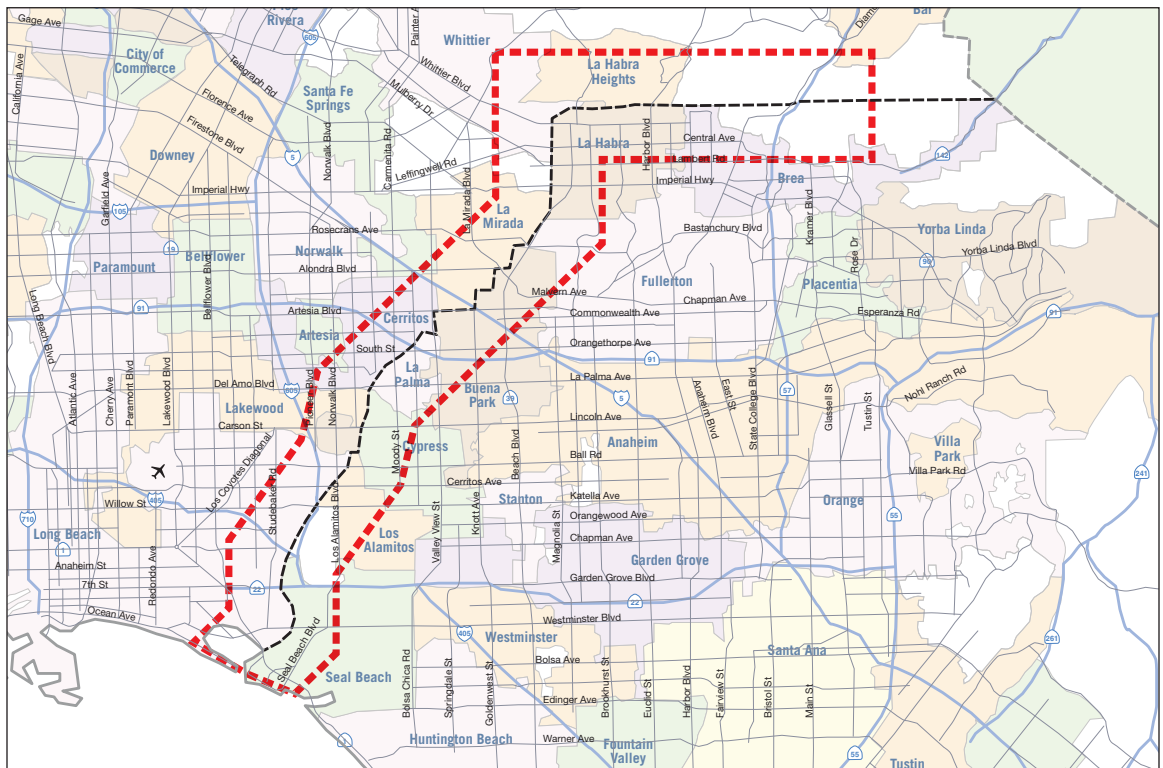




Orange and Los Angeles Intercounty Transportation Study

Pacific Electric Right of Way Assessment



July 1, 2008

IBI Group

with Fehr & Peers | Arellano Associates | Sarah Catz



ORANGE AND LOS ANGELES INTERCOUNTY TRANSPORTATION STUDY

Pacific Electric Right of Way Assessment

Task 4.4

July 1, 2008



in association with

Fehr & Peers, Arellano Associates, and Sarah Catz

PACIFIC ELECTRIC RIGHT OF WAY ASSESSMENT

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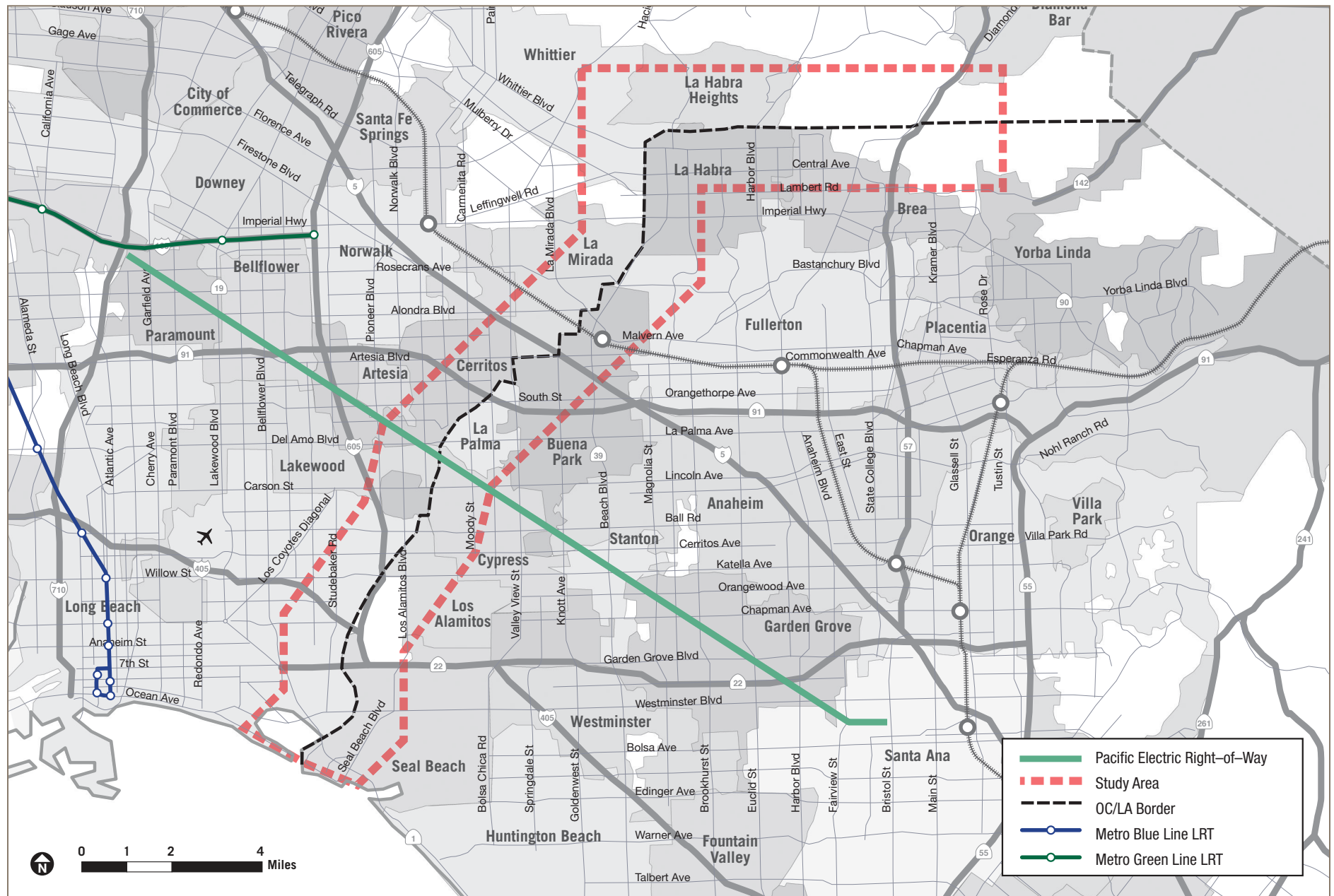
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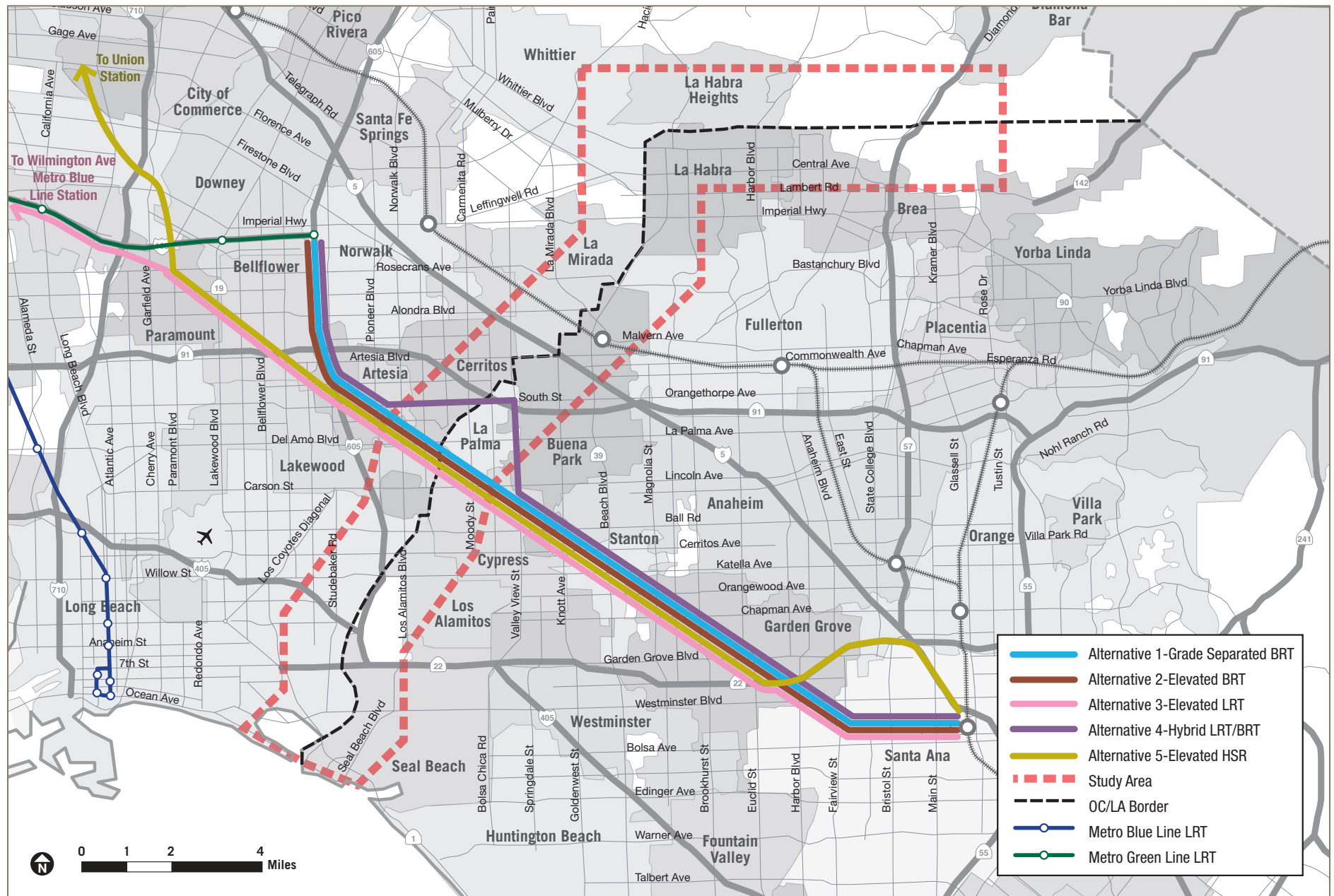
EXECUTIVE SUMMARY

The West Santa Ana Branch of the Pacific Electric Right of Way (PE ROW) travels in a northwest to southeast alignment between the Los Angeles River in the City of Paramount in Los Angeles County and Raitt Street in the City of Santa Ana in Orange County. In addition to Paramount and Santa Ana, the corridor passes through the cities of Bellflower, Cerritos, and Artesia in Los Angeles County and La Palma, Cypress, Buena Park, Anaheim, Stanton, and Garden Grove in Orange County. The corridor is 19.8 miles in length, with just over eight miles in Los Angeles County and approximately 11.75 miles in Orange County. The PE ROW alignment is illustrated in Exhibit S-1.

As part of the Orange and Los Angeles (OC/LA) Intercounty Transportation Study, five alternative transit service concepts have been developed for the PE ROW. These transit service concepts were identified during the development of the Conceptual Alternatives for the OC/LA study. These services range from bus rapid transit services operating at-grade with elevated arterial crossings to light rail and high speed rail alternatives that would be fully grade separated within the corridor. The alignment alternatives are shown in Exhibit S-2 and described below:

- **Alternative 1 – Grade Separated Bus Rapid Transit (BRT):** This alternative proposes a BRT service that would operate between the Santa Ana Metrolink Station and the Norwalk Metro Green Line Station (at I-105/I-605 interchange). Headways for the service would be 15 minutes during peak periods and 30 minutes during off-peak time periods. Grade separated crossings would be provided along the PE ROW at major arterial streets and freeways. All other street crossings would be at-grade. An at-grade bicycle and pedestrian pathway is proposed to run adjacent to the exclusive transit lanes. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway. The BRT service is intended to serve short to medium distance trips. Consistent with this objective; stations would be spaced about half-a-mile to one-mile apart.
- **Alternative 2 – Elevated Bus Rapid Transit (BRT):** This alternative proposes a BRT service that would operate between the Santa Ana Metrolink Station and the Norwalk Metro Green Line Station (at I-105/I-605 interchange). Headways for the service would be 10 minutes during peak periods and 30 minutes during off-peak time periods. The service would operate at-grade in exclusive travel lanes with traffic signal priority within Central Santa Ana. In the PE ROW between Civic Center Drive and the I-605 freeway, the BRT service would operate in elevated exclusive transit-only lanes. No at-grade crossings of arterial streets and freeways would occur. An at-grade bicycle and pedestrian pathway is proposed to run below the elevated transit lanes. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway. The BRT service is intended to serve medium distance trips and provide a faster travel time than Alternative 1. Consequently, stations would be spaced about one mile apart.





- **Alternative 3 – Elevated Light Rail Transit (LRT):** This alternative proposes a LRT service that would operate between the Santa Ana Metrolink Station and the Wilmington Metro Green Line-Blue Line Station. Headways for the service would be 10 minutes during peak periods and 20 minutes during off-peak time periods. The service would operate at-grade in exclusive travel lanes with traffic signal priority within Central Santa Ana. In the PE ROW between Civic Center Drive and the Los Angeles River, the LRT service would operate on an elevated structure. No at-grade crossings of arterial streets and freeways would occur. The alignment would then cross the Los Angeles River and connect to the existing Metro Green Line corridor in the median of the I-105 freeway. An at-grade bicycle and pedestrian pathway is proposed to run below the elevated transit structure within the PE ROW. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway. Similar to Alternative 2, stations would be placed about one mile apart.
- **Alternative 4 – Hybrid Light Rail Transit/Bus Rapid Transit:** This alternative proposes a LRT service that would operate between the Santa Ana Metrolink Station and Cypress College. A BRT system operating in mixed-flow traffic would then continue from Cypress College along Valley View Street, Orangethorpe Avenue/South Street and the I-605 freeway to link to the Metro Green Line Station. Headways for the service would be 15 minutes during peak periods and 30 minutes during off-peak time periods. The service would operate at-grade in exclusive travel lanes with traffic signal priority within Central Santa Ana. In the PE ROW between Civic Center Drive and Valley View Street, the LRT service would operate on an elevated structure. No at-grade crossings of arterial streets and freeways would occur. Mixed-flow BRT operations with traffic signal priority are proposed along Valley View Street, Orangethorpe Avenue, and South Street. An at-grade bicycle and pedestrian pathway is proposed to run below the elevated transit structure within the PE ROW between Fairview Street and Valley View Street. Stations would be spaced about one mile apart.
- **Alternative 5 – Elevated High Speed Transit:** Alternative 5 is a technology neutral high-speed transit service that would operate between the Santa Ana Metrolink Station and Union Station in Downtown Los Angeles. Headways for the service would be 10 minutes during peak periods and 20 minutes during off-peak. The objective of this service is to provide a high-speed connection between Central Orange County and downtown Los Angeles. Therefore, the service would be grade separated from other transportation facilities and the number of stations would be reduced compared to the previous four PE ROW alternatives in order to maintain higher travel speeds. Stations for this alternative would be spaced between five and ten miles apart to allow for higher travel speeds.

Population and Employment Forecasts

Based on year 2000 population data provided by OCTA and Metro, areas with the highest population densities near the PE ROW are Central Santa Ana, Stanton, and Bellflower. These areas continue to have the highest population densities in the year 2030. Increased densities are also observed in Paramount, Garden Grove, and western Anaheim. Employment densities near the PE ROW corridor in the year 2000 are highest in Central Santa Ana, in Cypress and West Garden Grove, and near the I-105 freeway in Bellflower and Downey. These three areas continue to have the highest employment densities near the PE ROW in the year 2030.

Overall, about 1.2 million people resided within two miles of the PE ROW in the year 2000 (defined as the segment between Raitt Street in Santa Ana and the Los Angeles River in Paramount). The population within this area is forecast to increase about 15% between 2000 and 2030 to 1.4 million residents. The employment data shows 368,000 workers were located within two miles of the corridor in the year 2000. By the year 2030 this figure is forecast to increase almost 20% to 441,000.

The population and employment data show that the PE ROW is located within a predominately residential area, with a significantly higher number of residents living within two miles of the corridor as compared to employment locations. This information suggests that connections between a transit service operating in the corridor and other regional transit services would be important to ensure that residents in the corridor have adequate connections to employment centers in Orange County and Los Angeles County.

Ridership Forecasts

Transit ridership forecasts for each of the five alternatives for transit service in the PE ROW were developed using the OCTA Orange County Transportation Analysis Model (OCTAM). The ridership forecasts assume the implementation of the Year 2030 Baseline projects outlined in the OC/LA Intercounty Transportation Study Corridor Mobility Problem and Purpose and Need Report. Table S-1 summarizes the year 2030 transit ridership forecasts for each alternative along with the breakdown of trips within and between Orange and Los Angeles counties.

TABLE S-1 OCTAM YEAR 2030 DAILY RIDERSHIP FORECASTS FOR PE ROW ALTERNATIVES

Transit Ridership	Alternative 1 Grade Separated Bus Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Total Daily Ridership	12,000	14,000	18,700	6,500	9,500
Within Orange County (% of total ridership)	36%	39%	41%	77%	5%
Within LA County (% of total ridership)	14%	12%	19%	8%	58%
Cross County (% of total ridership)	50%	49%	40%	15%	37%
Riders per Mile	600	700	661	273	278

Source: OCTAM 3.2

The ridership forecasts show some distinct differences between the alternatives under consideration. Alternatives 1, 2, and 3 are forecast to serve the highest total number of riders. These three alternatives also serve the greatest number of riders traveling across the county line. All three alternatives also serve a significant number of riders traveling within Orange County. This is partially a factor of the longer alignment and greater number of stations in Orange County for each alternative as compared to Los Angeles County.

Alternative 4, the hybrid BRT/LRT option, serves the lowest number of riders, possibly reflecting the negative impact that a forced transfer in modes causes to ridership. Alternative 5 had the second lowest ridership forecast, but served the greatest number of riders traveling

within Los Angeles County. This alternative likely benefited from the connection to Downtown Los Angeles.

The ridership forecasts developed for this initial assessment of PE ROW transit service alternatives did illustrate some distinct travel markets and travel patterns within the corridor. There is a strong attraction between origins in Southeast Los Angeles County and destinations in Central Orange County. Central Santa Ana, the South Coast Metro area, and the Irvine Business Complex are strong destinations at the southern end of the corridor. A transit service operating in the PE ROW seems well placed to serve this travel market. A key evaluation point for a future analysis would be to examine the potential for various travel service options to reduce some auto trips near the PE ROW corridor or on the I-5 and I-405 freeways that would otherwise travel between Southeast Los Angeles County and destinations in Central Orange County.

The year 2030 ridership forecasts do not show as strong a connection between points of origin in Orange County and destinations in Los Angeles County. This may be a factor of the limited number of employment centers located along the PE ROW in Southeast Los Angeles County. Exhibit S-3 compares the origins and destinations of cross border trips between Los Angeles and Orange counties, and illustrates the difference in Los Angeles County trip origins versus Orange County trip origins for those trips that cross the county line. All five alternatives show a similar pattern for trip origins and destinations.

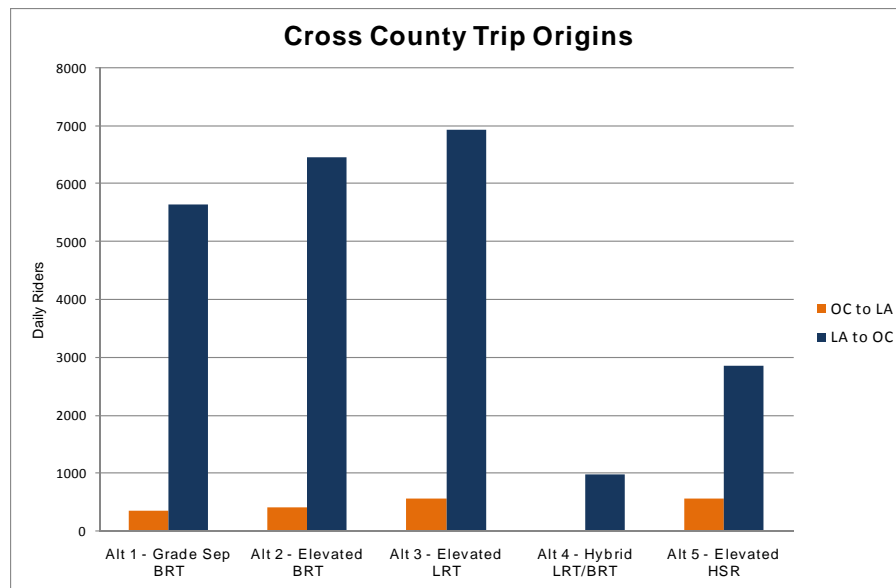


EXHIBIT S-3 COMPARISON OF CROSS COUNTY TRIP ORIGINS FOR PE ROW ALTERNATIVES

Trips within each county do highlight a difference in the travel markets served by Alternatives 1 through 4 and Alternative 5. The first four alternatives perform well at serving trips within Orange County, providing a good connection between West and Central Orange County. Alternative 5 does not perform as well in this regard, where the shorter travel distance reduces some of the benefits associated with high speed travel and the reduced number of stations limits the potential number of riders. In contrast, Alternative 5 performs the best in serving trips within Los Angeles County. The higher speed connection to Downtown Los Angeles succeeds in attracting a good ridership base from Southeast Los Angeles County. Exhibit S-4 compares

the performance of each alternative in serving trips within Orange County and within Los Angeles County.

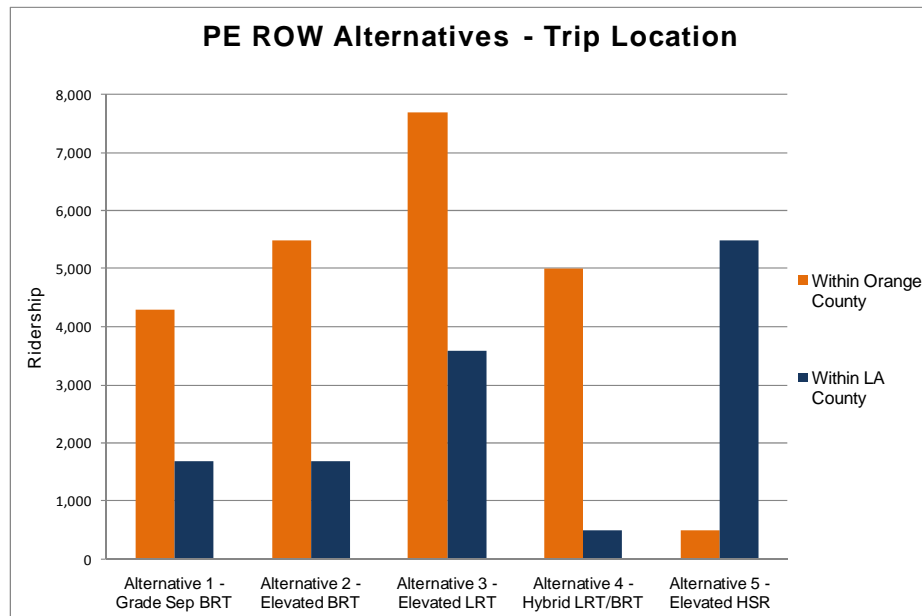


EXHIBIT S-4 INTRA-COUNTY TRIP ORIGINS AND DESTINATIONS FOR PE ROW ALTERNATIVES

The average or typical trip length is another component of the ridership forecasts. This information also highlights a difference in the travel markets served by the transit service alternatives. Exhibit S-5 compares the cumulative trip lengths forecast for the five PE ROW transit alternatives.

