikeways in Corridor Study Area	3-57
Figure 4.1 Land Uses	4-3
Figure 4.2 Visual and Privacy Impacts.....	4-40
Figure 4.3 Los Angeles County Historical Resources.....	4-51
Figure 4.4 Historic Resources Huntington Park and Los Angeles Insets.....	4-52
Figure 4.5 Orange County Historical Resources.....	4-53
Figure 4.6 Typical A-Weighted Noise Levels	4-72
Figure 4.7 Typical Ground-Borne Vibration Levels	4-74
Figure 4.8 Los Angeles County Parks and Recreational Facilities	4-84
Figure 4.9 Orange County Parks and Recreational Facilities	4-85
Figure 4.10 Los Angeles County Schools near Proposed Alignment.....	4-91
Figure 4.11 Orange County Schools near Proposed Alignment.....	4-96
Figure 4.12 Los Angeles County Environmental Justice Populations	4-104
Figure 4.13 Orange County Environmental Justice Populations.....	4-105

ACRONYMS

AA	Alternatives Analysis
ACTA	Alameda Corridor Transportation Authority
AQMP	Air Quality Management Plan
BNSF	Burlington Northern Santa Fe
BRT	Bus Rapid Transit
CAA	Federal Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAHSR	California High Speed Rail
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCSP	Climate Change Scoping Plan
CEC	California Energy Commission
CEDD	California Employment Development Department
CEI	Cost-Effectiveness Index
CEQA	California Environmental Quality Act
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CH ₄	Methane
CNG	Compressed Natural Gas
COG	Council of Governments
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CPUC	California Public Utilities Commission
CRA	California Redevelopment Agency
dB	Decibels
dBA	A-weighted decibel
DEIR	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Study
DMU	Diesel Multiple Unit
DOE	Department of Energy
DOT	Department of Transportation
EIR	Environmental Impact Report
EIS	Environmental Impact Study
EJ	Environmental Justice
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FRA	Federal Railroad Administration
GHG	Greenhouse Gas
GWP	Global Warming Potential

HOT	High Occupancy Toll Lane
HOV	High Occupancy Vehicle
HSST	High Speed Surface Transport
I	Interstate
IEPR	Integrated Energy Policy Report
IPCC	Intergovernmental Panel on Climate Change
ITS	Intelligent Transportation Systems
LACMTA	Los Angeles County Metropolitan Transportation Authority
LADWP	Los Angeles Department of Water and Power
LAX	Los Angeles International Airport
LOS	Level of Service
LRV	Light Rail Vehicle
LRT	Light Rail Transit
LRTP	Long Range Transportation Plan
Maglev	Magnetic Levitation
Metro	Los Angeles Metropolitan Transportation Authority
MIS	Major Investment Study
MOS	Minimum Operable Segment
N ₂ O	Nitrous Oxide
NABI	North American Bus Industries
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO ₂	Nitrogen Dioxide
NRHP	National Register of Historical Properties
NRIS	National Register Information System
OCS	Operating Control System
OCTA	Orange County Transportation Authority
OHP	California Office of Historic Preservation
OLDA	Orange Line Development Authority
O&M	Operating and Maintenance
PE	Pacific Electric
PEROW/WSAB	Pacific Electric Right of Way/West Santa Ana Branch Corridor
PM ₁₀	Particulate matter less than 10 microns in diameter
PM _{2.5}	Particulate matter less than 2.5 microns in diameter
ROW	right-of-way
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan
SARTC	Santa Ana Regional Transportation Center
SC	Steering Committee
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments

SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SO ₂	Sulfur Dioxide
SOV	Single Occupancy Vehicle
SR	State Route
TAC	Technical Advisory Committee
TAZ	Transportation Analysis Zone
TDM	Travel Demand Modeling
TGC	Southern California Gas Company
TIP	Transportation Improvement Program
TOD	Transit-oriented Development
TSM	Transportation Systems Management
UNFCCC	United Nations Framework Convention on Climate Change
UP	Union Pacific
USACE	US Army Corp of Engineers
USEPA	US Environmental Protection Agency
VdB	Vibration decibels
VMT	Vehicle Miles Traveled
WSAB	West Santa Ana Branch