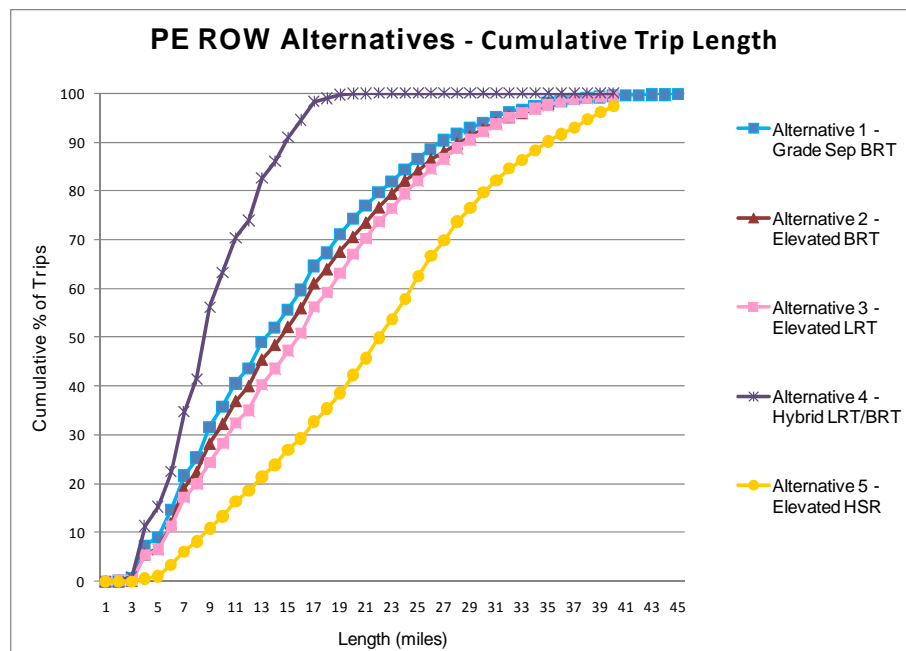


EXHIBIT S-5 COMPARISON OF CUMULATIVE TRIP LENGTHS FOR PE ROW ALTERNATIVES

Exhibit S-5 shows that Alternative 4 is forecast to serve short distance local trips. This result is likely related to the poor performance of this alternative in relation to the other alternatives in serving trips across the county line. Alternatives 1, 2, and 3 have similar performance with 50% of the trips for each alternative consisting of trips that are 11 to 13 miles in length or less. Alternative 5 serves a very different travel market, focused on longer distance trips with 50% of the trips on this alternative traveling over 20 miles.

Origins and Destinations

OCTAM forecasts of trip origins and destinations were also developed for each of the five PE ROW alternatives. The origin and destination information highlights the similarities and differences associated with the travel markets served by the five transit service alternatives. Alternatives 1 through 4 perform well at serving travel within Orange County, and in the case of Alternatives 1, 2, and 3, travel from Los Angeles County to Orange County. In contrast, Alternative 5 performs the best at serving travel within Los Angeles County, benefiting from the connection to downtown Los Angeles.

Areas of significant trip origins along the PE ROW include the Stanton-Garden Grove area, Cerritos, Norwalk, and the Lynwood-South Gate area. Major destinations include the Cypress College area, the Los Cerritos Center and Central Santa Ana. Cypress College acts as a significant destination within the central portion of the alignment. Central Santa Ana serves a major destination for riders traveling from West Orange County and Southeast Los Angeles County. There is a larger catchment area for potential riders in Los Angeles County, with the Metro Green Line serving as an excellent connection for potential riders in southeast and south central Los Angeles County. However, these areas do not function as a major destination for trips in the PE ROW, possibly reflecting the residential character of these communities.

Exhibits S-6 through S-9 provide a comparison of origins and destinations for Alternative 2 and Alternative 5. Alternative 2 was selected as a representative example of origins and destinations observed for the BRT and LRT alternatives considered in this assessment. These exhibits highlight differences in travel markets served by the BRT and LRT alternatives and Alternative 5, which proposes a high speed transit service.

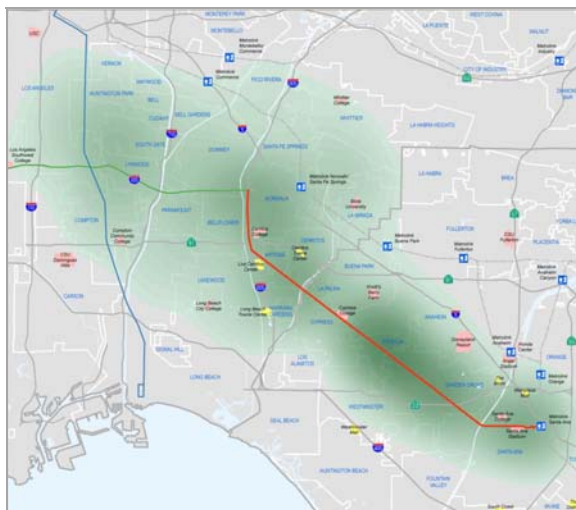


EXHIBIT S-6 ALTERNATIVE 2 TRIP ORIGIN MAP

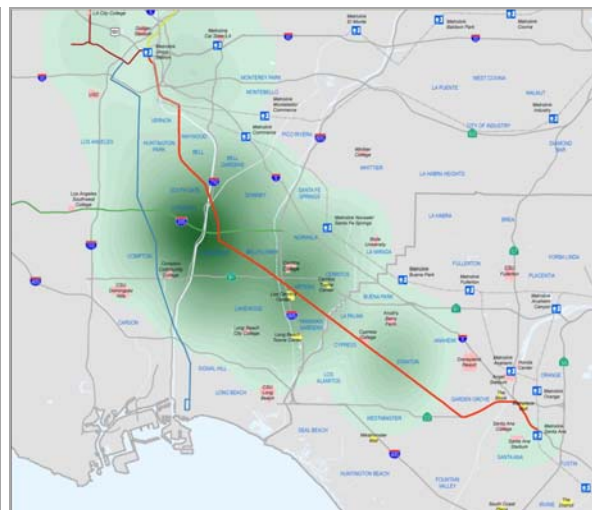


EXHIBIT S-7 ALTERNATIVE 5 TRIP ORIGIN MAP

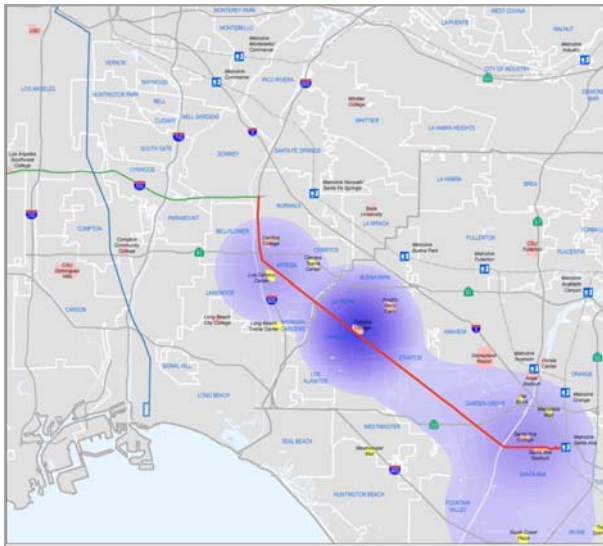


EXHIBIT S-8 ALTERNATIVE 2 TRIP DESTINATION MAP

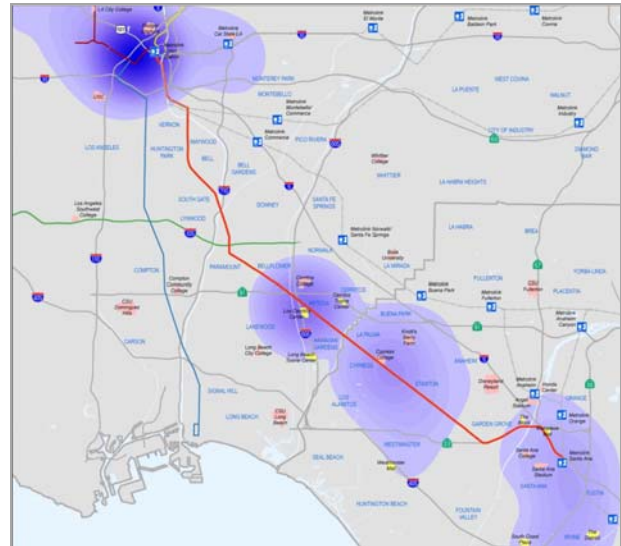


EXHIBIT S-9 ALTERNATIVE 5 TRIP DESTINATION MAP

Preliminary Cost Estimates

The order of magnitude capital cost estimates were developed for the PE ROW transit service alternatives. All costs are expressed in current year dollars (2008\$), and have been converted from previous year values as necessary using the California Department of Transportation Price Index for Selected California Construction Cost Items.

The representative unit costs for alternatives that include BRT or LRT are based on the cost estimates used in Maricopa Association of Governments High-Capacity Transit Study, the OCTA CenterLine Light Rail Preliminary Engineering, the Metro Gold Line LRT Foothill Extension Environmental Impact Statement/Environmental Impact Report (EIS/EIR), and the Metro Orange Line dedicated bus transitway. The cost estimates for Alternatives 1 through 4 include civil site modifications, guideway structures and track, stations, systems, facilities, vehicles, program implementation, and contingencies for environmental mitigation, design and construction. The line item costs and quantities for Alternative 1 through 4 are provided in the Appendix.

The Alternative 5 (high speed transit) is a technology-neutral option, including the full spectrum of higher speed train types from steel-wheel to maglev. The cost estimates for Alternative 5 are based on average cost-per-mile data from the Orangeline High Speed Maglev Phase I Preliminary Engineering Report published by the Orangeline Development Authority, the environmental documents published for the California High Speed Rail Authority, and the Southern California Association of Governments (SCAG) High Speed Regional Transport System Design Report. With an assumed cost per mile ranging from \$120 to \$200 million per mile for elevated or underground high speed rail, Alternative 5 is estimated to cost between \$4.1 and \$6.8 billion.

A summary of the estimated total capital cost and cost per mile for each alternative is included in Table S-2.

TABLE S-2 – PE ROW TRANSIT SERVICE ALTERNATIVES ORDER OF MAGNITUDE COST ESTIMATES

Alternative	BRT Route Length (miles)	LRT Route Length (miles)	HSR Route Length (miles)	Estimated Cost per Mile (millions)	Total Capital Cost Estimate (millions)
Grade Separated BRT	20.0	0.0	0.0	\$37	\$740
Elevated BRT	21.9	0.0	0.0	\$84	\$1,832
Elevated LRT	0.0	30.2	0.0	\$100	\$3,021
Hybrid LRT/BRT	13.5	12.2	0.0	\$58	\$1,485
High Speed Transit	0.0	0.0	34.2	\$120 to \$200	\$4,100 to \$6,800

Source: IBI Group

Preliminary Evaluation

Each of the five transit service alternatives for the PE ROW was subjected to a preliminary evaluation using several criteria. The screening and evaluation of transit alternatives is designed to identify viable alternatives that should be carried forward for detailed study and analysis, and to identify those alternatives that may have significant impacts or poor system performance. The goal is to develop a short list of reasonable alternatives that can be studied in a future phase at a higher level of detail. The criteria selected for evaluation were assigned to the following groups:

- Mobility Improvements
- Connectivity (with other transit systems)
- Visual Impacts
- Traffic Impacts
- Cost Effectiveness

The comparison of the five proposed alternatives is based upon a rating system applied to specific evaluation criteria that fall into the categories mentioned above. The rating represents how each transit alternative ranks in terms of individual evaluation criteria on a scale of 1 to 5. The rating scale is as follows:

- 1 – Significant Constraint
- 2 – Not Supportive
- 3 – Neutral
- 4 – Supportive
- 5 – Very Supportive

Ratings were assigned for each corridor in the various categories using an equal interval method. Table S-3 below presents the rating applied to a range of values under each evaluation criteria.

TABLE S-3 – EVALUATION CRITERIA RATING ASSIGNMENTS

Evaluation Criteria	Significant Constraint "1"	Not Supportive "2"	Neutral "3"	Supportive "4"	Very Supportive "5"
Mobility Improvements					
Total Ridership	0 – 4,000	4,001 – 8,000	8,001 – 12,000	12,001 – 16,000	16,001 – 20,000
Ridership within Orange County	0 – 1,600	1,601 – 3,200	3,201 – 4,800	4,801 – 6,400	6,401 – 8,000
Ridership within Los Angeles County	0 – 1,200	1,201 – 2,400	2,401 – 3,600	3,601 – 4,800	4,801 – 6,000
Ridership between Counties	0 – 1,600	1,601 – 3,200	3,201 – 4,800	4,801 – 6,400	6,401 – 8,000
Riders per Mile	0 – 160	161 – 320	321 – 480	481 – 640	641 – 800
Connectivity					
Connectivity with Existing Transit Network	Less than 15	15 – 30	31-45	46-60	Over 60
No. of Stations	Up to 5	6-10	11-15	16-20	Over 20
No. of Stations with Park and Ride	Less Than 15%	15% - 30%	31% - 45%	46% - 60%	Above 60%
Visual Impacts					
Structure/Guideway Visual Impacts to Adjacent Properties	n/a	Fully Elevated	Primarily Elevated	Partially Elevated	Fully At-Grade
Traffic Impacts					
Roadway Capacity Impacts	n/a	Replacing Traffic Lanes with Exclusive Transit Lanes	Replacing Left-Turn Lanes with Exclusive Transit Lanes	Mixed-flow Operations	Exclusive Transit Lanes with no Changes to Traffic Lanes
Roadway Crossing Impacts	n/a	Fully At-Grade	Partially Elevated	Primarily Elevated	Fully Elevated Alignment
Cost Effectiveness					
Construction Cost per Mile	Above \$120,000,000	\$90,000,001 - \$120,000,000	\$60,000,001 - \$90,000,000	\$30,000,001 - \$60,000,000	Less than \$30,000,000
Construction Cost per Annual Rider	Above \$160	\$121 - \$160	\$81 - \$120	\$41 - \$80	\$0 - \$40

Comparison of Alternatives

The rankings assigned to each alternative using the criteria outlined in this initial assessment were totaled to obtain an overall score for each of the five alternatives. The overall score summarizes the performance of each alternative under this initial assessment and evaluation. The scores can be used to identify alternatives the merit further consideration in a future more detailed study and those alternatives that may require some refinement in order to be considered for future evaluation and study. Table S-4 summarizes the results of the evaluation of the five PE ROW transit service alternatives.

TABLE S-4 – OVERALL EVALUATION CRITERIA MATRIX

Evaluation Criteria	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Mobility Improvements					
Total Ridership	4	4	5	2	3
Within Orange County	3	4	5	4	1
Within LA County	2	2	4	1	5
Cross County	4	4	5	1	3
Riders per Mile	4	5	5	2	2
Connectivity					
Connectivity with Existing Transit Network	5	4	5	4	2
No. of Stations	5	3	4	4	1
No. of Stations with Park and Ride	3	4	5	3	5
Visual Impacts					
Structure/Guideway Visual Impacts to Adjacent Properties	4	3	3	4	2
Traffic Impacts					
Roadway Capacity Impacts	4	3	3	3	5
Roadway Crossing Impacts	3	4	4	3	5
Cost Effectiveness					
Construction Cost per Mile	4	3	2	4	1
Construction Cost per Annual Rider	5	5	4	4	1
Total Points	50	48	54	39	36

Alternative 3 performed the best in this initial evaluation with Alternatives 1 and 2 ranked close behind. Each of these alternatives provides good connectivity to the existing regional transit system and is forecast to serve the highest number of riders. Alternative 1 further benefited from the lower capital cost associated with having portions of the alignment operate at-grade. The ridership forecasts developed using OCTAM show a strong link between population centers in West Orange County and Southeast Los Angeles County to employment centers in Central and West Orange County. Each of these three alternatives performs well at serving this travel market.

Conclusions

This assessment report is intended to be an initial analysis and evaluation of selected transit service alternatives for the West Santa Ana Branch of the PE ROW between Orange County and Los Angeles County. The key findings of this initial assessment are:

- The ridership forecasts and origin and destination forecasts developed using OCTAM suggest that there is demand for travel between Orange and Los Angeles counties in areas surrounding the PE ROW corridor.
- The transit service options attract significantly more trips from Los Angeles County to Orange County than in the reserve direction.
- Alternatives 1, 2, 3, and 4 perform well at serving travel demand from West Orange County and Southeast Los Angeles County to Central Santa Ana, the South Coast Metro area, and the Irvine Business Complex.
- Alternative 5 performs well at serving travel demand between Southeast Los Angeles County and Downtown Los Angeles.
- Alternative 5 is competitive with the Metrolink OC Line, diverting about 1,000 riders per day.
- Alternatives 2 and 3 are forecast to serve the greatest number of total riders and riders per mile, while Alternatives 4 and 5 have the lowest forecast ridership and riders per mile.
- Connections to the Metro Green Line and Metro Blue Line LRT are important.
- Alternative 1 (Grade Separated BRT) has the lowest cost and cost per rider due to at-grade alignment in portions of the PE ROW.
- Future studies would need to consider Renewed Measure M Project S (Go Local) recommendations for transit services using the PE ROW.

Based on the evaluation presented in this technical report, Alternatives 1, 2, and 3 appear to warrant further analysis as part of a future study. Alternative 4 does provide some travel benefits within Orange County and could be considered as an initial operating segment for an LRT service between Santa Ana and the Cypress College area if the institutional challenges associated with transit operations across the county line prove difficult to overcome in the near term. On a cost per mile and cost per rider basis, BRT services would likely benefit from at-grade operations within the PE ROW as much as feasible. Alternative 5 would require refinement to be potentially competitive with the other alternatives. If a high speed transit alternative is studied in the future, alternative alignments or station locations may need to be considered.

Additional transit service alternatives studied in the future could include refinements to alignments, station locations, terminus points and transit technologies. It is recommended that at a minimum the Alternatives 1, 2, and 3 presented in this report be incorporated into any future analysis in some form based on their performance and potential for serving travel demand in and near the PE ROW corridor.

1 INTRODUCTION

The West Santa Ana Branch of the Pacific Electric Right of Way (PE ROW) travels in a northwest to southeast alignment between the Los Angeles River in the City of Paramount in Los Angeles County and Raitt Street in the City of Santa Ana in Orange County. In addition to Paramount and Santa Ana, the corridor passes through the cities of Bellflower, Cerritos, and Artesia in Los Angeles County and La Palma, Cypress, Buena Park, Anaheim, Stanton, and Garden Grove in Orange County. The corridor is 19.8 miles in length, with just over eight miles in Los Angeles County and approximately 11.75 miles in Orange County. The PE ROW alignment is illustrated in Exhibit 1-1.

The corridor is part of the old Pacific Electric railcar system that operated throughout Southern California in the first half of the 20th century. A majority of the corridor has been abandoned and is not currently used for transportation purposes. The Los Angeles County Metropolitan Transportation Authority (Metro) owns the right of way in Los Angeles County, while the Orange County Transportation Authority (OCTA) owns a majority of the alignment in Orange County. The only portion of the corridor currently utilized for transportation purposes is a short segment between Garfield Avenue and Somerset Boulevard in Los Angeles County that is used by freight trains servicing an oil refinery located at the northwest corner of Lakewood Boulevard and Somerset Boulevard.

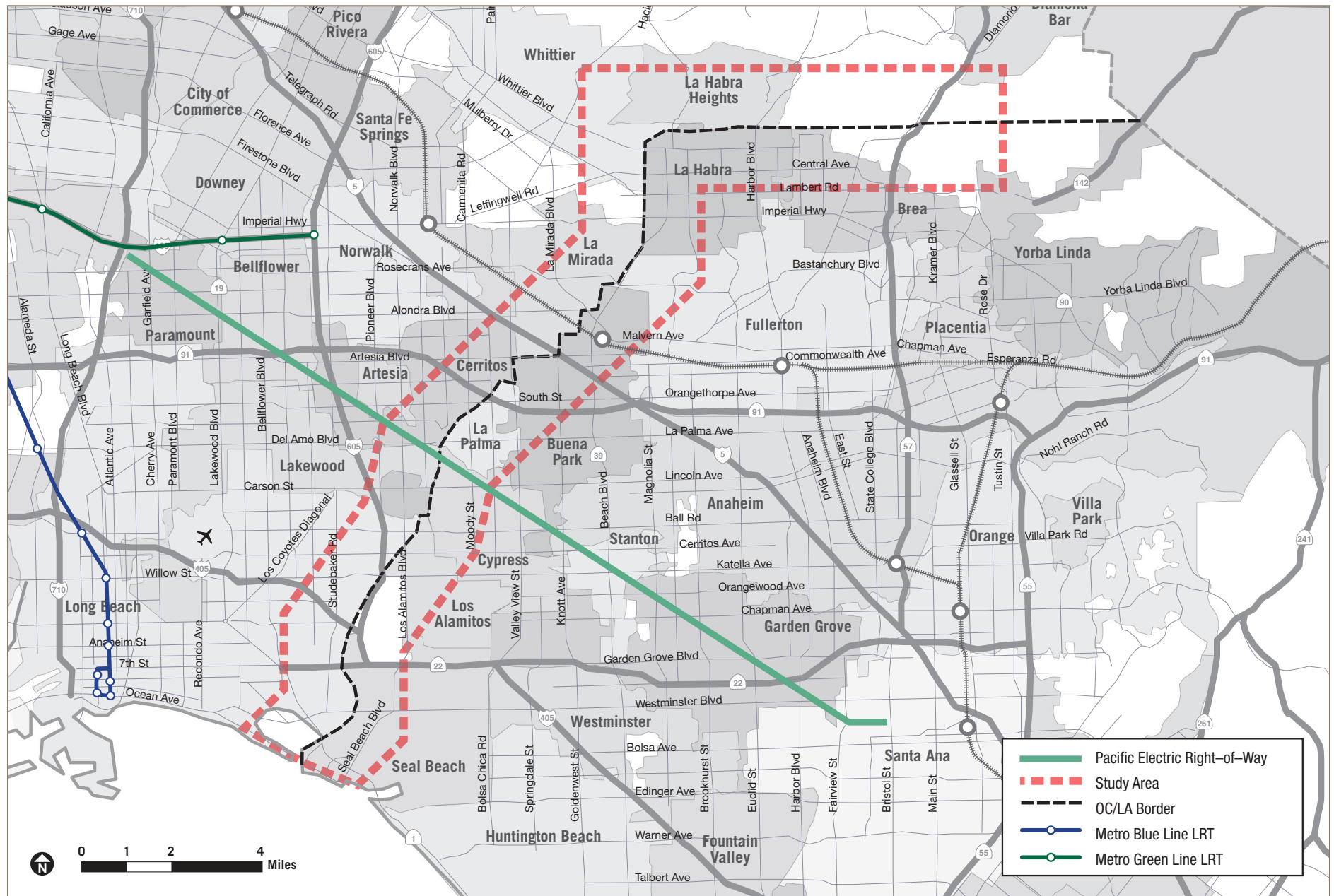
As part of the Orange and Los Angeles (OC/LA) Intercounty Transportation Study, five alternative transit service concepts have been developed for the PE ROW. These transit service concepts were identified during the development of the Conceptual Alternatives for the OC/LA study. These services range from bus rapid transit services operating in a hybrid at-grade and elevated alignment to light rail and high speed rail alternatives that would be fully grade separated within the corridor. This technical memorandum describes the five transit alternatives and presents the results of an initial assessment and evaluation of the service concepts.

The objective of this assessment is to identify the potential demand for transit services in the PE ROW corridor and begin the process of evaluating candidate transit services that could serve the forecasted demand. The results of this assessment will serve as a baseline for future more detailed studies of the corridor.

This technical report includes the following components:

1. Introduction
2. PE ROW Transit Alternatives
3. Travel Market Assessment
4. Preliminary Cost Estimates
5. Evaluation of Alternatives

Section 2 describes the five alternative transit services proposed between Orange and Los Angeles counties that would operate along the PE ROW. Section 3 discusses the ridership forecasts, existing and forecast population and employment, as well as major origins and destinations near the corridor. The order of magnitude cost estimates developed for the five transit service alternatives are described in Section 4. The evaluation of the five transit alternatives is summarized in Section 5.



2 PE ROW TRANSIT ALTERNATIVES

2.1 OC/LA CONCEPTUAL ALTERNATIVES

As part of the OC/LA Intercounty Transportation Study, five conceptual alternative strategies were developed to address transportation needs between Orange and Los Angeles counties. The conceptual alternatives build on an established baseline year 2030 condition that included funded projects that are scheduled to be completed by 2030. The baseline and conceptual alternatives are:

2030 Baseline – The 2030 Baseline consists of projects that have a committed funding source and are planned for completion by the year 2030. Components of the Baseline 2030 concept include freeway enhancement projects as identified in the adopted OCTA and Metro Long Range Transportation Plan (LRTP, Baseline and Constrained projects only); Renewed Measure M Early Action Plan freeway projects in Orange County; arterial roadway improvements as identified in the study area city Capital Improvement Programs (CIP); planned enhancements by OCTA and Metro to local bus transit routes in the study area; new OCTA bus rapid transit routes on Harbor Boulevard, Westminster Avenue, and State College Boulevard/Bristol Street in Orange County; new Metro Rapid routes on Atlantic Boulevard and Long Beach Boulevard in Los Angeles County; and the implementation of 30-minute headways for Metrolink service between Fullerton and Laguna Niguel/Mission Viejo in Orange County.

Transportation System Management/Transportation Demand Management Concept - The Transportation System Management (TSM) and Transportation Demand Management (TDM) concept identifies improvements to increase the efficiency of the transportation system and improve mobility. The concept covers all modes of transportation, including freeways, roadways, transit, bicycle, and pedestrian facilities. Freeway and roadway improvements include strategies to reduce congestion near and across the county line. Strategies for transit consist of improving local transit services and adding more transit facilities. Bike and pedestrian improvements focus on enhancing the condition of bike and pedestrian paths. The TSM/TDM concept is included in all the following alternatives.

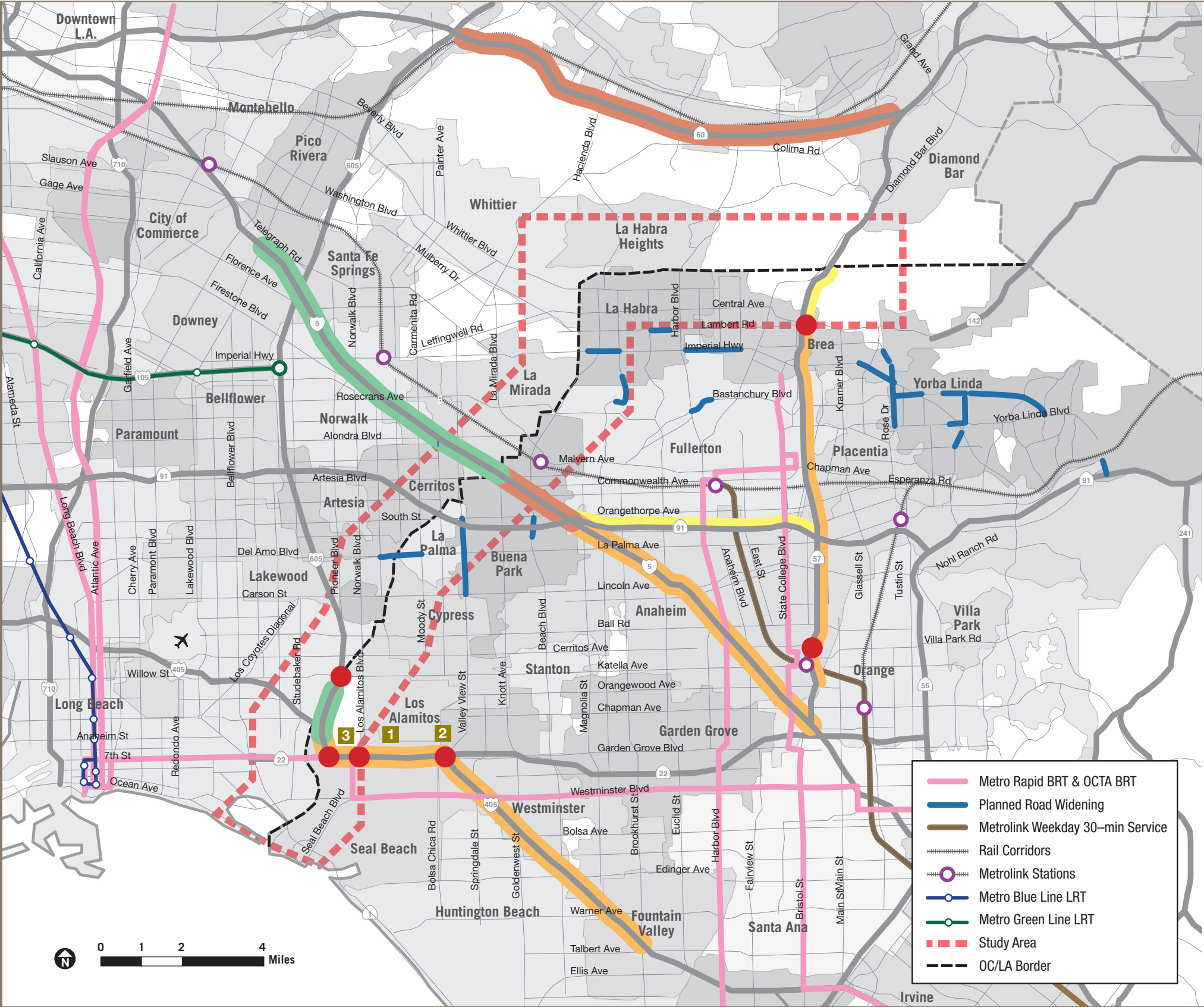
Street and Rapid Bus Concept - The Street/Rapid Bus Concept is a multimodal approach that concentrates on increasing freeway and street capacity, especially in the more congested areas adjacent to freeway on ramps and off ramps. This concept also includes new rapid bus services near and across the OC/LA county line, a bus rapid transit service on the Pacific Electric Right of Way (PE ROW), and improved bus shuttle services to Metrolink stations. The Street/Rapid Bus Concept builds on the Baseline 2030 TSM/TDM Concept and is included in all of the following alternatives.

Freeway Concept - The Freeway Concept proposes capacity improvements to freeways that serve regional traffic between Orange and Los Angeles counties. The strategies identified in this concept were designed with the objective of improving mobility on the freeway system to accommodate the existing and projected regional traffic. The strategies include 1) providing additional capacity through new general purpose lanes or high occupancy vehicle (HOV) lanes to freeways that are forecast to experience congestion under existing and 2030 conditions, and 2) increasing roadway capacity for areas with lack of direct freeway access by converting arterial roadways to parkways. This concept assumes all projects from the 2030 Baseline, TSM/TDM and Street/Rapid Bus concepts.

Transit Concept - The Transit Concept identifies transit oriented alternatives to increase frequency, capacity, and connectivity to meet future travel demands. The objectives of this concept are to improve transit services for both short and long distance trips, improve the efficiency of local transit services, increase Metrolink service, extend planned rapid bus routes, and provide connections between different modes of transportation. This concept includes all 2030 Baseline, TSM/TDM Concept, and Street/Rapid Bus Concept improvements.

Public-Private Partnership Concept - The Public/Private Concept focuses on identifying privately financed improvements to freeways, streets, and transit that could supplement the improvements that are possible with public funds. Concepts include high occupancy toll lanes on freeway corridors and high speed transit services on the PE ROW. This concept assumes all improvements in the 2030 Baseline, TSM/TDM Concept, and Street/Rapid Bus Concept.

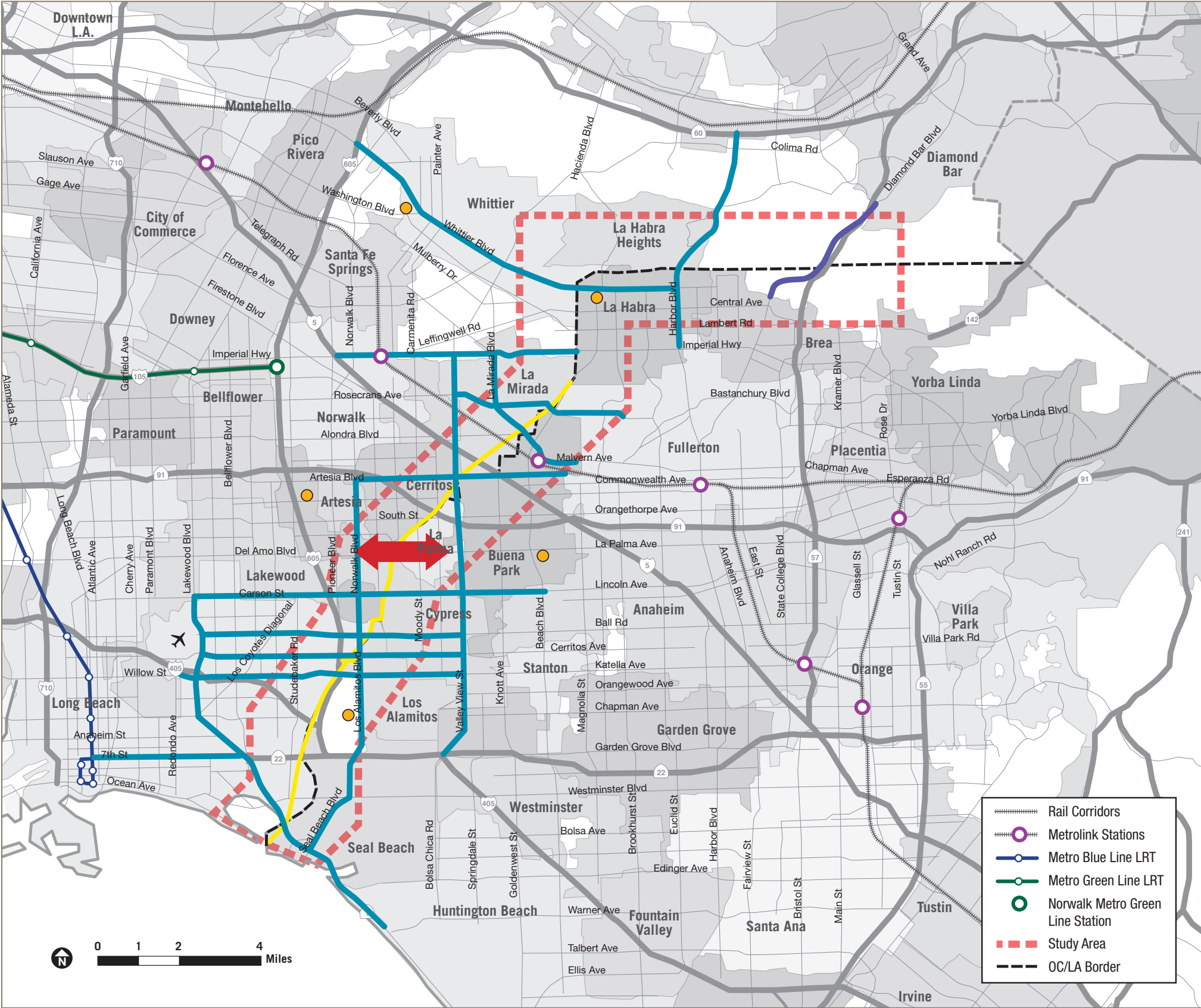
Exhibits 2-1 through 2-6 illustrate the 2030 Baseline and the five Conceptual Alternatives strategies identified above.



Transportation projects included in the Baseline Year 2030 concept have a committed funding source and are planned for completion prior to the Year 2030. The components of the Baseline Year 2030 concept include the following:

- Freeway enhancement projects as identified in the adopted OCTA and Metro Long Range Transportation Plans (LRTP) (Baseline and Constrained projects only);
- In Orange County, Renewed Measure M Early Action Plan freeway projects;
- Arterial Roadway improvements as identified in study area city Capital Improvement Programs (CIPs);
- Planned enhancements by OCTA and Metro to local bus transit routes in the study area;
- New OCTA bus rapid transit routes on Harbor Boulevard, Westminster Avenue, and State College Boulevard/Bristol Street in Orange County;
- New Metro Rapid routes on Atlantic Boulevard and Long Beach Boulevard in Los Angeles County;
- The implementation of 30-minute headways for Metrolink service between Fullerton and Laguna Niguel/Mission Viejo in Orange County.

I-5 Freeway	
	Add 1 general purpose lane & 1 HOV lane in each direction; improve interchanges from Rosemead Blvd – Orange county Line
	Add 1 general purpose lane & 1 HOV lane in each direction from SR-91 to County Line
	Improve from SR-57 to SR-91
I-405 Freeway	
	Add 1 general purpose lane in each direction from Brookhurst – I-605
	Auxiliary lanes between entrance ramps & downstream exit ramps at most locations
	Add 1 HOV lane in each direction from SR-22 to I-605
I-605 Freeway	
	Improve freeway access & arterial connection in communities of Los Alamitos & Cypress
	New freeway-to-freeway carpool ramps to I-405
	Add HOV lane from I-405 to Orange County Line (Part of West Orange County Connectors Project)
SR-22 Freeway	
	Construct HOV connector to I-405
SR-57 Freeway	
	Add new NB truck climbing lane from Lambert Rd – Tonner Canyon
	Add new NB lane from Orangewood Ave-Lambert Rd
	Reconfigure existing interchange & add SB lane off-ramp at Lambert Rd
	Construct HOV drop ramps to Cerritos Ave
SR-91 Freeway	
	Add 1 WB lane from I-5 to SR-57
SR-60 Freeway	
	Add 1 HOV lane in each direction from I-605 to Brea Canyon Road



The Transportation System Management (TSM) and Transportation Demand Management (TDM) Concept includes strategies to increase the efficiency of the transportation system and improve mobility across the OC/LA county line. The TSM/TDM concept focuses on increasing local bus coordination, implementing traffic signal coordination on streets near and across the county line to reduce congestion, and increased freeway traffic monitoring. This alternative also includes the construction of additional park-and-ride and transit center facilities. The TSM/TDM Concept is included in all of the following alternatives.

Note: Includes Year 2030 Baseline Improvements

Freeways/Roadways

- Include Goods Movement Intelligent Transportation Systems (ITS) Integration
- Upgrade freeway traffic surveillance on all study area freeways
- Upgrade freeway ramp metering at various locations
- Enhance arterial roadways (Traffic Signal Coordination, bus turn-outs, and other improvements) on the following corridors:
 - Pacific Coast Hwy from Warner Ave to Lakewood Blvd
 - 7th St from SR-22 to Long Beach Blvd
 - Willow St/Katella Ave from Valley View St to Redondo Ave
 - Carson St/Lincoln Ave from Beach Blvd to Lakewood Blvd
 - Lakewood Blvd from Pacific Coast Hwy to Carson St
 - Artesia Blvd from Gilbert St to Norwalk Blvd
 - Rosecrans Ave from Gilbert St to Valley View St
 - La Mirada Blvd from Burlingame Ave to Imperial Hwy
 - Imperial Hwy from County line to Pioneer Blvd
 - Whittier Blvd from Harbor Blvd to I-605
 - Harbor Blvd from Imperial Hwy to SR-60
 - Cerritos Ave/Spring St from Valley View St to Lakewood Blvd
 - Ball Rd/Wardlow Rd from Valley View St to Lakewood Blvd
 - Seal Beach Blvd/Los Alamitos Blvd from Pacific Coast Hwy to Artesia Blvd
 - Valley View St. from SR-22 to Imperial Hwy.
- Offer Carpool/Vanpool incentives
- Interlink city Traffic Management Centers (TMC) and Caltrans District 7 and 12 TMCs
- Increase CCTV locations
- Implement real-time traffic information
- Add alternative work hours
- Add incident management
- Implement safety and operational improvements consistent with Caltrans State Highway Operation and Protection Plan on Brea Canyon Road.

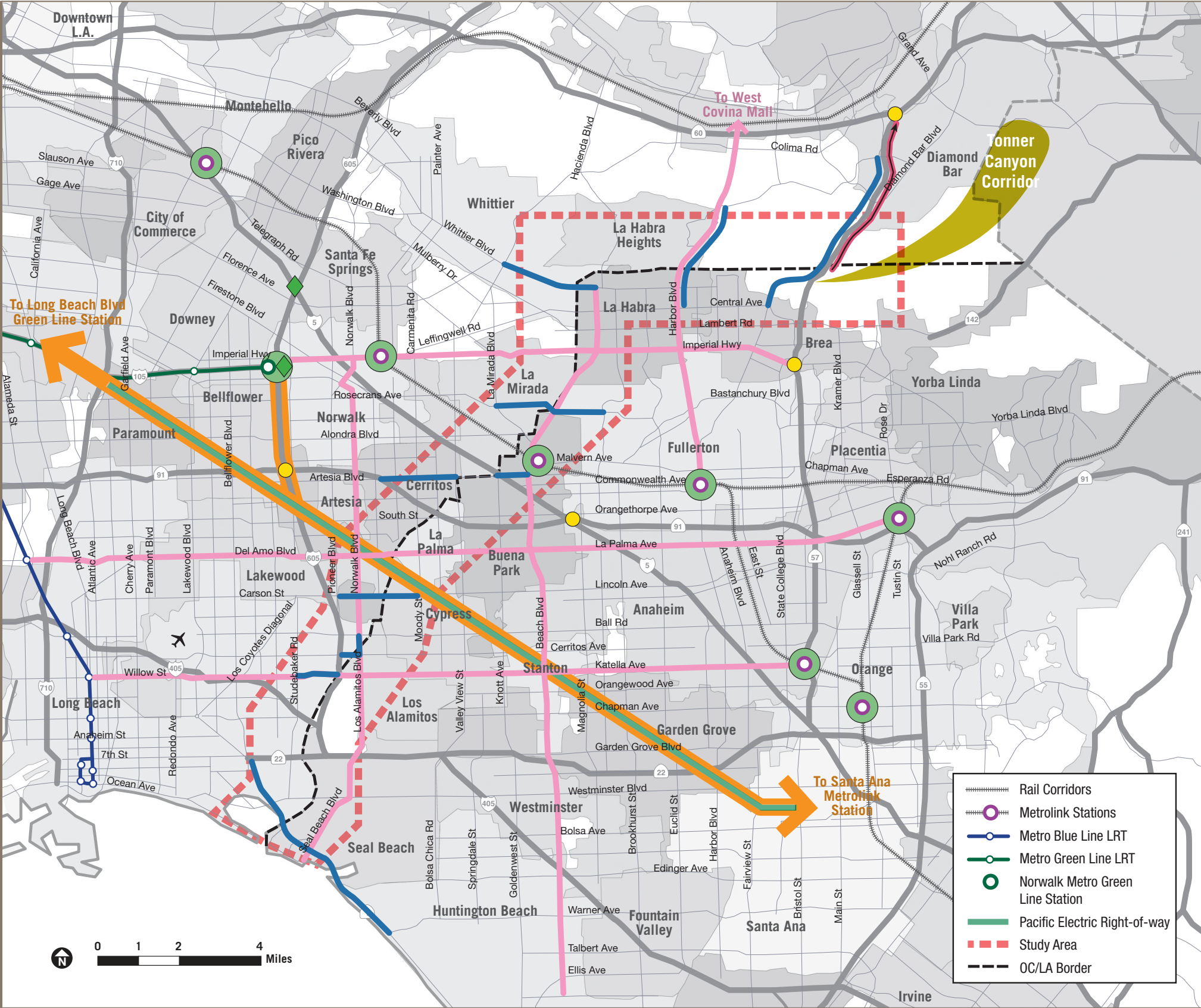
Transit

- Increase local bus coordination between counties
- Increase local bus service frequency and span of service
- Add Park and Ride Lots in cities of Artesia/Cerritos, Buena Park, La Habra, Seal Beach/Los Alamitos and Whittier
- Improve transit service information distribution (i.e. kiosks at malls and transit centers)

Bike/Pedestrian

- Enhance Coyote Creek Bikeway
- Add new bicycle corridors over Coyote Creek and along rail lines

- ↔ Increase Local Bus Coordination
- Arterial Corridor Improvements
- Safety and Operational Improvements
- Bikeway Enhancement
- New Park-and-Ride Lot



The Street/Rapid Bus Concept is a multimodal concept that concentrates on increasing arterial roadway capacity, especially in the congested areas of the Coastal and Northern Sub Areas, and improving freeway interchanges. New Rapid Bus services near and across the OC/LA county line are proposed, along with a grade-separated Bus Rapid Transit service in the Pacific Electric Right of Way (PE ROW) and improved bus shuttle services to Metrolink Stations. The Street/ Rapid Bus Concept is included in all of the following alternatives.

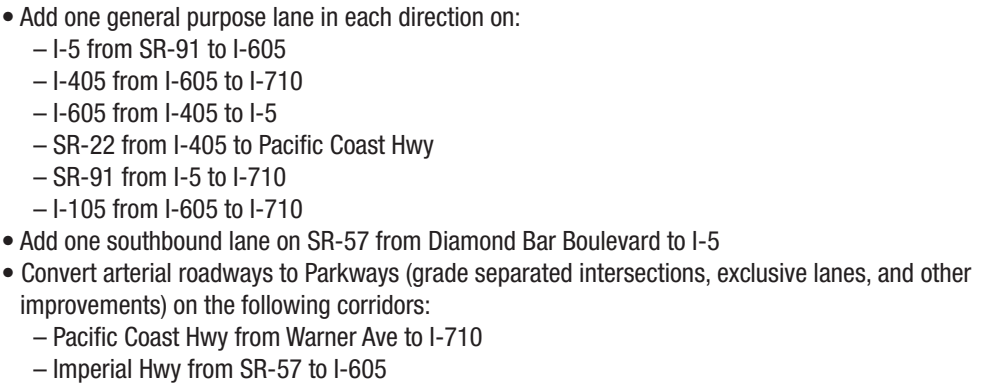
This concept includes Year 2030 Baseline and TSM/TDM improvements

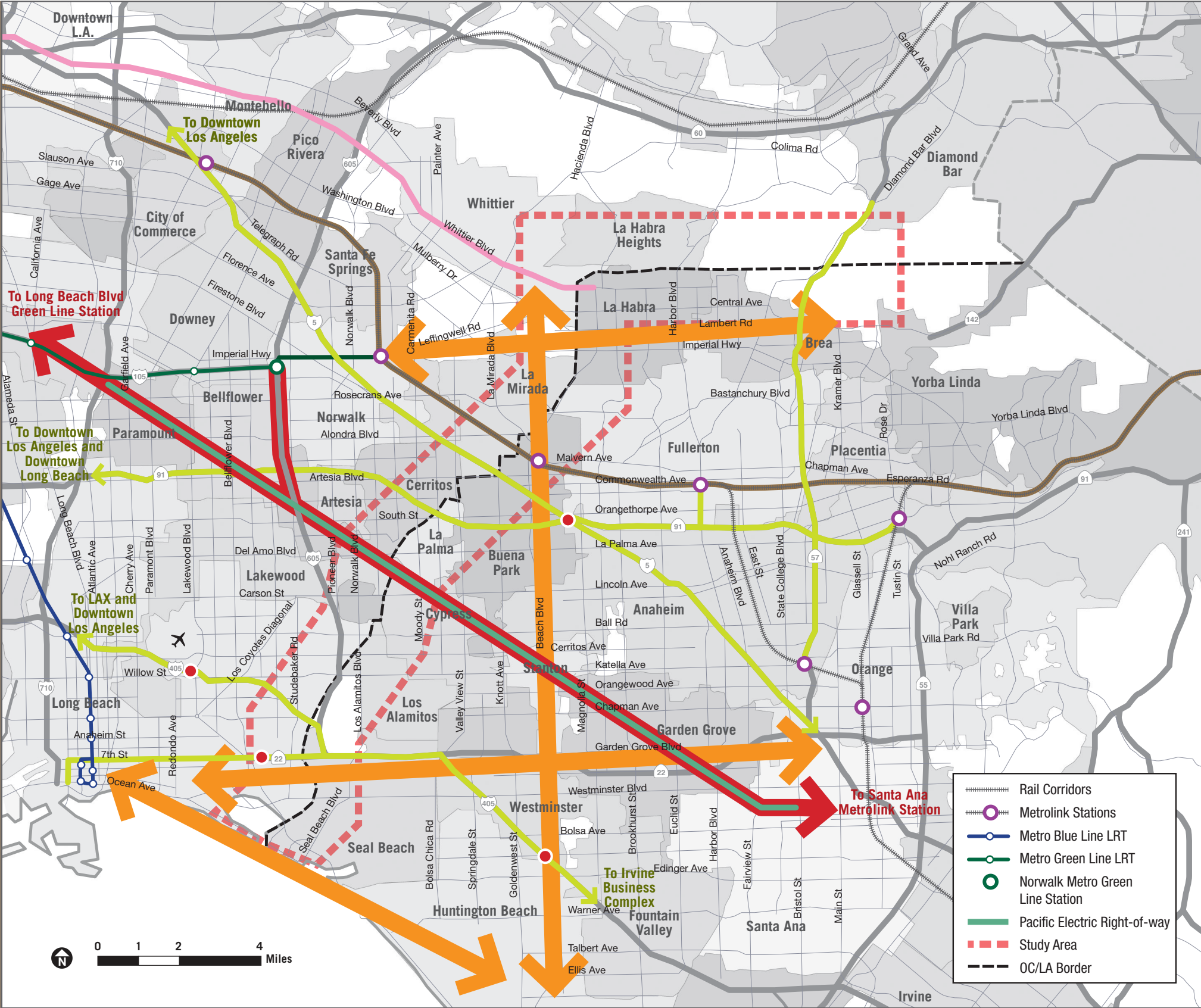
Freeway/Roadway

- Improve interchanges at the following locations: SR-57/SR-60, SR-57/Imperial Hwy, I-5/SR-91 and I-605/SR-91
- Add new HOV connector at I-5/I-605 and I-105/I-605 interchanges
- Extend truck climbing lane on northbound SR-57
- Add one general purpose lane in each direction on various streets, including:
 - Pacific Coast Hwy from Warner Ave to 7th St
 - Willow St from the I-605 to Studebaker Rd
 - Carson St/Lincoln Ave from Moody St to Pioneer Blvd
 - Artesia Blvd from Beach Blvd to Knott Ave and Valley View St to SR-91
 - Rosecrans Ave from Gilbert St to La Mirada Blvd
 - Whittier Blvd from Beach Blvd to Colima Rd
 - Harbor Blvd from La Habra Blvd to Pathfinder Rd
 - Brea Canyon Road from Central Ave to Pathfinder Rd
- Extend Tonner Canyon Rd to Grand Ave
- Improve / widen bridges on Cerritos Ave and Los Alamitos Blvd over Coyote Creek

Transit

- Increase transit frequencies and coordination on local bus routes
- Add shuttles/feeders to Metrolink stations
- Implement grade-separated Bus Rapid Transit on the PE ROW with connection to Norwalk Green Line Station or Long Beach Blvd Green Line Station
- Implement Rapid Bus along:
 - Imperial Hwy from Brea Mall to the Norwalk Green Line Station
 - Del Amo Blvd/La Palma Ave from the Anaheim Canyon Metrolink Station to Metro Blue Line Del Amo Blvd stop
 - Willow St/Katella Ave from Anaheim Metrolink Station to Metro Blue Line Willow St stop
 - Seal Beach Blvd/Los Alamitos Blvd/Norwalk Blvd from Pacific Coast Hwy to the Norwalk/Santa Fe Springs Metrolink Station
 - Beach Blvd from downtown Huntington Beach to Whittier Blvd
 - Harbor Blvd from Fullerton Metrolink Station to West Covina Mall





The Transit Concept looks exclusively at transit oriented alternatives to accommodate future travel demand. The objectives of this concept are to improve transit services for both short and long distance trips, improve the efficiency of local transit services, increase Metrolink service, enhance planned Rapid Bus routes, and provide connections between different modes of transportation.

This concept includes Year 2030 Baseline, TSM/TDM and Street/Rapid Bus improvements

Transit

- Increase Metrolink weekday frequency on the Orange County Line from Fullerton to Downtown Los Angeles and 91 Line from Corona to Downtown Los Angeles (Assumes 3rd main track and grade separations)
- Implement Rapid Bus on Whittier Blvd from Beach Blvd to Downtown Los Angeles
- Extend Metro Green Line Light Rail Transit (LRT) to Norwalk/Santa Fe Springs Metrolink Station
- Add Express bus services along the following corridors:
 - Irvine Business Complex to Long Beach Transit Mall via I-405 and SR-22
 - Irvine Business Complex to Downtown Los Angeles via I-405 and I-110
 - Santa Ana Metrolink Station to Downtown Los Angeles via I-5
 - Anaheim Canyon Metrolink Station to Downtown Long Beach via SR-91 and I-710
 - Anaheim Metrolink Station to Diamond Bar via SR-57
- Replace the grade separated Bus Rapid Transit (BRT) service in the Pacific Electric Right of Way (PE ROW) with a fully elevated transit service (bus or rail). Maintain the proposed connection to the Metro Green Line and an at-grade pedestrian / bike path within the corridor.
- Enhance selected rapid bus lines proposed in the Street / Rapid Bus Concept to full Bus Rapid Transit service operating in exclusive rights of way (specific alignment to be determined) connecting:
 - Huntington Beach to Whittier
 - Brea to Norwalk
 - Long Beach to Anaheim/Santa Ana
 - Long Beach to Irvine



2.2 PE ROW TRANSIT SERVICE ALTERNATIVES

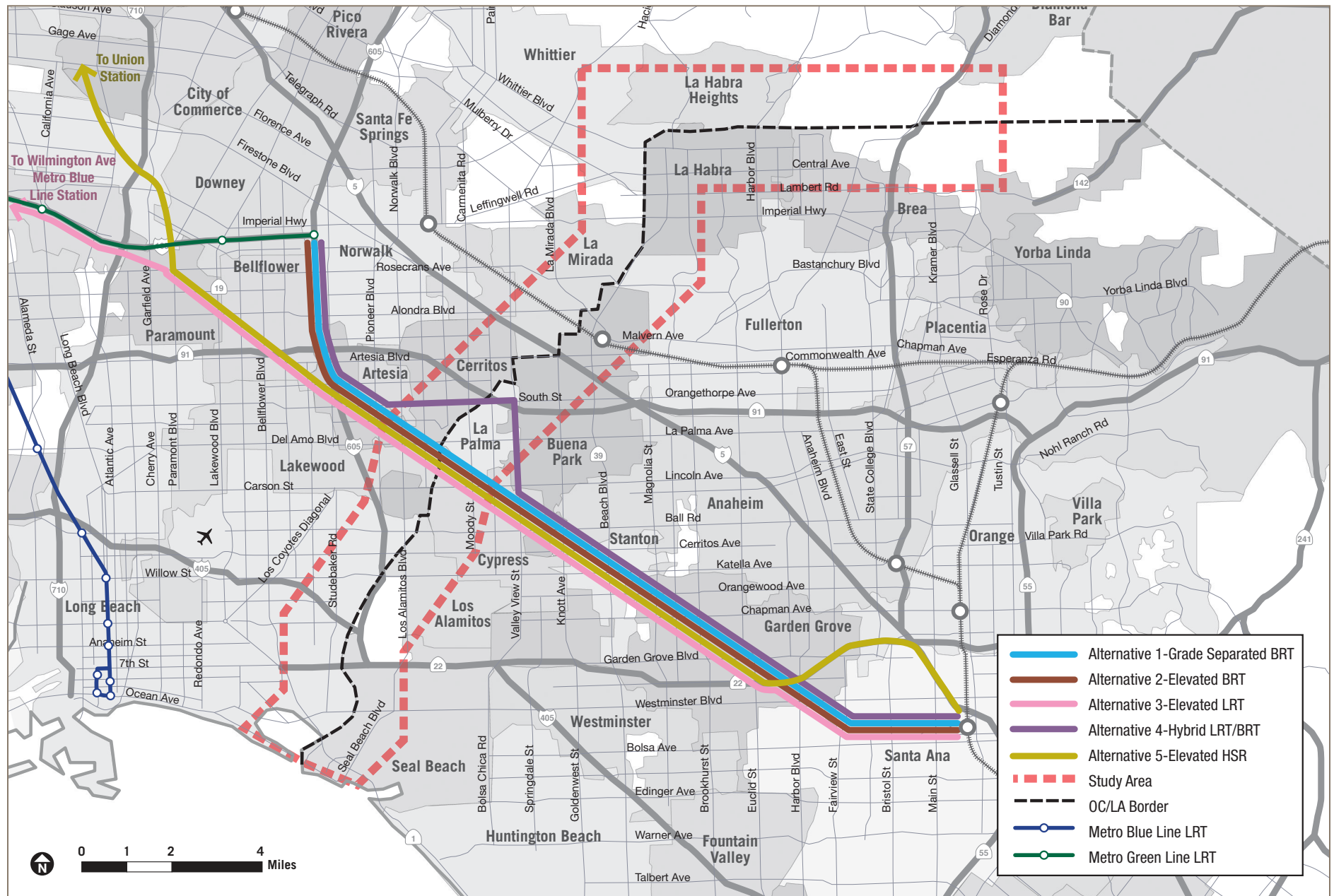
Transit service improvements in the PE ROW are identified in three of the five OC/LA Intercounty Transportation Study conceptual alternative strategies. The Street-Rapid Bus Concept includes a proposal for a grade separated bus rapid transit service operating between the Santa Ana Metrolink Station and the Norwalk Metro Green Line Station. The Transit Concept proposes an elevated bus rapid transit service or light rail transit service between the Santa Ana Metrolink Station and the Norwalk Metro Green Line Station or the Long Beach Boulevard Green Line Station. The Public-Private Partnership Concept proposes a high speed transit service between the Santa Ana Metrolink Station and Downtown Los Angeles. These three concepts for transit services were used as the baseline for identifying a set of five alternative service concepts operating in the PE ROW. The objective of the assessment of these five alternatives is to provide some additional detail regarding travel demand and the potential for transit services in the corridor in response to feedback received from local cities and elected officials regarding potential public uses for the corridor.

The five PE ROW transit service alternatives are:

- Alternative 1: Grade Separated Bus Rapid Transit
- Alternative 2: Elevated Bus Rapid Transit
- Alternative 3: Elevated Light Rail Transit
- Alternative 4: Elevated Hybrid Light Rail Transit/Bus Rapid Transit
- Alternative 5: Elevated High Speed Transit

Exhibit 2-7 illustrates the alignments of the five alternatives. Each of the five alternatives considered in this assessment is described in more detail later in this section.

The five alternatives identified and assessed in this report are intended to provide a representative sample of the potential types of transit services that could be considered for the PE ROW. The alternatives are based on the strategies identified as part of the OC/LA conceptual alternatives. There are additional concepts for transit services that OCTA and Metro may also decide to consider and evaluate as part of future studies. These could include alternative terminus points, bus routes that enter and exit the corridor prior to the corridor terminus points in Paramount and Santa Ana, or alternative transit technologies such as streetcar or monorails. The objective of the assessment described in this report is to provide an initial understanding of the travel demand and origin and destination data associated with particular alignments, service frequencies and station locations.



Alternative 1: Grade Separated Bus Rapid Transit

This alternative proposes a BRT service that would operate between the Santa Ana Metrolink Station and the Norwalk Metro Green Line Station (at I-105/I-605 interchange). Headways for the service would be 15 minutes during peak periods and 30 minutes during off-peak time periods. Within downtown Santa Ana, the service would follow an alignment along Civic Center Drive between the Santa Ana Metrolink Station and the PE ROW. The service would operate at-grade in mixed-flow travel lanes with traffic signal priority. No street widening along Civic Center Drive is assumed. In the PE ROW between Civic Center Drive and the I-605 Freeway the BRT service would operate in exclusive transit-only lanes. Grade separated crossings of arterial streets and freeways would be provided at the following locations:

- Westminster Boulevard
- Harbor Boulevard
- SR-22 freeway
- Euclid Street
- Garden Grove Boulevard
- Acacia Parkway
- Nelson Street
- Magnolia Street
- Orangewood Avenue
- Katella Avenue
- Beach Boulevard
- Knott Avenue
- Ball Road
- Valley View Street
- Lincoln Avenue
- Walker Street
- Moody Street
- Crescent Avenue
- Del Amo Boulevard
- 195th St
- Norwalk Boulevard
- Pioneer Boulevard
- 183rd Street/Gridley Boulevard
- Studebaker Road
- I-605 freeway

All other street crossings would be at-grade. An at-grade bicycle and pedestrian pathway is proposed to run adjacent to the exclusive transit lanes. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway, and would provide a non-motorized transportation link in areas where there are few existing bikeways.

At the I-605 freeway, an exclusive transit only elevated structure would be constructed between the PE ROW and the existing high occupancy vehicle (HOV) lanes on the I-605 freeway. This structure would allow for buses operating in the corridor to have a seamless connection to the HOV lanes. The BRT service would proceed along the I-605 freeway, operating in the existing HOV lanes, connecting to the Norwalk Metro Green Line Station at the

I-105 interchange. The Norwalk Metro Green Line Station would be accessed via the existing Imperial Highway interchange with the I-605 freeway.

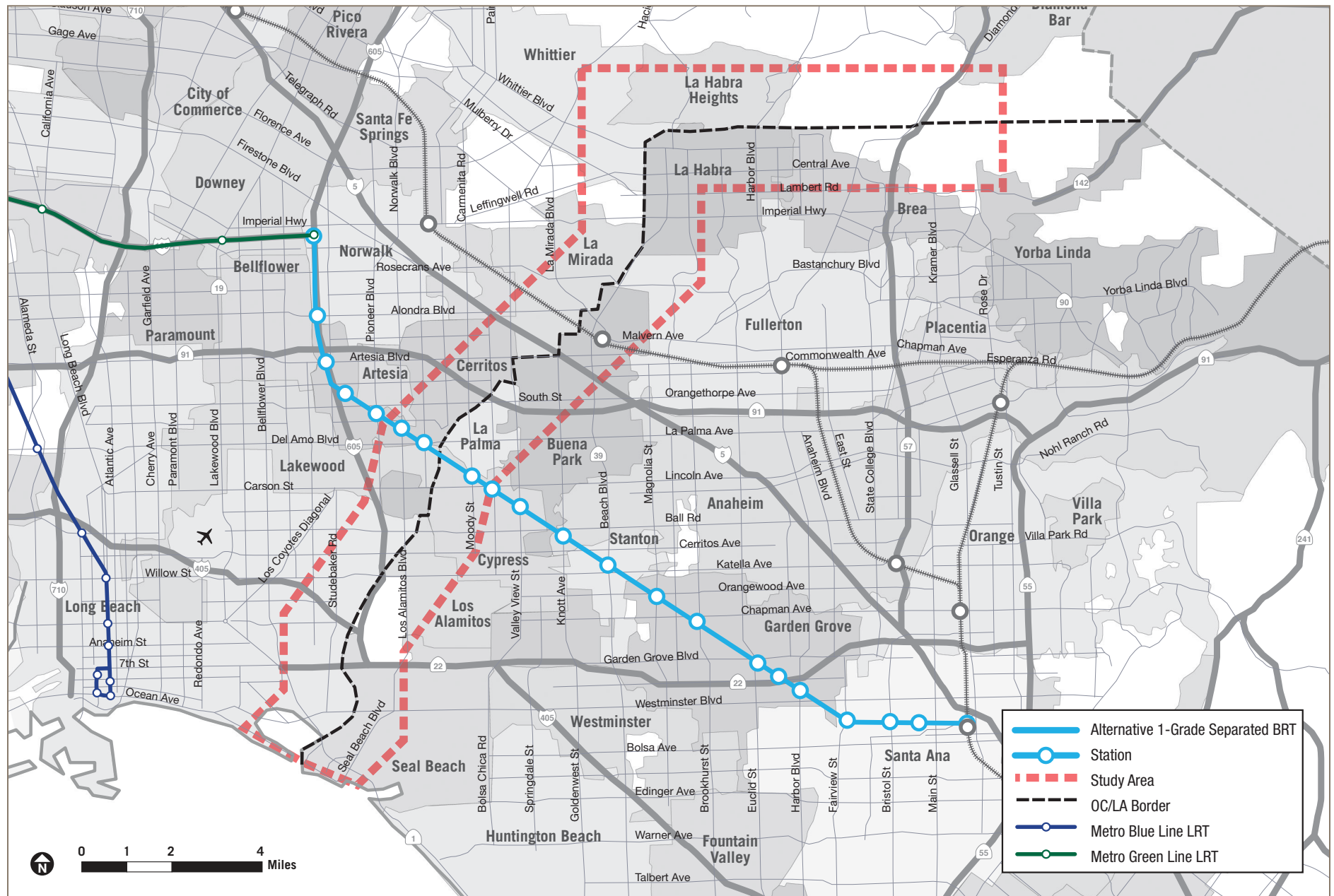
The BRT service is intended to serve short to medium distance trips. Consistent with this objective; stations would be spaced about half-a-mile to one-mile apart at the following locations:

- Santa Ana Metrolink Station
- Civic Center Drive-Ross Street
- Civic Center Drive-Bristol Street
- Civic Center Drive-Fairview Street
- PE ROW-Harbor Boulevard/Westminster Avenue
- PE ROW-Trask Avenue
- PE ROW-Euclid Street-Garden Grove Boulevard
- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Orangewood Avenue-Magnolia Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Ball Road-Knott Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- PE ROW-Lincoln Avenue
- PE ROW-Moody Street-Crescent Avenue
- PE ROW-Del Amo Boulevard-La Palma Avenue
- PE ROW-195th Street-Norwalk Boulevard
- PE ROW-South Street-Pioneer Boulevard
- PE ROW-183rd Street-Gridley Road (Los Cerritos Mall)
- I-605-Artesia Boulevard - accessed via new station located in the median of the I-605 freeway
- I-605-Alondra Boulevard - accessed via new station located in the median of the I-605 freeway
- Norwalk Metro Green Line Station

Park-and-Ride facilities are proposed at the following stations:

- Santa Ana Metrolink Station (existing)
- Civic Center Drive-Fairview Street
- PE ROW-Euclid Street-Garden Grove Boulevard
- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- PE ROW-South Street-Pioneer Boulevard
- PE ROW-183rd Street-Gridley Road (Los Cerritos Mall)
- Norwalk Metro Green Line Station (existing)

These park-and-ride locations were identified based on areas with high existing and forecast traffic volumes, convenient connections from nearby freeways, and the proximity of land uses where a park-and-ride facility could be co-located with an existing use (shopping centers, schools, etc). All other stations would be accessed by walking or through transit connections. The proposed alignment and station locations for Alternative 1 are shown in Exhibit 2-8.



Alternative 2: Elevated Bus Rapid Transit

This alternative proposes a BRT service that would operate between the Santa Ana Metrolink Station and the Norwalk Metro Green Line Station (at I-105/I-605 interchange). Headways for the service would be 10 minutes during peak periods and 30 minutes during off-peak time periods. Within downtown Santa Ana, the service would follow an alignment along Civic Center Drive and Santa Ana Boulevard between the Santa Ana Metrolink Station and the PE ROW. The service would operate at-grade in exclusive travel lanes with traffic signal priority. No street widening along Civic Center Drive or Santa Ana Boulevard is assumed. One lane on each street is assumed to be converted to transit use. In the PE ROW between Civic Center Drive and the I-605 freeway the BRT service would operate in elevated exclusive transit-only lanes. No at-grade crossings of arterial streets and freeways would occur.

An at-grade bicycle and pedestrian pathway is proposed to run below the elevated transit lanes. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway, and would provide a non-motorized transportation link in areas where there are few existing bikeways.

At the I-605 freeway, an exclusive transit only elevated structure would be constructed between the PE ROW and the existing high occupancy vehicle (HOV) lanes on the I-605 freeway. This structure would allow for buses operating in the corridor to have a seamless connection to the HOV lanes. The BRT service would proceed along the I-605 freeway, operating in the existing HOV lanes, connecting to the Norwalk Metro Green Line Station at the I-105 interchange. The Norwalk Metro Green Line Station would be accessed via the existing Imperial Highway interchange with the I-605 freeway.

The BRT service is intended to serve medium distance trips and provide a faster travel time than Alternative 1. Consequently, stations would be spaced about one mile apart at the following locations:

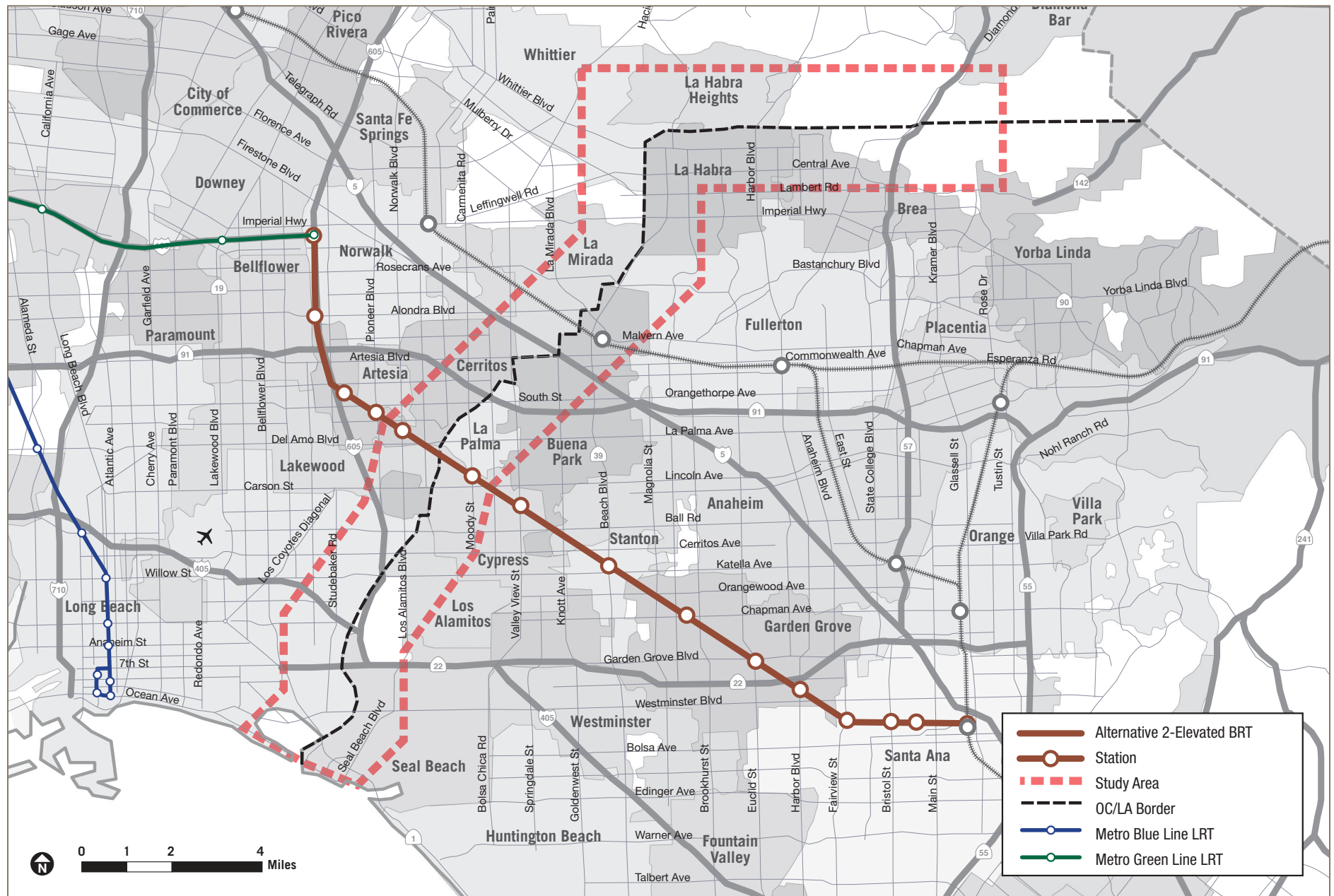
- Santa Ana Metrolink Station
- Civic Center Drive-Ross Street
- Civic Center Drive-Bristol Street
- Civic Center Drive-Fairview Street
- PE ROW-Harbor Boulevard-Westminster Avenue
- PE ROW-Euclid Street-Garden Grove Boulevard
- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- PE ROW-Moody Street-Crescent Avenue
- PE ROW-195th Street-Norwalk Boulevard
- PE ROW-South Street-Pioneer Boulevard
- PE ROW-183rd Street-Gridley Road (Los Cerritos Mall)
- I-605-Alondra Boulevard
- Norwalk Metro Green Line Station

Park-and-Ride facilities are proposed at the following stations:

- Santa Ana Metrolink Station (existing)
- Civic Center Drive-Fairview Street
- PE ROW-Euclid Street-Garden Grove Boulevard

- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- PE ROW-South Street-Pioneer Boulevard
- PE ROW-183rd Street-Gridley Road (Los Cerritos Mall)
- Norwalk Metro Green Line Station (existing)

As is the case with Alternative 1, these park-and-ride locations were identified based on areas with high existing and forecast traffic volumes, convenient connections from nearby freeways, and the proximity of land uses where a park-and-ride facility could be co-located with an existing use (shopping centers, schools, etc). All other stations would be accessed by walking or through transit connections. The proposed alignment and station locations for Alternative 2 are shown in Exhibit 2-9.



Alternative 3: Elevated Light Rail Transit

This alternative proposes a LRT service that would operate between the Santa Ana Metrolink Station and the Wilmington Metro Green Line-Blue Line Station. Headways for the service would be 10 minutes during peak periods and 20 minutes during off-peak time periods. Within downtown Santa Ana, the service would follow an alignment along Civic Center Drive and Santa Ana Boulevard between the Santa Ana Metrolink Station and the PE ROW. The service would operate at-grade in exclusive travel lanes with traffic signal priority. No street widening along Civic Center Drive or Santa Ana Boulevard is assumed. One lane on each street is assumed to be converted to transit use. In the PE ROW between Civic Center Drive and the Los Angeles River, the LRT service would operate on an elevated structure. No at-grade crossings of arterial streets and freeways would occur. The alignment would then cross the Los Angeles River and connect to the existing Metro Green Line corridor in the median of the I-105 freeway.

An at-grade bicycle and pedestrian pathway is proposed to run below the elevated transit structure within the PE ROW. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway, and would provide a non-motorized transportation link in areas where there are few existing bikeways.

Stations would be spaced about one mile apart at the following locations:

- Santa Ana Regional Transportation Center
- Civic Center Drive-Ross Street
- Civic Center Drive-Bristol Street
- Civic Center Drive-Fairview Street
- PE ROW-Harbor Boulevard-Westminster Avenue
- PE ROW-Euclid Street-Garden Grove Boulevard
- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- PE ROW-Moody Street-Crescent Avenue
- PE ROW-195th Street-Norwalk Boulevard
- PE ROW-South Street-Pioneer Boulevard
- PE ROW-183rd Street-Gridley Road (Los Cerritos Mall)
- PE ROW-Bellflower Boulevard
- PE ROW-Lakewood Boulevard
- PE ROW-Rosecrans Avenue-Paramount Boulevard
- I-105-Long Beach Boulevard
- I-105-Wilmington Avenue-Metro Blue Line

Park-and-Ride facilities are proposed at the following stations:

- Santa Ana Metrolink Station (existing)
- Civic Center Drive-Fairview Street
- PE ROW-Euclid Street-Garden Grove Boulevard
- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- PE ROW-South Street-Pioneer Boulevard

- PE ROW-183rd Street-Gridley Road (Los Cerritos Mall)
- PE ROW-Bellflower Boulevard
- PE ROW-Rosecrans Avenue-Paramount Boulevard
- I-105-Long Beach Boulevard (existing)
- I-105-Wilmington Avenue-Metro Blue Line (existing)

As is the case with previous alternatives, these park-and-ride locations were identified based on areas with high existing and forecast traffic volumes, convenient connections from nearby freeways, and the proximity of land uses where a park-and-ride facility could be co-located with an existing use (shopping centers, schools, etc). All other stations would be accessed by walking or through transit connections. The proposed alignment and station locations for Alternative 3 are shown in Exhibit 2-10.



Alternative 4: Elevated Hybrid BRT/LRT

This alternative proposes a LRT service that would operate between the Santa Ana Metrolink Station and Cypress College. A BRT system operating in mixed-flow traffic would then continue from Cypress College along Valley View Street, Orangethorpe Avenue/South Street and the I-605 freeway to link to the Metro Green Line Station. Headways for the service would be 15 minutes during peak periods and 30 minutes during off-peak time periods. Within downtown Santa Ana, the service would follow an alignment along Civic Center Drive and Santa Ana Boulevard between the Santa Ana Metrolink Station and the PE ROW. The service would operate at-grade in exclusive travel lanes with traffic signal priority. No street widening along Civic Center Drive or Santa Ana Boulevard is assumed. One lane on each street is assumed to be converted to transit use. In the PE ROW between Civic Center Drive and Valley View Street, the LRT service would operate on an elevated structure. No at-grade crossings of arterial streets and freeways would occur.

An at-grade bicycle and pedestrian pathway is proposed to run below the elevated transit structure within the PE ROW between Fairview Street and Valley View Street. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway, and would provide a non-motorized transportation link in areas where there are few existing bikeways.

Stations would be spaced about one mile apart at the following locations:

- Santa Ana Metrolink Station
- Civic Center Drive-Ross Street
- Civic Center Drive-Bristol Street
- Civic Center Drive-Fairview Street
- PE ROW-Harbor Boulevard-Westminster Avenue
- PE ROW-Euclid Street-Garden Grove Boulevard
- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- Valley View Street at Lincoln, La Palma, Orangethorpe
- Orangethorpe at Carmenita, Bloomfield, Pioneer, Gridley
- Norwalk Green Line Station

Park-and-Ride facilities are proposed at the following stations:

- Santa Ana Metrolink Station (existing)
- Civic Center Drive-Fairview Street
- PE ROW-Euclid Street-Garden Grove Boulevard
- PE ROW-Chapman Avenue-Brookhurst Street
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-Valley View-Orange Avenue (Cypress College)
- Norwalk Metro Green Line Station (existing)

The park-and-ride locations are designed to serve the LRT portions of the alignment, and were identified based on areas with high existing and forecast traffic volumes, convenient connections from nearby freeways, and the proximity of land uses where a park-and-ride facility could be co-located with an existing use (shopping centers, schools, etc). All other

stations would be accessed by walking or through transit connections. The proposed alignment and station locations for Alternative 4 are shown in Exhibit 2-11.



Alternative 5: High-Speed Transit

Alternative 5 is a technology neutral high-speed transit service that would operate between the Santa Ana Metrolink Station and Union Station in Downtown Los Angeles. Headways for the service would be 10 minutes during peak periods and 20 minutes during off-peak. The objective of this service is to provide a high-speed connection between Central Orange County and Downtown Los Angeles. Therefore, the service would be grade separated from other transportation facilities and the number of stations would be reduced compared to the previous four PE ROW alternatives in order to maintain higher travel speeds. The service would follow this alignment:

- The I-5 freeway between Santa Ana Boulevard and the SR-22 freeway. The service would be elevated above the existing freeway.
- The SR-22 freeway between the I-5 freeway and the PE ROW.
- The PE ROW from the SR-22 freeway to the Union Pacific San Pedro Rail Subdivision (near I-105/I-710 Interchange).
- The Union Pacific San Pedro Rail Subdivision north through Bell, Huntington Park, and Vernon. The rail line runs adjacent to Downey Street in Vernon and Salt Lake Avenue in Huntington Park and Bell.
- The alignment would then join the existing Metrolink corridor. Past Soto Street, the alignment would swing west over the Los Angeles River and parallel the existing rail corridor, entering Union Station from the south.

The Los Angeles Union Station alignment for this alternative was selected over an optional alignment to connect to Los Angeles International Airport (LAX). The Union Station alignment is considered to be the preferred alignment for the following reasons:

- **Availability of right of way:** The Union Station alignment would follow the Los Angeles River and existing railroad rights of way to connect between Union Station and the terminus of the PE ROW in Paramount. The transit alignment would be either at-grade or elevated above these existing rights of way, depending on the selected technology. The LAX alignment could follow the I-105 freeway from the PE ROW terminus to LAX, but the placement of a high speed rail alignment within the I-105 right of way would be challenging, as the median of the freeway is already occupied by the Metro Green Line light rail. The HSR system would either need to run alongside the freeway shoulder or straddle the freeway, which would involve significant capital cost. The complex interchanges at the I-105/I-110 and I-105/I-405 freeways would also impact the potential for a feasible alignment for HSR in the I-105 corridor. An alternative route would be to use the UP San Pedro and BNSF Harbor Subdivisions, but this alignment also poses challenges in terms of geometry that is not conducive to high-speed travel, and immediately-adjacent residential neighborhoods. This alignment is also more circuitous than the I-105 alignment.
- **Connections to Other Modes:** Union Station serves as the central transit hub for Los Angeles County, providing connections to Amtrak, Metrolink, Metro Rail (Red Line, Blue Line, Gold Line), and numerous local and regional bus services. Additionally, the proposed station at the I-710/I-105 could be connected to the Metro Green Line LRT, providing a link from the HSR system to LAX via the Green Line. This would require the construction of a new Green Line station near the I-710/I-105 interchange. The

Union Station alignment also provides a secondary connection to LAX via the existing FlyAway Bus Service that links Union Station to LAX.

- **Capital Costs:** An alignment to LAX would likely involve higher capital costs than an alignment to Union Station due largely to the need for extensive trenched or aerial construction necessitated by constrained rights of way and adjacent residential neighborhoods. The two potential alignment corridors travel through areas housing significant minority and low-income populations, raising significant environmental justice issues.

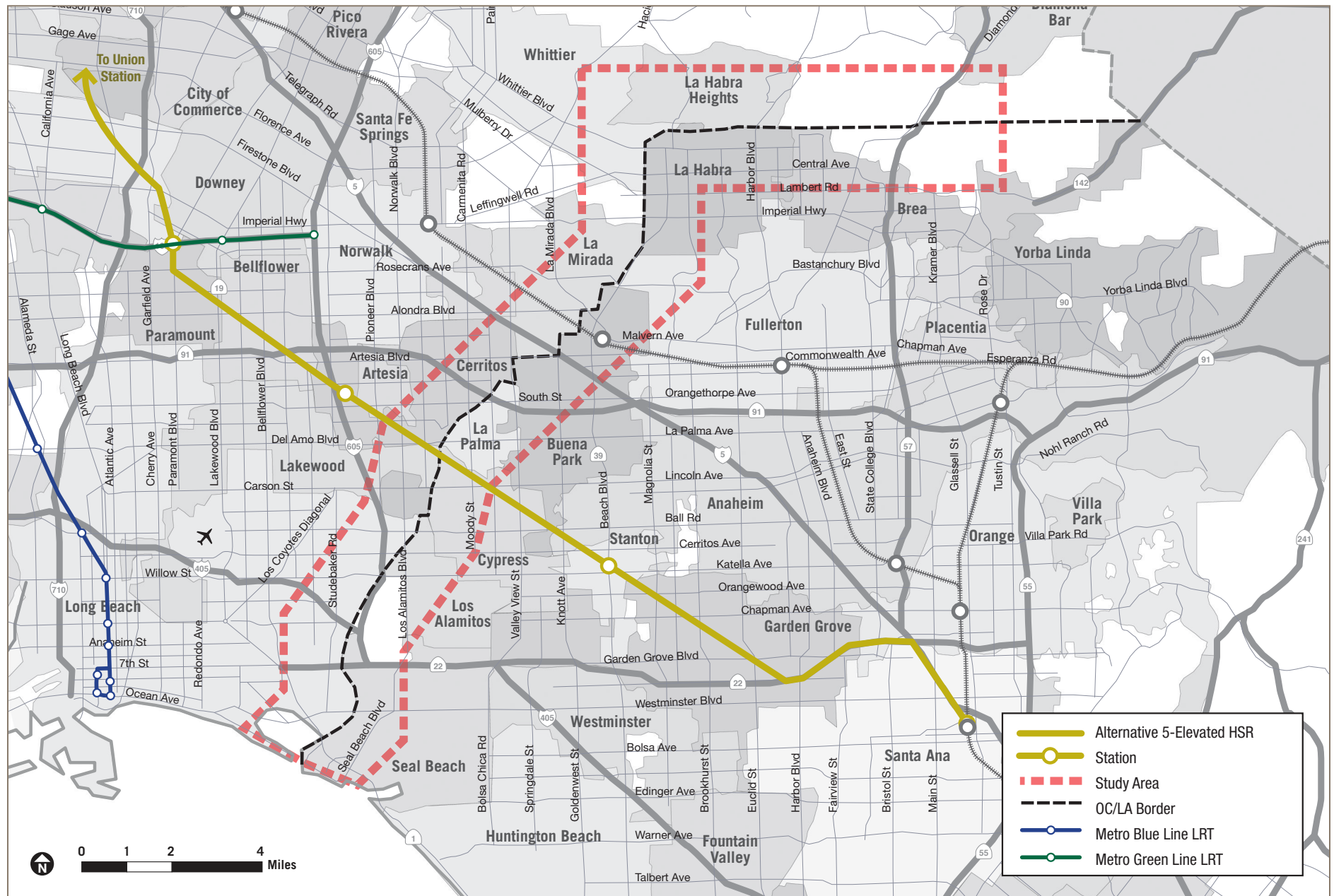
A high speed rail service operating in the PE ROW between Santa Ana and Union Station in Los Angeles would roughly parallel existing intercity and commuter rail services operated by Amtrak and Metrolink in the Los Angeles to San Diego (LOSSAN) rail corridor. This may result in the proposed high speed rail alternative being competitive with existing LOSSAN rail services. However, the following points should be considered:

- While the terminus stations of the proposed high speed rail alignment (Union Station and Santa Ana) overlap with existing Amtrak and Metrolink stations, the remaining portion of the alignment and proposed stations in Stanton, Cerritos, and Paramount serve cities and portions of Los Angeles and Orange Counties that do not currently have convenient and quick access to existing Amtrak and Metrolink stations. The high speed alternative would serve new regional travel markets that are not well-served in the existing condition.
- The high speed alternative (like the previous four alternatives under consideration for the PE ROW) would contribute to the regional transit network and assist in attracting ridership for all modes.

Stations for this alternative would be spaced between five and ten miles apart to allow for higher travel speeds, and would be placed at the following locations:

- Santa Ana Metrolink Station
- PE ROW-Beach Boulevard-Katella Avenue
- PE ROW-183rd Street-Gridley Road (SR-91/I-605 vicinity)
- I-710/I-105
- Union Station

The park-and-ride facilities would be provided at all stations. Stations could also be accessed by walking or through transit connections. As is the case with the other alternatives, an at-grade bicycle and pedestrian pathway is proposed to run below the elevated transit structure within the PE ROW between Fairview Street and Paramount Boulevard. This bicycle and pedestrian pathway would be designed consistent with Caltrans standards for a Class I bikeway, and would provide a non-motorized transportation link in areas where there are few existing bikeways. The proposed alignment and station locations for Alternative 5 are shown in Exhibit 2-12.



3 TRAVEL MARKET ASSESSMENT

The Corridor Mobility Problem and Purpose and Need Report for the OC/LA Intercounty Transportation Study summarized population and employment forecasts near the OC/LA county line, which were used in the identification of transportation needs in the study area and potential transportation improvements. As part of the PE ROW assessment, a more focused look at population and employment figures near the corridor has been completed.

Existing and forecast population and employment figures for the OC/LA study area were obtained from OCTA and Metro. The population and employment forecasts provided by each agency are based on regional forecasts developed by the Southern California Association of Governments (SCAG) and the California State University, Fullerton, Center for Demographic Research.

Ridership and trip origin and destination information for each of the five PE ROW alternatives was developed using the OCTA's Orange County Transportation Analysis Model (OCTAM). Major origins and destinations for each of the alternatives are identified later in this section.

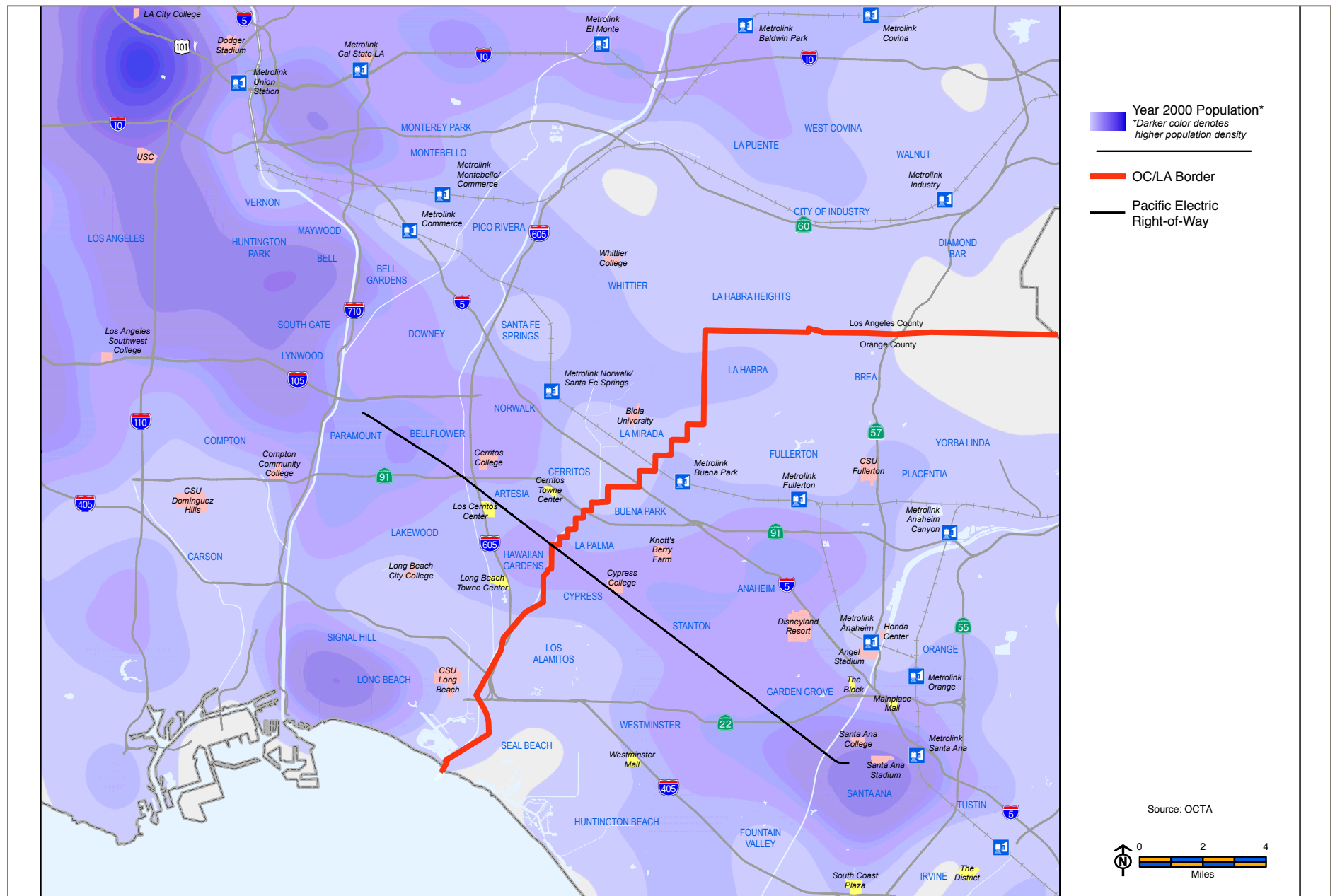
3.1 POPULATION AND EMPLOYMENT DATA

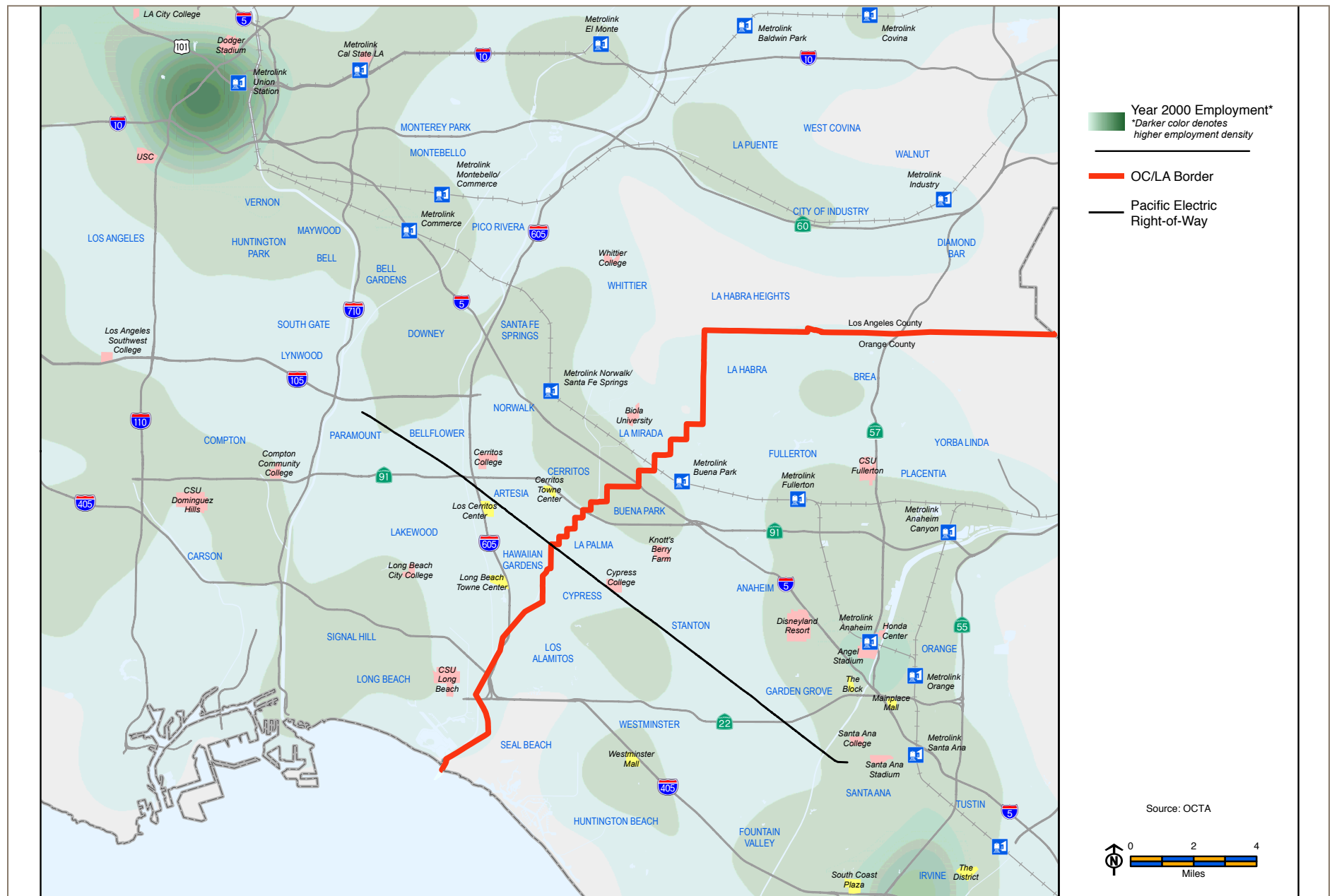
Population and employment densities for Orange and Los Angeles counties for the year 2000 and 2030 are presented in Exhibits 3-1 through 3-4. Based on year 2000 population data, areas with the highest population densities near the PE ROW are Central Santa Ana, Stanton, and Bellflower. These areas continue to have the highest population densities in the year 2030. Increased densities are also observed in Paramount, Garden Grove, and western Anaheim.

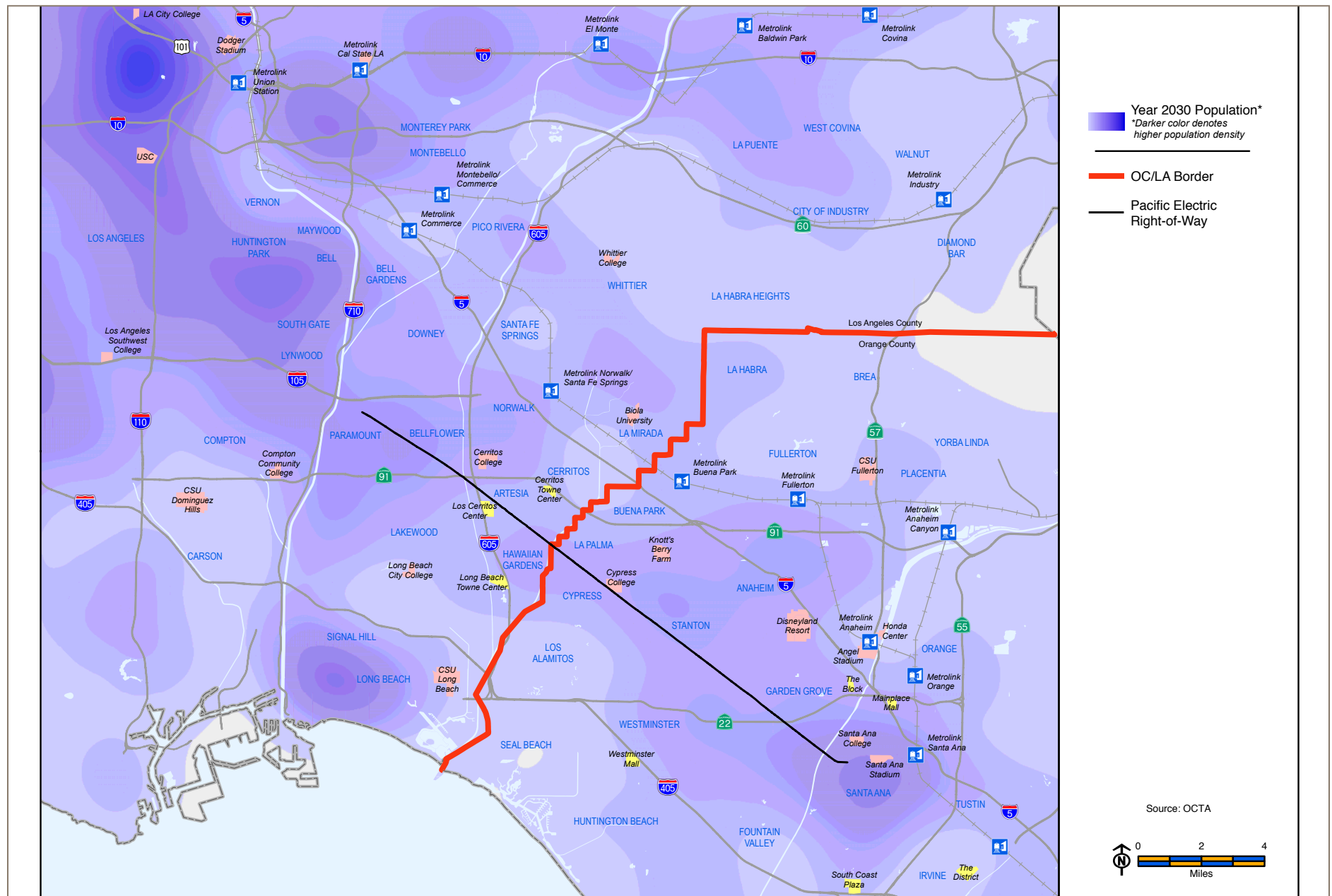
Employment densities near the PE ROW corridor in the year 2000 are highest in Central Santa Ana, in Cypress and western Garden Grove, and near the I-105 freeway in Bellflower and Downey. These three areas continue to have the highest employment densities near the PE ROW in the year 2030.

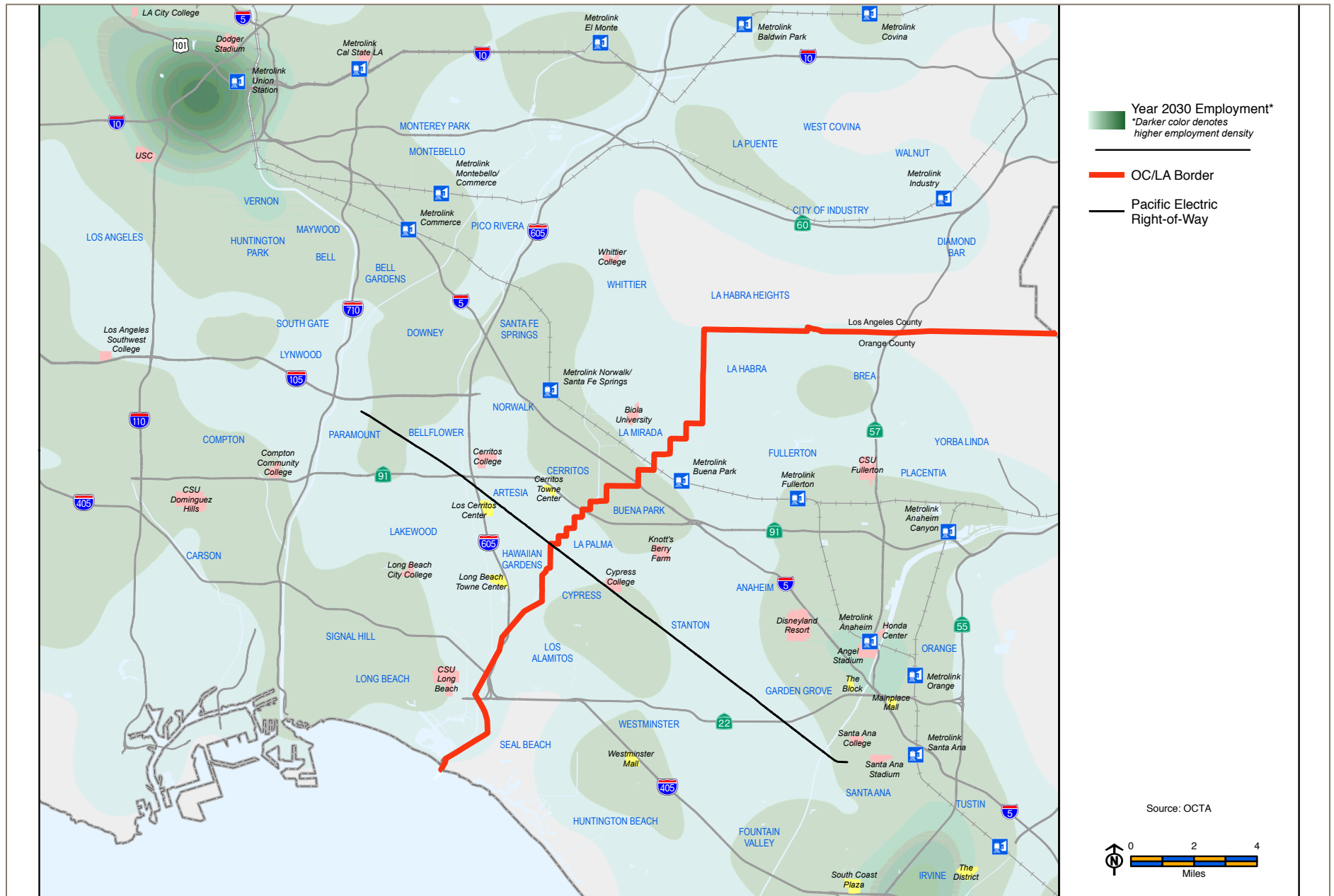
Overall, about 1.2 million people resided within two miles of the PE ROW in the year 2000 (defined as the segment between Fairview Street in Santa Ana and the Los Angeles River in Paramount). The population within this area is forecast to increase about 15% between 2000 and 2030 to 1.4 million residents. The employment data shows 368,000 workers were located within two miles of the corridor in the year 2000. By the year 2030 this figure is forecast to increase almost 20% to 441,000.

The population and employment data show that the PE ROW is located within a predominately residential area, with a significantly higher number of residents living within two miles of the corridor as compared to employment locations. This information suggests that connections between a transit service operating in the corridor and other regional transit services would be important to ensure that residents in the corridor have adequate connections to employment centers in Orange and Los Angeles counties.









3.2 TRANSIT RIDERSHIP

Transit ridership forecasts for each of the five alternatives for transit service in the PE ROW were developed using OCTAM. The ridership forecasts assume the implementation of the Year 2030 Baseline projects outlined in the OC/LA Intercounty Transportation Study Corridor Mobility Problem and Purpose and Need Report.

The transit ridership forecasts were further detailed by identifying the origin and destination of each trip by county. Trips include either those that travel entirely within a single county or those trips that originate in one county and have a destination in the other county. Table 3-1 summarizes the year 2030 transit ridership forecasts for each alternative along with the breakdown of trips within and between Orange and Los Angeles counties.

TABLE 3-1 OCTAM YEAR 2030 DAILY RIDERSHIP FORECASTS FOR PE ROW ALTERNATIVES

Transit Ridership	Alternative 1 Grade Separated Bus Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Total Daily Ridership	12,000	14,000	18,700	6,500	9,500
Within Orange County (% of total ridership)	36%	39%	41%	77%	5%
Within LA County (% of total ridership)	14%	12%	19%	8%	58%
Cross County (% of total ridership)	50%	49%	40%	15%	37%
Riders per Mile	600	700	661	273	278

Source: OCTAM 3.2

The ridership forecasts developed using OCTAM do not include fare estimates, the forecasts are demand only. Modeling ridership with fares could result in changes to the ridership forecasts, particularly for Alternative 5, which would likely charge a higher fare than the other four alternatives.

The ridership forecasts show some distinct differences between the alternatives under consideration. Alternatives 1, 2, and 3 are forecast to serve the highest total number of riders. These three alternatives also serve the greatest number of riders traveling across the county line. All three alternatives also serve a significant number of riders traveling within Orange County. This is partially a factor of the longer alignment and greater number of stations in Orange County for each alternative as compared to Los Angeles County.

Alternative 4, the hybrid BRT/LRT option, serves the lowest number of riders, possibly reflecting the negative impact that a forced transfer in modes causes to ridership. Alternative 5 had the second lowest ridership forecast, but served the greatest number of riders traveling within Los Angeles County. This alternative likely benefited in this case from the connection to Downtown Los Angeles.

Travel Markets

The ridership forecasts developed for this initial assessment of PE ROW transit service alternatives did illustrate some distinct travel markets and travel patterns within the corridor.

There is a strong attraction between origins in Southeast Los Angeles County and destinations in Central Orange County. Central Santa Ana, the South Coast Metro area, and the Irvine Business Complex are strong destinations at the southern end of the corridor. A transit service operating in the PE ROW seems well placed to serve this travel market. A key evaluation point for a future analysis would be to examine the potential for various travel service options to reduce some auto trips near the PE ROW corridor or on the I-5 and I-405 freeways that would otherwise travel between Southeast Los Angeles County and destinations in Central Orange County.

The year 2030 ridership forecasts do not show as strong a connection between points of origin in Orange County and destinations in Los Angeles County. This may be a factor of the limited number of employment centers located along the PE ROW in Southeast Los Angeles County. Exhibit 3-5 compares the origins and destinations of cross border trips between Los Angeles and Orange counties, and illustrates the difference in Los Angeles County trip origins versus Orange County trip origins for those trips that cross the county line. All five alternatives show a similar pattern for trip origins and destinations.

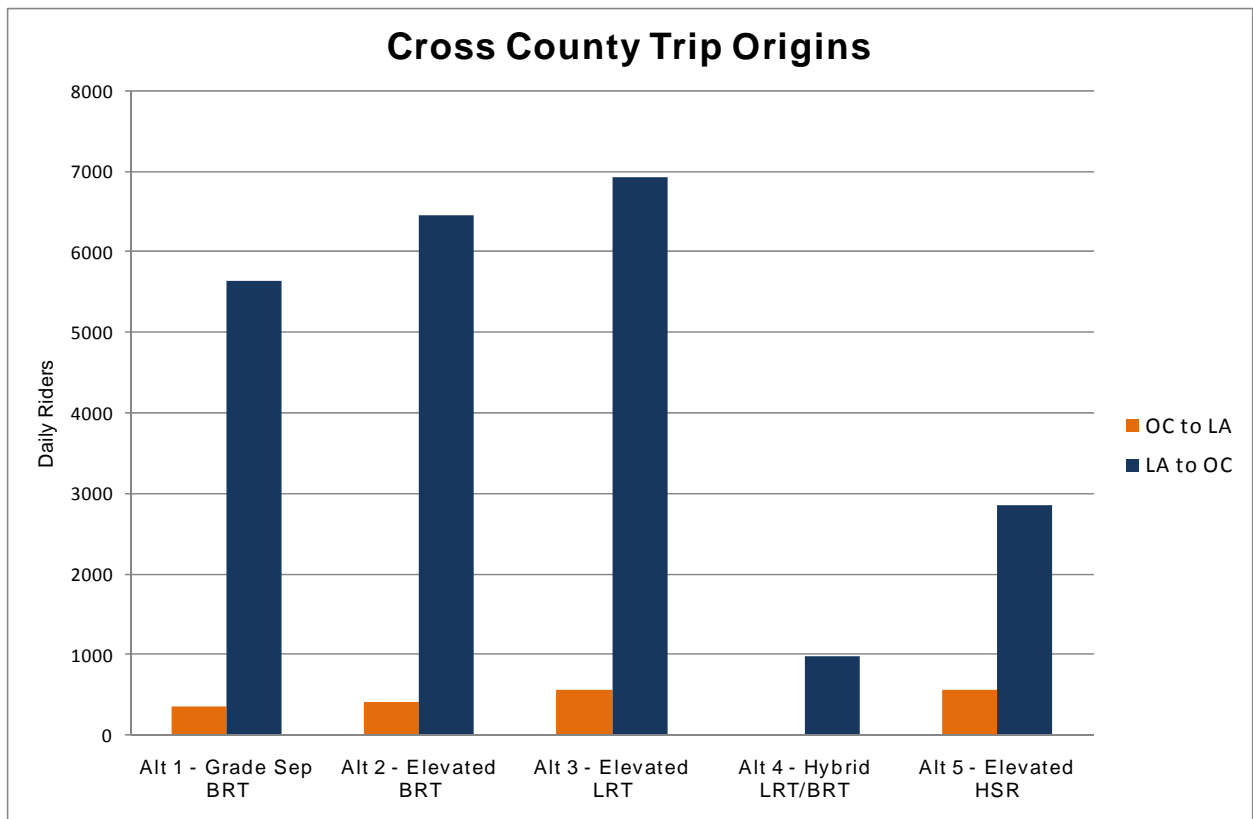


EXHIBIT 3-5 COMPARISON OF CROSS COUNTY TRIP ORIGINS FOR PE ROW ALTERNATIVES

Trips within each county do highlight a difference in the travel markets served by Alternatives 1 through 4 and Alternative 5. The first four alternatives perform well at serving trips within Orange County, providing a good connection between West and Central Orange County. Alternative 5 does not perform as well in this regard, where the shorter travel distance reduces some of the benefits associated with high speed travel and the reduced number of stations limits the potential number of riders. In contrast, Alternative 5 performs the best in serving trips within Los Angeles County. The higher speed connection to Downtown Los Angeles succeeds in attracting a good ridership base from Southeast Los Angeles County. Exhibit 3-6 compares the performance of each alternative in serving trips within Orange County and within Los Angeles County.

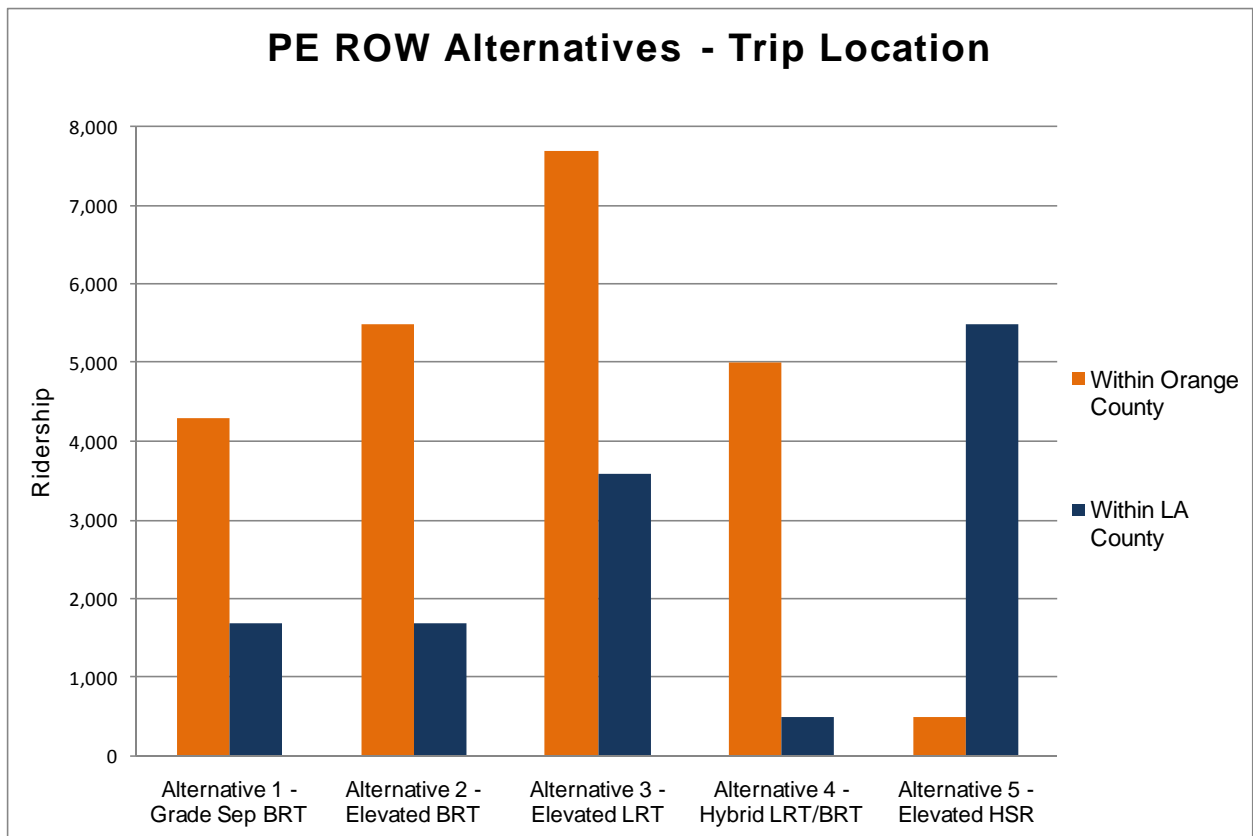


EXHIBIT 3-6 INTRA-COUNTY TRIP ORIGINS AND DESTINATIONS FOR PE ROW ALTERNATIVES

The average or typical trip length is another component of the ridership forecasts. This information also highlights a difference in the travel markets served by the transit service alternatives. Exhibit 3-7 compares the cumulative trip lengths forecast for the five PE ROW transit alternatives.

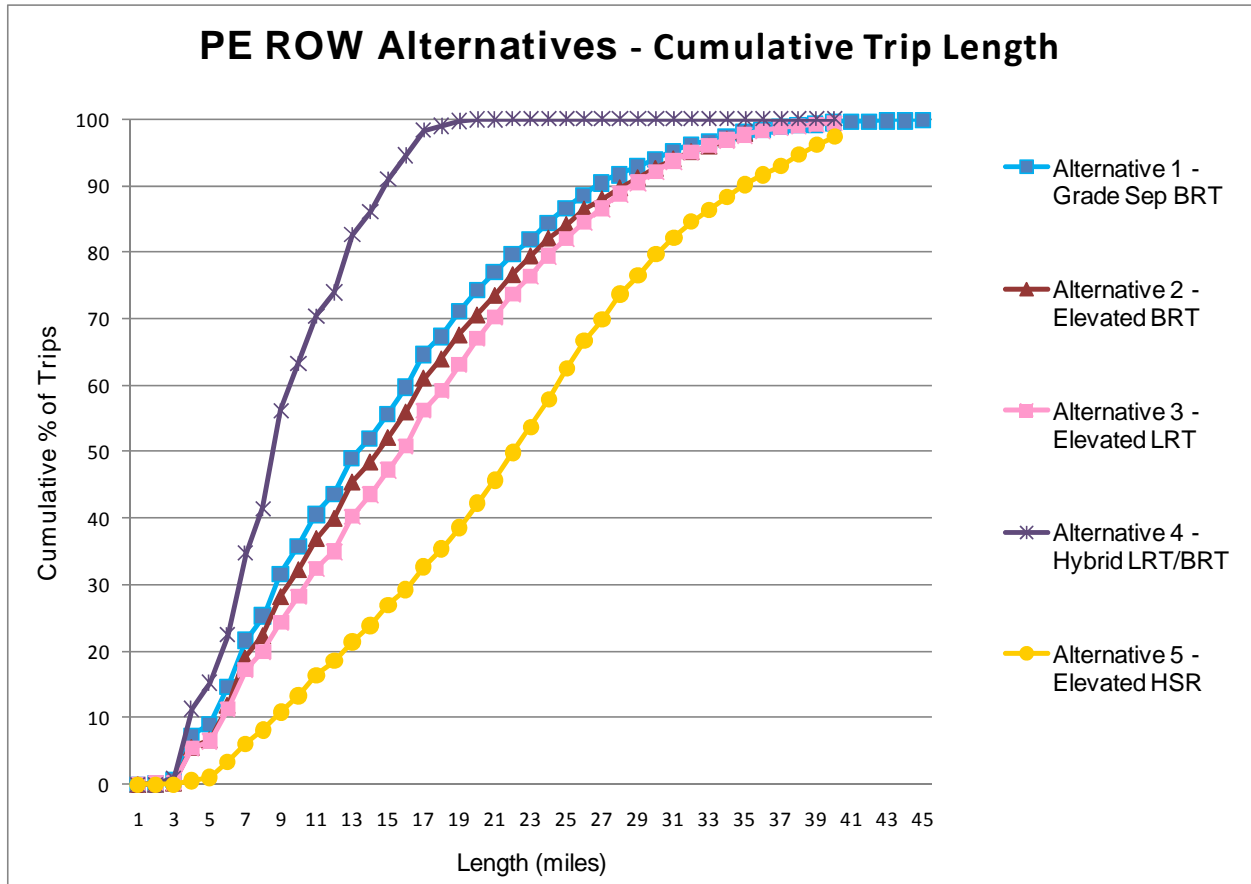


EXHIBIT 3-7 COMPARISON OF CUMULATIVE TRIP LENGTHS FOR PE ROW ALTERNATIVES

Exhibit 3-7 shows that Alternative 4 is forecast to serve short distance local trips. This condition is likely related to the poor performance of this alternative in relation to the other alternatives in serving trips across the county line. Alternatives 1, 2, and 3 have similar performance with 50% of the trips for each alternative consisting of trips that are 11 to 13 miles in length or less. Alternative 5 serves a very different travel market, focused on longer distance trips with 50% of the trips on this alternative traveling over 20 miles.

3.3 ORIGINS AND DESTINATIONS

OCTAM forecasts of trip origins and destinations were also developed for each of the five PE ROW alternatives. These forecasts assist in identifying the major trip generators and attractors located near the PE ROW corridor. The origin and destination forecasts for each alternative are described below.

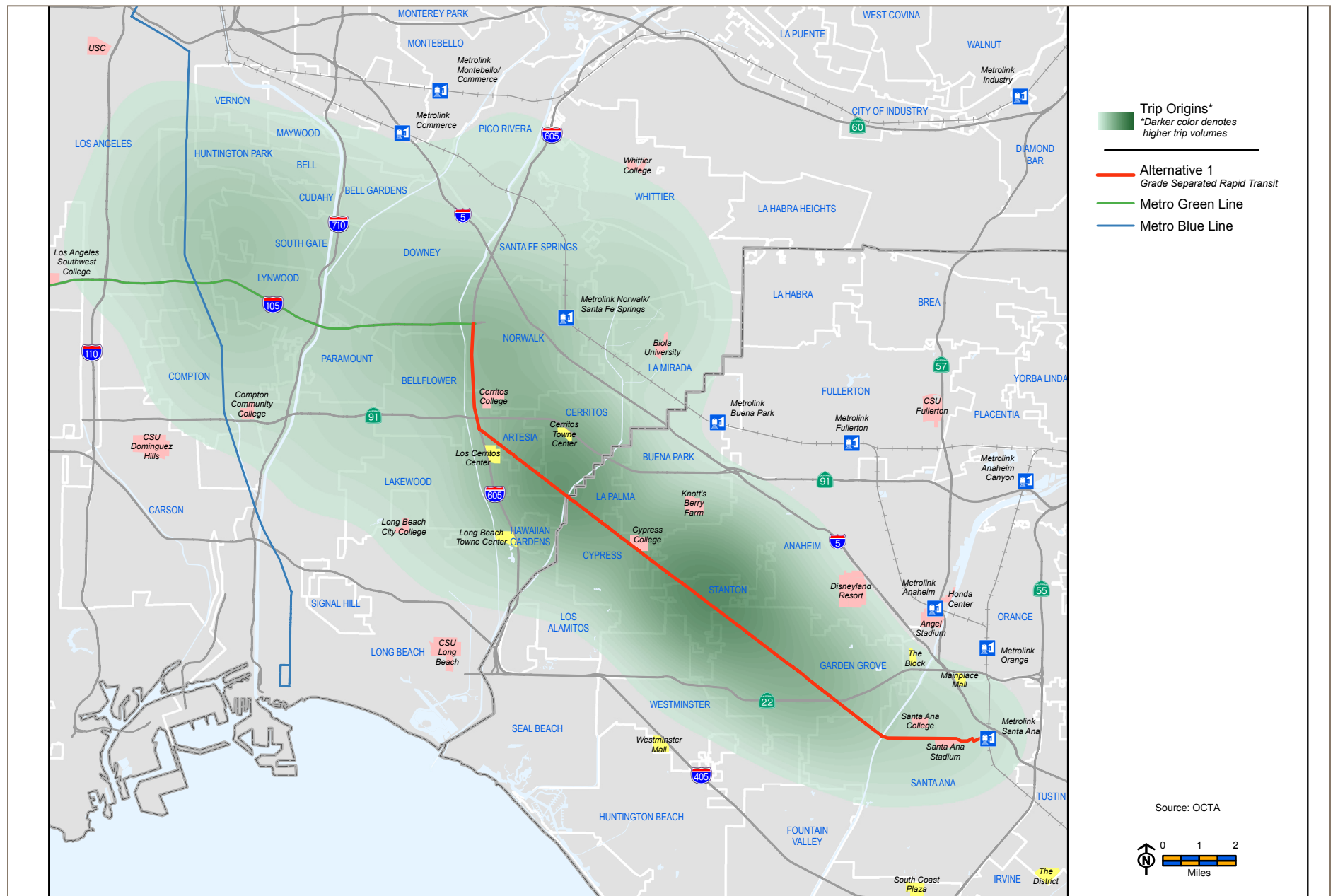
Alternative 1

Trip origins for this alternative have several focal points, including the Stanton-Garden Grove area, Cerritos, Norwalk, and the Lynwood-South Gate area. Major destinations include the Cypress College area, the Los Cerritos Center and Central Santa Ana. Cypress College acts as a significant destination within the central portion of the alignment. Central Santa Ana serves a major destination for riders traveling from West Orange County and Southeast Los Angeles County. Trip origins are much more dispersed than trip destinations for this alternative. There is a larger catchment area for potential riders in Los Angeles County, with the Metro Green Line serving as an excellent connection for potential riders in southeast and south central Los Angeles County. However, these areas do not function as a major destination for trips in the PE ROW, possibly reflecting the residential character of these communities. A majority of the Orange County trip origins are focused within two to three miles of the alignment. Exhibit 3-8 illustrates density of trip origins for Alternative 1. Exhibit 3-9 shows the density of trip destinations for this alternative.

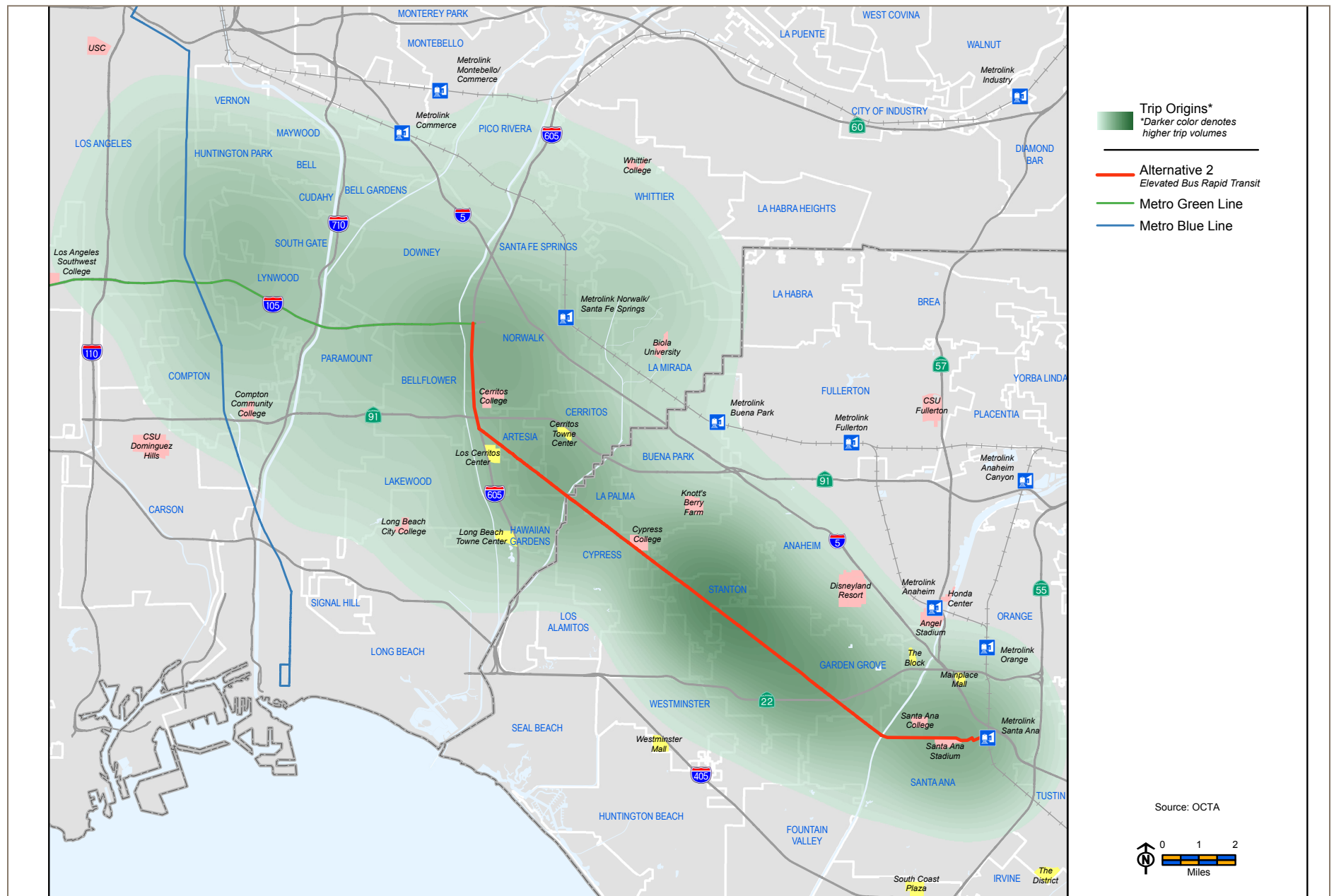
Alternative 2

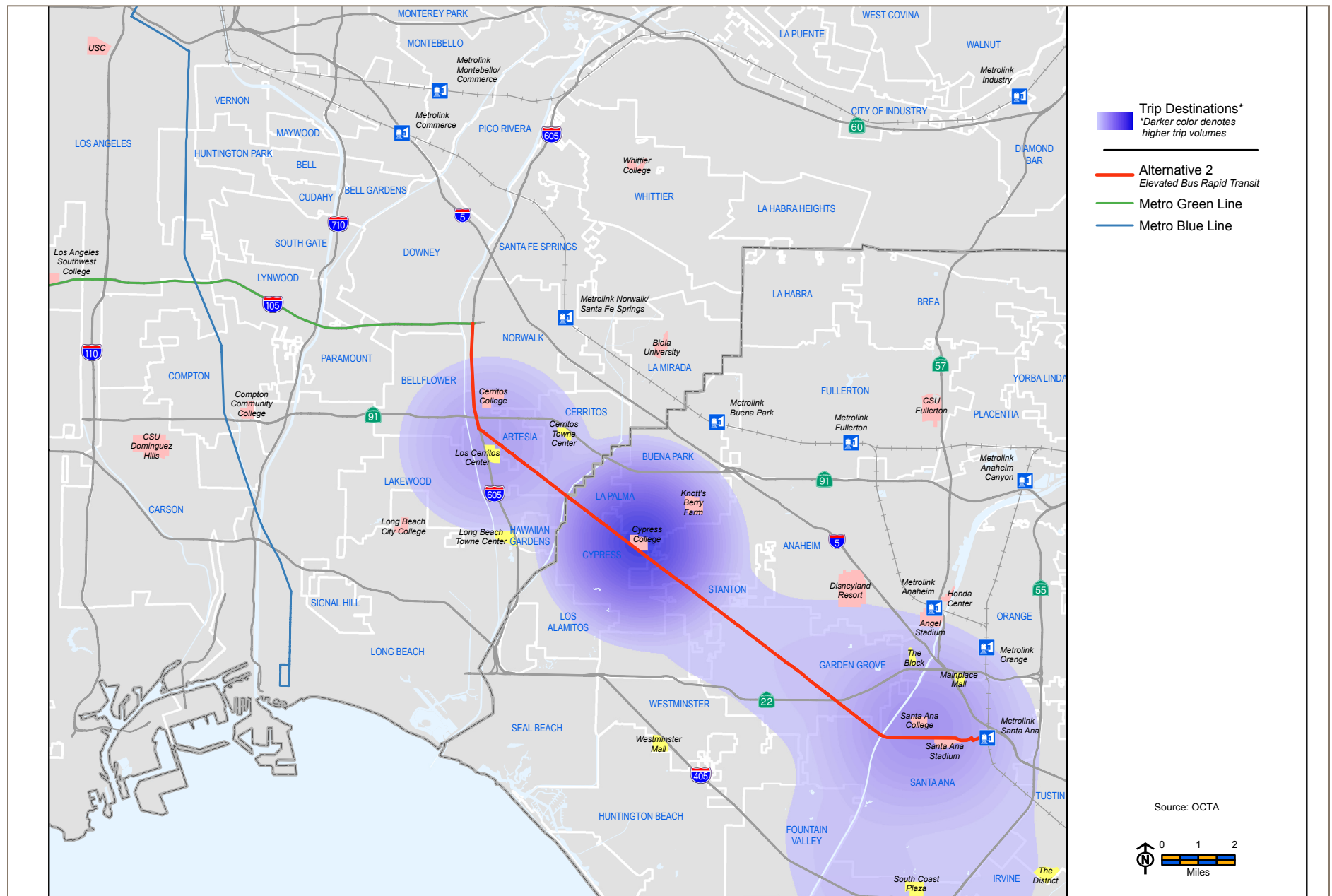
The focal points for trip origins in this alternative include the Stanton-Garden Grove area, Cerritos, Norwalk, the Lynwood-South Gate area, and Central Santa Ana. Major destinations include the Cypress College area, the Los Cerritos Center and Central Santa Ana. This alternative is forecast to have a larger catchment area for both trip origins and destinations compared to Alternative 1. There are a greater number of trip destinations in the South Coast Metro and Irvine Business Complex area. The expansion of the trip destinations further south of the proposed alignment can likely be attributed to the increased travel speeds associated with this alternative, increasing the potential rider travel market.

Cypress College continues to act as a significant destination within the central portion of the alignment. Central Santa Ana also serves as a major destination for riders traveling from West Orange County and Southeast Los Angeles County. As was the case with Alternative 1, trip origins are much more dispersed than trip destinations for this alternative. There is a larger catchment area for potential riders in Los Angeles County, with the Metro Green Line serving as an excellent connection for potential riders in southeast and south central Los Angeles County. A majority of the Orange County trip origins are still focused within two to three miles of the alignment, with more trips attracted from Central Garden Grove. Exhibit 3-10 illustrates density of trip origins for Alternative 2. Exhibit 3-11 shows the density of trip destinations for this alternative.









Alternative 3

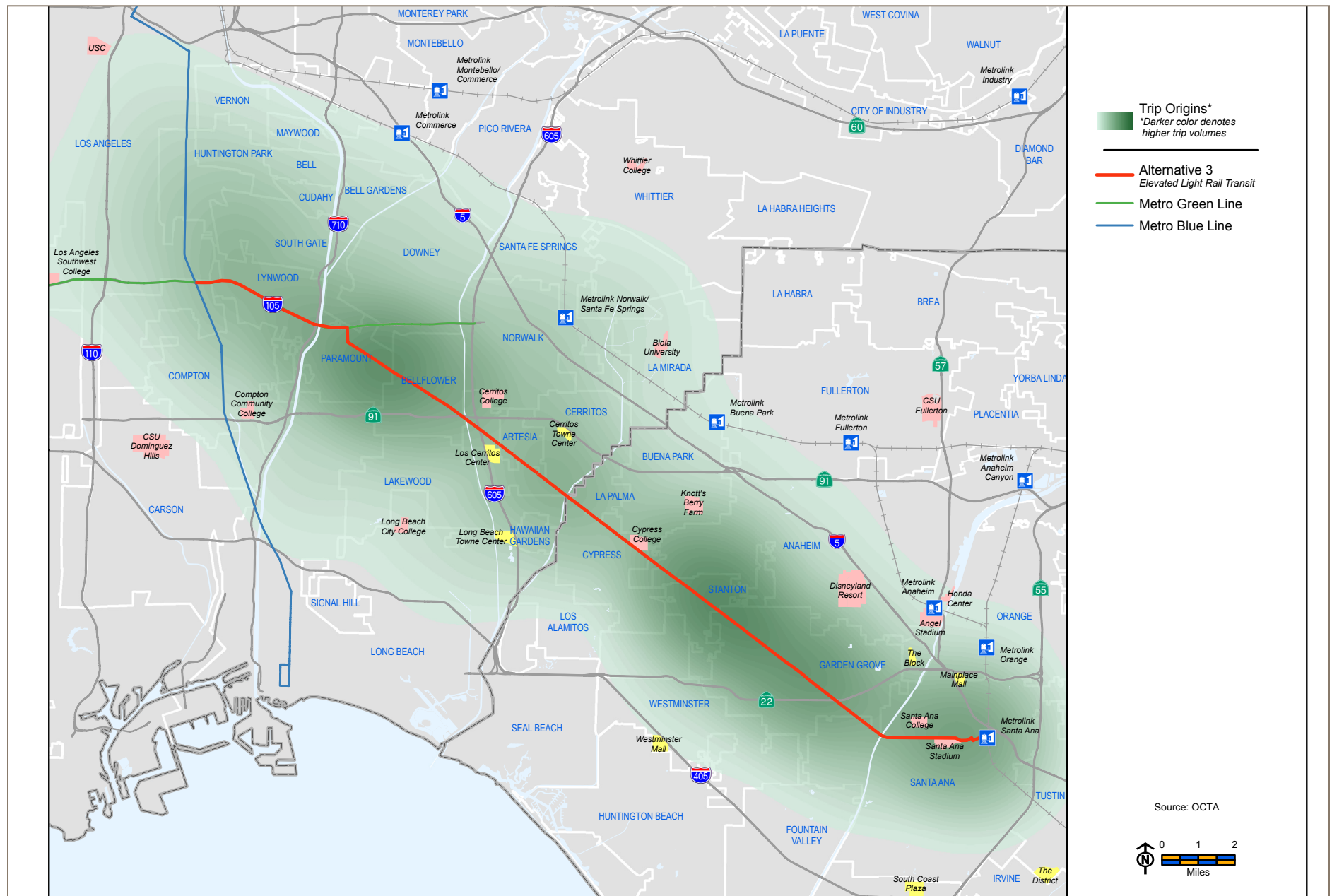
Alternative 3 follows a different alignment in Los Angeles County than Alternatives 1 and 2, continuing along the PE ROW west of the I-605 freeway to connect to the Metro Green Line and Blue Line at the Wilmington Avenue Station. Trip origins in Orange County for this alternative are similar to those forecasted for Alternative 2. The extension of this alignment further into Central Los Angeles County results in the attraction of more transit trips from the Paramount/Bellflower area, as well as from Lynwood and South Gate near the I-105 freeway.

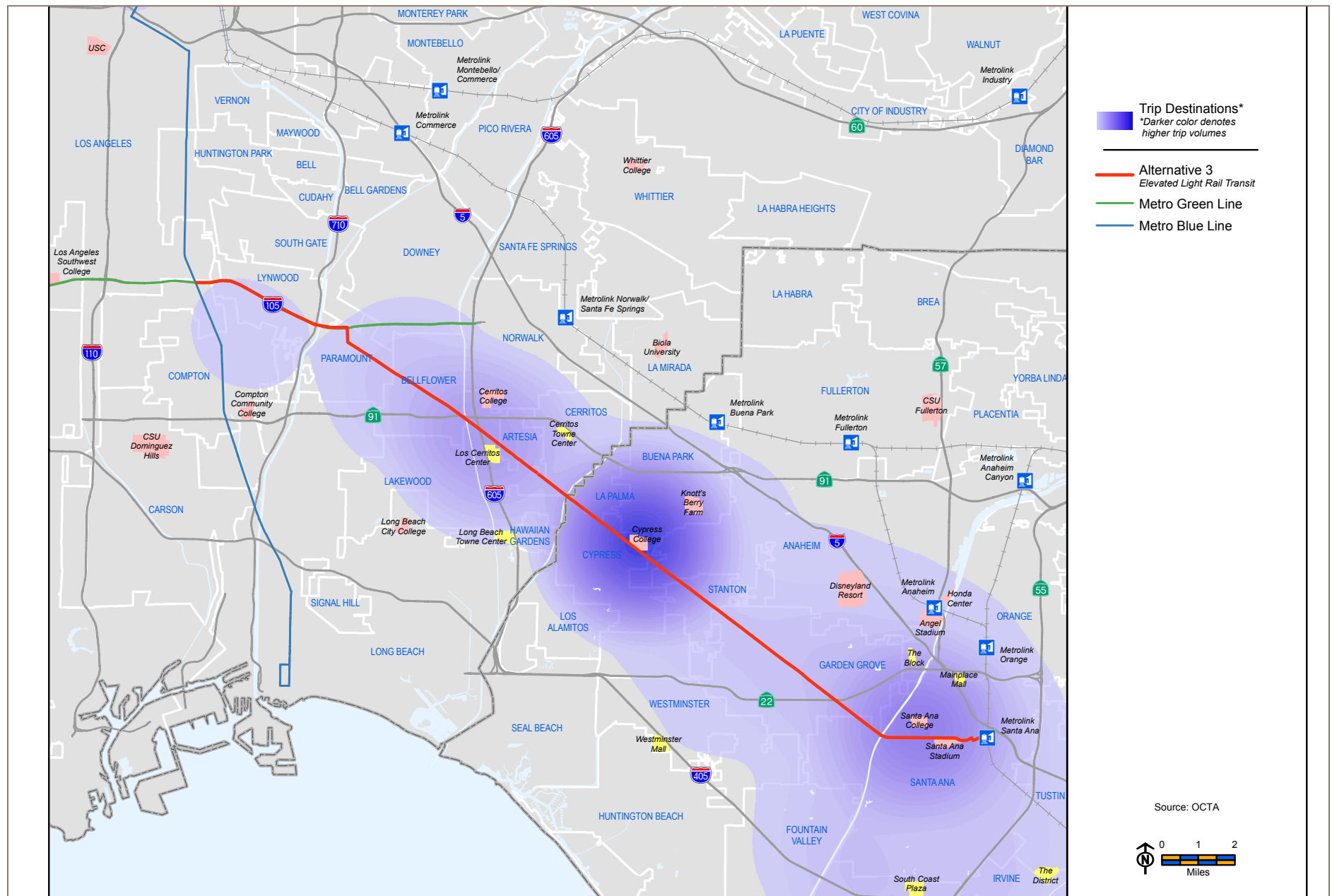
Destinations for trips in this alternative follow a similar pattern to Alternatives 1 and 2. However, there is a much stronger attraction to destinations in Santa Ana, Tustin and Irvine in Central Orange County. This area continues to function as a major destination for trips originating in West Orange County and Southeast Los Angeles County. The Paramount, Lynwood, and Compton areas also function as destination areas in Los Angeles County, suggesting that this alternative performs better than Alternatives 1 and 2 at attracting trips from Orange County to Los Angeles County. Exhibit 3-12 illustrates the density of trip origins for Alternative 3. Exhibit 3-13 shows the density of trip destinations for this alternative.

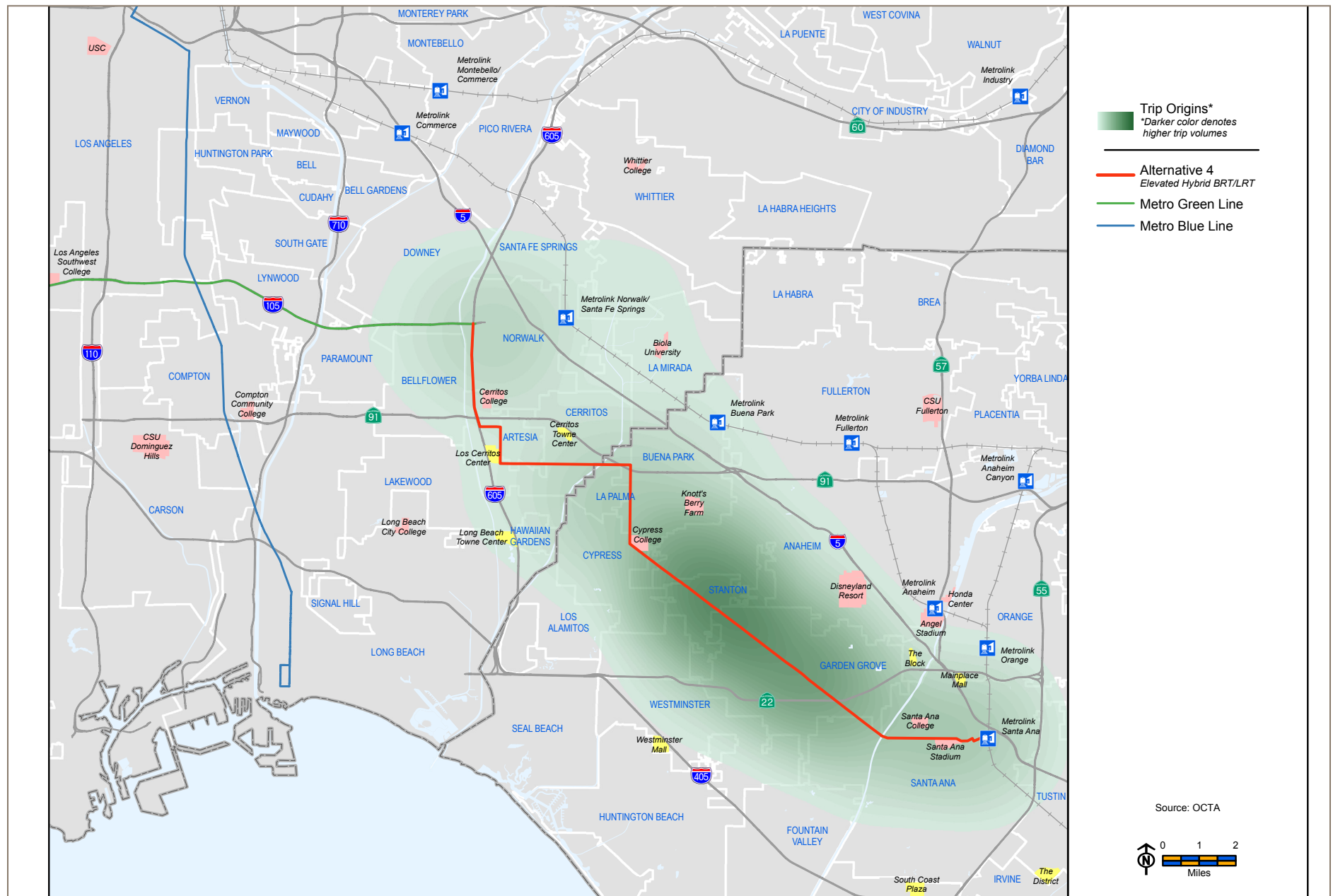
Alternative 4

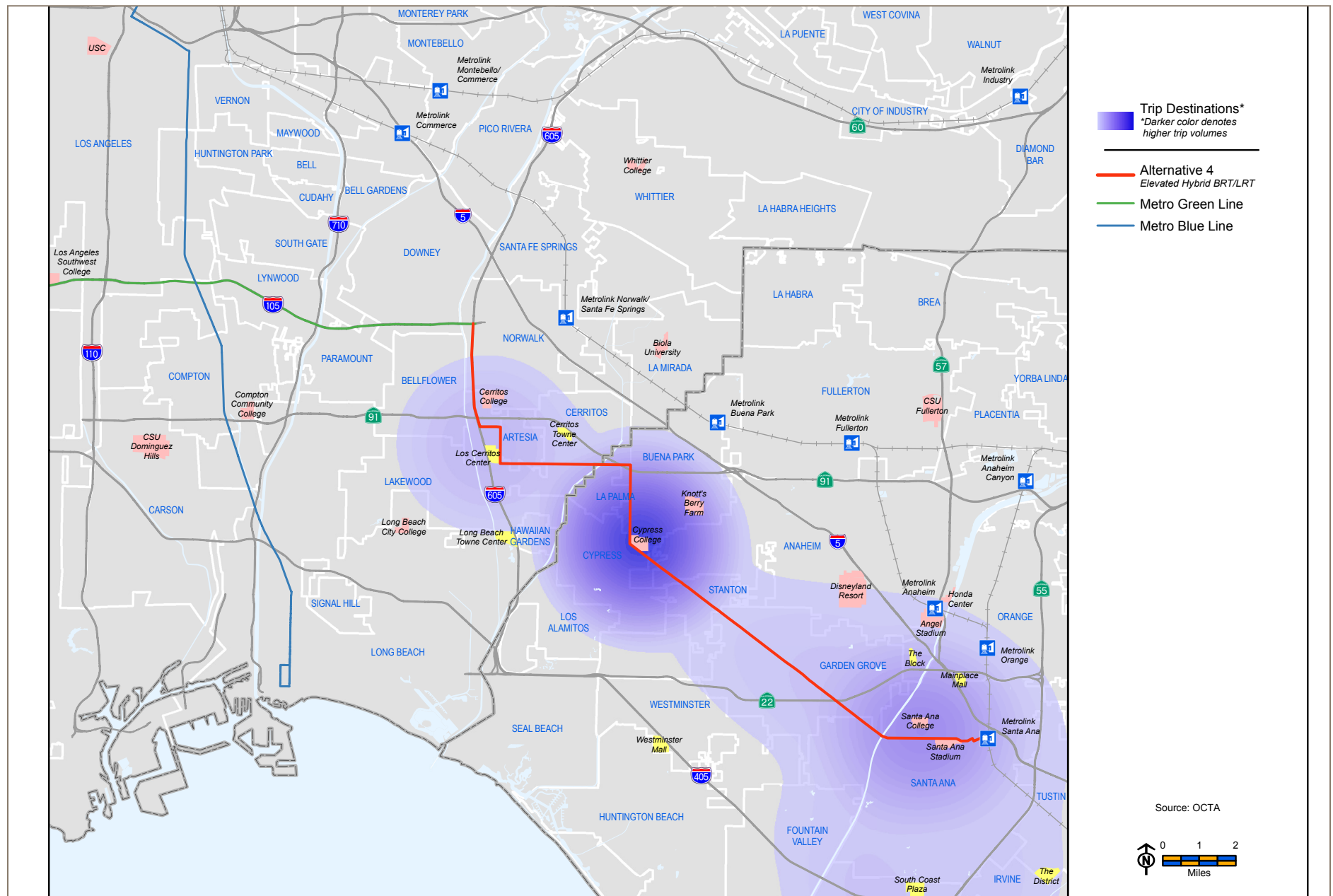
Alternative 4 has a much smaller distribution of trip origins and destinations in comparison to the previous three alternatives. This is anticipated, given the significantly lower ridership forecasts for this alternative. The Stanton-Garden Grove area in the central portion of the alignment serves the major point of origin for trips in this alternative. Major destinations continue to include Cypress College and Central Santa Ana. The light rail service operating between Cypress College and the Santa Ana Metrolink Station continues to serve riders traveling from West Orange County and Southeast Los Angeles County to destinations in the Santa Ana, Tustin, and Irvine areas.

As noted in the previous section, the change in mode required by this alternative does impact ridership, with the lowest number of trip origins and destinations observed along the mixed-flow BRT portions of the alignment. Exhibit 3-14 illustrates density of trip origins for Alternative 4. Exhibit 3-15 shows the density of trip destinations for this alternative.







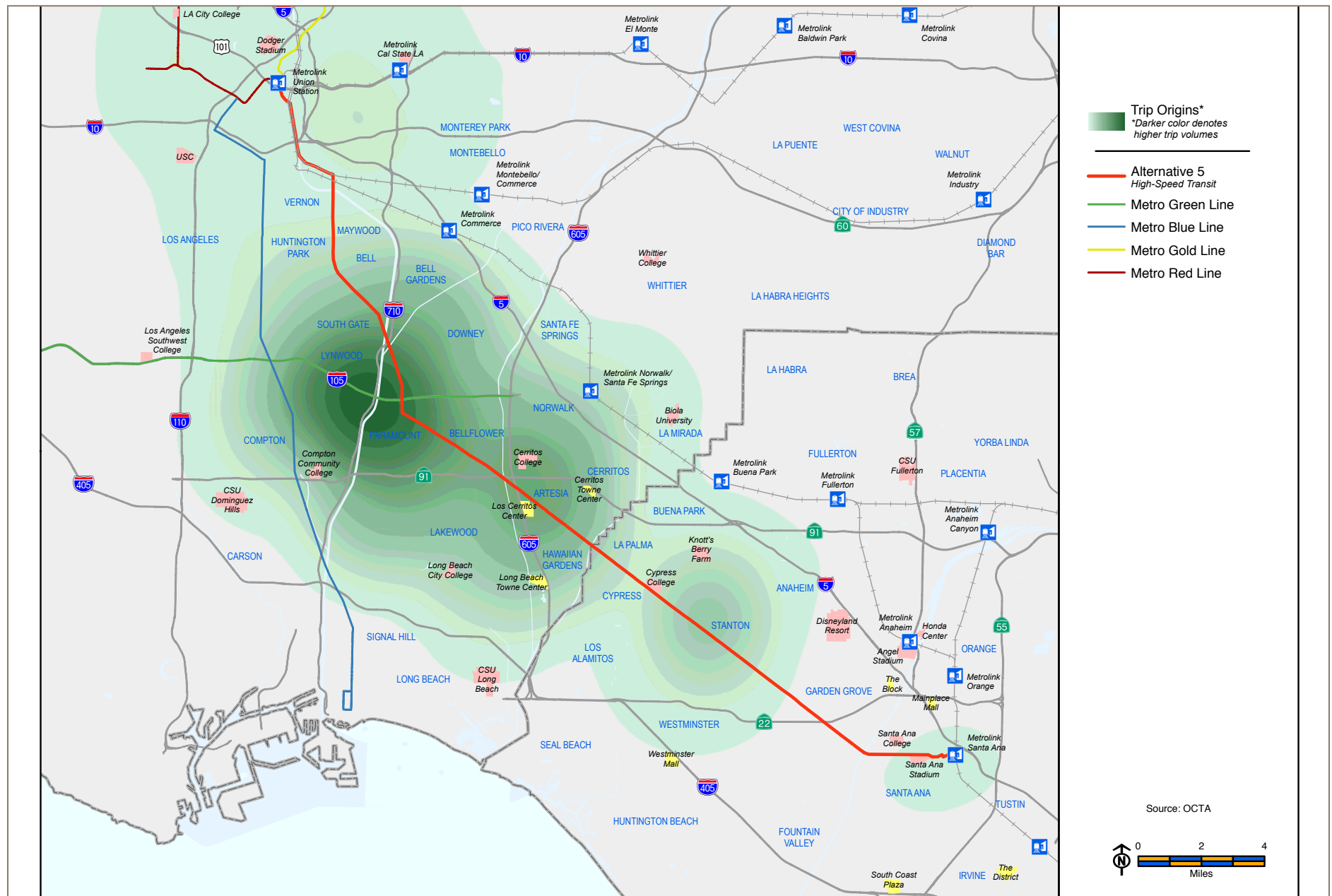


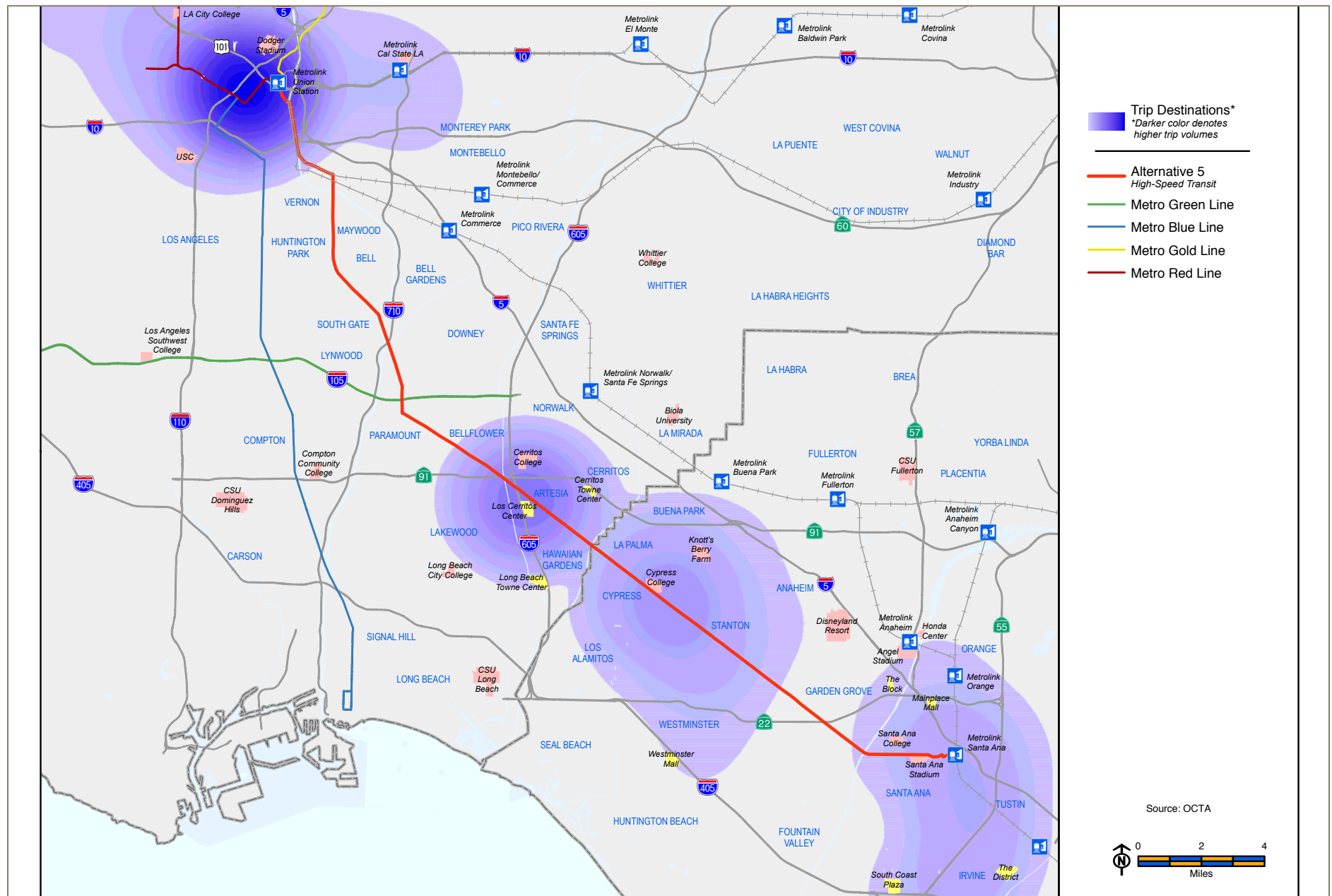
Alternative 5

Alternative 5 is designed to serve a different travel market than the previous four alternatives, focusing on longer distance trips to major employment centers and destinations. This alternative has fewer stations, but is able to provide improved travel times and more efficient connections to Downtown Los Angeles and Central Santa Ana when compared to the previous alternatives.

The Lynwood, Paramount, and South Gate areas surrounding the I-105/I-710 interchange are the primary trip origin points for this alternative, significantly outweighing other areas along the proposed alignment. In comparing this data to the ridership figures summarized in Table 3-1, it appears that riders are attracted from this area due to the improved transit connection to Downtown Los Angeles provided by this alternative. Cerritos also serves as a major point of origin for ridership. The two Orange County stations in Stanton and Santa Ana attract a lower number of trip origins compared to the southeast Los Angeles County stations.

Major destinations for this alternative include Downtown Los Angeles, the Los Cerritos Center area, the Cypress College area, and Central Santa Ana. This alternative provides the residential areas of southeast Los Angeles County with a much faster connection to these destinations. Exhibits 3-16 and 3-17 illustrate the density of trip origins and destinations for Alternative 5.





3.4 FINDINGS

The primary findings of the analysis of OCTAM ridership forecasts for the five PE ROW alternatives are summarized below:

- The highest ridership forecasts are observed for Alternatives 1, 2, and 3. These three alternatives also have the highest forecasts for riders per mile.
- Alternatives 1, 2, and 3 perform the best in serving trips within Orange County across the OC/LA county line.
- Alternatives 2 and 3 have the largest catchment area for trip origins and the greatest distribution of destinations.
- Alternative 4 has the lowest ridership and trip catchment area. However, it does perform well in serving trips within Orange County.
- Alternative 5 serves the greatest number of trips within Los Angeles County and provides the fastest and most efficient connection to Downtown Los Angeles.
- Alternative 5 does not function as well as the other four alternatives in serving travel demand within Orange County.
- Alternative 5 is somewhat competitive with Metrolink services, attracting about 1,000 riders per day away from Metrolink in the year 2030 forecast.
- There is a strong attraction in trips across the OC/LA county line between Southeast Los Angeles County and Central Orange County. These trips are not currently well served by Metrolink or other regional transit services. Alternatives 1, 2, 3, and 5 perform well at serving these trips from Los Angeles County to Orange County.
- Major destinations served by the PE ROW include Cypress College, Central Santa Ana, and the Los Cerritos Center area.

4 PRELIMINARY COST ESTIMATES

The order of magnitude capital cost estimates developed for the PE ROW transit service alternatives are based on the alignments and operating characteristics described in Section 2.2, and are used to compare the various alternatives. All costs are expressed in current year dollars (2008\$), and have been converted from previous year values as necessary using the California Department of Transportation Price Index for Selected California Construction Cost Items.

The representative unit costs for alternatives that include BRT or LRT are based on the cost estimates used in Maricopa Association of Governments High-Capacity Transit Study, the OCTA CenterLine Light Rail Preliminary Engineering, the Metro Gold Line LRT Foothill Extension Environmental Impact Statement/Environmental Impact Report (EIS/EIR), and the Metro Orange Line dedicated bus transitway. The cost estimates for Alternatives 1 through 4 include civil site modifications, guideway structures and track, stations, systems, facilities, vehicles, program implementation, and contingencies for environmental mitigation, design and construction. The line item costs and quantities for Alternative 1 through 4 are provided in the Appendix.

The Alternative 5 (high speed transit) is a technology-neutral option, including the full spectrum of higher speed train types from steel-wheel to maglev. The cost estimates for Alternative 5 are based on average cost-per-mile data from the Orangeline High Speed Maglev Phase I Preliminary Engineering Report published by the Orangeline Development Authority, the environmental documents published for the California High Speed Rail Authority, and the Southern California Association of Governments (SCAG) High Speed Regional Transport System Design Report. With an assumed cost per mile ranging from \$120 to \$200 million per mile for elevated or underground high speed rail, Alternative 5 is estimated to cost between \$4.1 and \$6.8 billion.

A summary of the estimated total capital cost and cost per mile for each alternative is included in Table 4-1.

TABLE 4-1 – PE ROW TRANSIT SERVICE ALTERNATIVES ORDER OF MAGNITUDE COST ESTIMATES

Alternative	BRT Route Length (miles)	LRT Route Length (miles)	HSR Route Length (miles)	Estimated Cost per Mile (millions)	Total Capital Cost Estimate (millions)
Grade Separated BRT	20.0	0.0	0.0	\$37	\$740
Elevated BRT	21.9	0.0	0.0	\$84	\$1,832
Elevated LRT	0.0	30.2	0.0	\$100	\$3,021
Hybrid LRT/BRT	13.5	12.2	0.0	\$58	\$1,485
High Speed Transit	0.0	0.0	34.2	\$120 to \$200	\$4,100 to \$6,800

Source: IBI Group

5 EVALUATION OF ALTERNATIVES

Each of the five transit service alternatives for the PE ROW was subjected to a preliminary evaluation using several criteria. The screening and evaluation of transit alternatives is designed to identify viable alternatives that should be carried forward for more detailed study and analysis, and to identify those alternatives that may have significant impacts or poor system performance. The goal is to develop a short list of reasonable alternatives that can be studied in a future phase at a higher level of detail. The criteria selected for evaluation were assigned to the following groups:

- Mobility Improvements
- Connectivity (with other transit systems)
- Visual Impacts
- Traffic Impacts
- Cost Effectiveness

The comparison of the five proposed alternatives is based upon a rating system applied to specific evaluation criteria that fall into the categories mentioned above. The rating represents how each transit alternative ranks in terms of individual evaluation criteria on a scale of 1 to 5. The rating scale is as follows:

- 1 – Significant Constraint
- 2 – Not Supportive
- 3 – Neutral
- 4 – Supportive
- 5 – Very Supportive

Ratings were assigned for each corridor in the various categories using an equal interval method. Table 5-1 below presents the rating applied to a range of values under each evaluation criteria.

TABLE 5-1 – EVALUATION CRITERIA RATING ASSIGNMENTS

Evaluation Criteria	Significant Constraint "1"	Not Supportive "2"	Neutral "3"	Supportive "4"	Very Supportive "5"
Mobility Improvements					
Total Ridership	0 – 4,000	4,001 – 8,000	8,001 – 12,000	12,001 – 16,000	16,001 – 20,000
Ridership within Orange County	0 – 1,600	1,601 – 3,200	3,201 – 4,800	4,801 – 6,400	6,401 – 8,000
Ridership within Los Angeles County	0 – 1,200	1,201 – 2,400	2,401 – 3,600	3,601 – 4,800	4,801 – 6,000
Ridership between Counties	0 – 1,600	1,601 – 3,200	3,201 – 4,800	4,801 – 6,400	6,401 – 8,000
Riders per Mile	0 – 160	161 – 320	321 – 480	481 – 640	641 – 800
Connectivity					
Connectivity with Existing Transit Network	Less than 15	15 – 30	31-45	46-60	Over 60
No. of Stations	Up to 5	6-10	11-15	16-20	Over 20
No. of Stations with Park and Ride	Less Than 15%	15% - 30%	31% - 45%	46% - 60%	Above 60%
Visual Impacts					
Structure/Guideway Visual Impacts to Adjacent Properties	n/a	Fully Elevated	Primarily Elevated	Partially Elevated	Fully At-Grade
Traffic Impacts					
Roadway Capacity Impacts	n/a	Replacing Traffic Lanes with Exclusive Transit Lanes	Replacing Left-Turn Lanes with Exclusive Transit Lanes	Mixed-flow Operations	Exclusive Transit Lanes with no Changes to Traffic Lanes
Roadway Crossing Impacts	n/a	Fully At-Grade	Partially Elevated	Primarily Elevated	Fully Elevated Alignment
Cost Effectiveness					
Construction Cost per Mile	Above \$120,000,000	\$90,000,001 - \$120,000,000	\$60,000,001 - \$90,000,000	\$30,000,001 - \$60,000,000	Less than \$30,000,000
Construction Cost per Annual Rider	Above \$160	\$121 - \$160	\$81 - \$120	\$41 - \$80	\$0 - \$40

Mobility Improvements

Ridership is a critical element for identifying tangible benefits and justifying an alternative and its potential to achieve intended mobility improvements. For the purposes of this evaluation, mobility improvements are categorized in terms of total system ridership, riders per mile, ridership within Orange County, ridership within Los Angeles County, and ridership between the two counties. Table 5-2 summarizes year 2030 ridership forecasts for the five transit service alternatives.

TABLE 5-2 – RIDERSHIP STATISTICS FOR TRANSIT ALTERNATIVES

Transit Ridership	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Total Ridership	12,000	14,000	19,000	6,400	9,500
Within Orange County (% of total ridership)	36%	39%	41%	77%	5%
Within LA County (% of total ridership)	14%	12%	19%	8%	58%
Cross County (% of total ridership)	50%	40%	40%	15%	36%
Riders per Mile	600	700	661	273	278

Source: OCTAM 3.2

Alternative 1 (Grade Separated Bus Rapid Transit) is anticipated to have around 12,000 daily riders and has the third highest system ridership amongst the alternatives. Thirty-six percent of the daily riders (4,300 riders) complete trips solely within Orange County, 14% (1,700 riders) of trips occur within Los Angeles County. The majority of daily riders (6,000 riders, 50% of total riders) are anticipated to commute between Orange and Los Angeles counties. This alternative is about 20 miles in length and would serve an average of 600 riders per mile.

Alternative 2 (Elevated Bus Rapid Transit) is anticipated to have around 14,000 daily riders and has the second highest system ridership amongst the alternatives. Thirty-nine percent of the daily riders (5,400 riders) complete trips within Orange County, and similar percentage (5,600 riders) complete trips between the two counties. A smaller percentage of the total ridership (12%, 1,600 riders) is forecast to complete trips solely within Los Angeles County. Like Alternative 1, this alternative is also 20 miles in length. The higher ridership forecast results in a higher rider per mile forecast of 700 riders. This is the highest average rider per mile forecast of the five alternatives.

Alternative 3 (Elevated Light Rail Transit) is forecast to serve about 19,000 daily riders and has the highest system ridership amongst all transit alternatives. Around 41% of the daily riders (7,800 riders) complete trips within Orange County and similar percentage (7,600 riders) make trips across the OC/LA county line. Only 19% (3,600 riders) of riders are forecast to complete trips within Los Angeles County. While Alternative 3 serves the highest number of riders among the five alternatives, it has a longer alignment length at about 28 miles, resulting in an average ridership per mile forecast of 661 riders.

Alternative 4 (Elevated Hybrid BRT/LRT) is forecast to serve about 6,500 daily riders and has the lowest ridership of the five alternatives studied. A majority of the daily riders (4,900 riders) complete trips within Orange County, 8% (500 riders) complete trips solely within Los Angeles County, and 15% (960 riders) are anticipated to travel across the OC/LA county line. This alternative also has the lowest per mile ridership forecast, serving an average of 273 riders per mile.

Alternative 5 (High-Speed Transit) is forecast to serve approximately 9,500 daily riders. Less than 500 daily riders complete trips within Orange County. A majority, 58%, of the daily riders (5,500 riders) complete trips within Los Angeles County and 37% (3,500 riders) are forecast to

travel between the two counties. Alternative 5 has the longest alignment length, so the per mile ridership forecast is among the lowest at 278 riders per mile.

The ridership forecasts show that Alternatives 1, 2, 3 perform the best at serving trips across the county line and within Orange County. Alternative 5 performs the best at serving trips within Los Angeles County, benefiting from the connection to Downtown Los Angeles.

Each of the alternatives is ranked in terms of their performance in five categories:

1. Total Ridership – Based on the daily forecast ridership for each alternative.
2. Ridership within Orange County – Compares the performance of each alternative in serving trips within Orange County.
3. Ridership within Los Angeles County – Compares the performance of each alternative in serving trips within Los Angeles County.
4. Ridership between Counties – Compares the performance of each alternative in serving trips between Los Angeles and Orange counties.
5. Riders per Mile – This criterion helps to account for differences in the alignment length between alternatives.

Table 5-3 summarizes the performance of each alternative in the five categories identified above.

TABLE 5-3 – RIDERSHIP EVALUATION MATRIX

Evaluation Criteria	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Mobility Improvements					
Total Ridership	4	4	5	2	3
Within Orange County	3	4	5	4	1
Within Los Angeles County	2	2	4	1	5
Between Counties	4	4	5	1	3
Riders per Mile	4	5	5	2	2
Total Ridership Rank	17	19	24	10	14

An overall rank for mobility improvements and ridership is assigned to each alternative based on the total individual ranking across the five ridership categories. In terms of an overall ridership rating, Alternative 3 ranks highest across all the alternatives and is forecast to be very supportive in achieving desired mobility improvements. Alternative 2 has the second highest overall ranking, performing slightly better than Alternative 1. These alternatives serve the same alignment, but the reduced number of stations proposed for Alternative 2 allows for a slightly faster travel time from end to end on the alignment, attracting a greater number of riders compared to Alternative 1.

Alternatives 1, 2, 3 and 4 perform well at serving trips within Orange County. While 1, 2, 3 and 5 serve trips across the OC/LA county line well. Alternative 5 scores well serving trips within

Los Angeles County, but performs poorly at serving trips in Orange County. Alternative 4 is assigned the lowest rank and exhibits the worst performance in terms of serving travel demand in the PE ROW. This is primarily a result of the forced transfer in mode between LRT and BRT at Cypress College.

Connectivity

Connectivity is a critical element in identifying how well a proposed alternative fits into and connects with the existing transit network. The criteria included within this category serve as a tool to measure the effectiveness of a proposed alternative in connecting to major activity centers, existing local and regional transit services, and effectively serving transportation needs between the two counties.

The connectivity of the proposed five transit service alternatives to the existing transit network is evaluated based on the three following criteria:

1. Existing bus routes within a quarter mile walking radius from proposed station locations along each alternative.
2. Number of stations along a proposed alternative.
3. Number of stations along a proposed alternative with a park-and-ride facility.

Proposed station locations with existing bus stops (serving multiple bus lines) within a quarter mile walking distance are assigned higher ranks as compared to station locations with bus stops located outside a reasonable walking distance. Quarter mile is a distance most people are willing to walk to train station or other destinations as it can be comfortably traveled within a five to ten minute range.

The number of bus and rail lines operating within the quarter mile distance for individual station locations was counted for all alternatives. Each station location was assigned a specific number of points based on the number of transit connections, at a weighting of one point per route or connection. Points for all stations along an alternative are added to get the total. Relative rankings are assigned to each alternative based on the total points. Rankings are also assigned for pedestrian and vehicular access to stations for each alternative based on the number of stations provided and the number of park-and-ride facilities proposed for each alternative.

Table 5-4 summarizes number of stations proposed for each alternative and number of stations that have a park-and-ride facility. The alternative with the highest number of stations is considered very supportive (rank 5) as it provides the most potential connection points to the existing transit network. The alternative with the highest number of stations offering a park and ride facility is considered very supportive (rank 5) as it provides access points for potential commuters traveling from areas not served by existing transit. Park-and-ride facilities are also supportive in encouraging mode shift from car travel to transit. The results of the connectivity evaluation are summarized in Table 5-5.

TABLE 5-4 – CONNECTIVITY VALUES FOR TRANSIT ALTERNATIVES

Alternative	No. of Stations	No. of Stations with Park-and-Ride
Alternative 1 (Grade Separated Rapid Transit)	21	9
Alternative 2 (Elevated Bus Rapid Transit)	15	9
Alternative 3 (Elevated Light Rail Transit)	18	12
Alternative 4 (Elevated Hybrid BRT/ LRT)	17	7
Alternative 5 (High-Speed Transit)	5	5

TABLE 5-5 – CONNECTIVITY EVALUATION MATRIX

Evaluation Criteria	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Connectivity (with other transit systems)					
Connectivity with Existing Transit Network	5	4	5	4	2
No. of Stations	5	3	4	4	1
No. of Stations with Park and Ride Facility	3	4	5	3	5
<i>Overall Connectivity Rating</i>	<i>13</i>	<i>11</i>	<i>14</i>	<i>11</i>	<i>8</i>

Alternative 1 and 3 are very supportive in terms of their connectivity to the existing transit network, and provide the highest number of pedestrian oriented connections to existing transit services. Alternatives 2 and 4 are similar in their supportiveness of transit connectivity. Alternative 5 provides very good connectivity at Union Station and the Santa Ana Metrolink Station, but the smaller number of stations reduces the overall performance of this alternative.

Visual Impacts

The visual impact criterion is focused on assessing the potential impacts of elevated or at-grade alignments on land uses located adjacent to the proposed PE ROW transit service alternatives. The PE ROW is bordered by numerous residential developments that could be negatively impacted by the implementation of a transit alignment within the corridor. In this case, an at-grade transit alternative is considered to be visually less intrusive when compared to an elevated transit alternative. The rankings are assigned on a qualitative basis at this stage with alternatives that are fully elevated scoring the lowest, while alternatives with at-grade components would receive a better ranking. Table 5-6 summarizes the visual impacts evaluation of the alternatives.

TABLE 5-6 – VISUAL IMPACTS EVALUATION MATRIX

Evaluation Criteria	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Visual Impacts	4	3	3	4	2

Alternatives 1 and 4 have significant portions of their alignments at-grade and would be considered to be less visually intrusive than the other alternatives. The remaining three alternatives are either fully elevated or primarily elevated, and are considered to be more visually intrusive.

Traffic Impacts

The potential impact of each proposed alternative on roadway traffic is evaluated based on the following criteria:

1. Transit alignment operating in mixed flow lanes vs. exclusive lanes
2. Transit alignment operating at-grade vs. elevated

In the case of operations in mixed-flow or exclusive traffic lanes, the lowest ranking would be assigned to an alternative that replaces existing traffic lanes with exclusive traffic lanes. This would result in a potentially substantial reduction in traffic capacity. The loss of turning lanes to accommodate exclusive transit lanes would result in a neutral ranking, while the implementation of exclusive transit lanes with no changes in traffic lane capacity would result in the highest possible ranking. Mixed-flow operations are considered to be supportive as no reduction of traffic capacity would result, but the additional transit vehicles operating in the existing traffic lanes would cause some impact to traffic operations due to the increased number of vehicles traveling on the roadway.

The comparison of at-grade and elevated transit services focuses on street crossings, where at-grade crossings for the transit system may result in traffic delays and impacts to cross streets. Elevated systems avoid these potential traffic impacts. The rankings are assigned on a scale with fully elevated alignments being very supportive and fully at-grade options being not supportive. Table 5-7 summarizes the results of the traffic impact evaluation.

TABLE 5-7 – TRAFFIC IMPACTS EVALUATION MATRIX

Evaluation Criteria	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Traffic Impacts					
Roadway Capacity Impacts	4	3	3	3	5
Roadway Crossing Impacts	3	4	4	3	5
<i>Overall Traffic Impacts Rating</i>	<i>7</i>	<i>7</i>	<i>7</i>	<i>6</i>	<i>10</i>

Alternatives 1, 2, 3, and 4 perform similarly overall. Each alternative has pros and cons in terms of potential traffic impacts. Alternative 1 benefits from mixed-flow operation within Central Santa Ana, resulting in the highest ranking for the roadway capacity criterion. However, the at-grade crossings associated with this alternative result in a lower score for roadway crossing impacts. Alternatives 2, 3, and 4 are the reverse, causing roadway capacity impacts due to the proposal for exclusive lanes in Central Santa Ana. In contrast to Alternative 1, the elevated profile of these alternatives in the PE ROW eliminates potential impacts to roadway crossings. Alternative 5 is fully elevated and runs in exclusive travel lanes along the entire alignment. This alternative is considered to have the lowest potential impacts to traffic under both criteria.

Cost Effectiveness

Cost effectiveness of the five transit service alternatives is evaluated based on the following two cost factors:

1. Capital cost per mile
2. Capital cost per rider

The capital cost per mile criterion is a relatively simple calculation that is based on the total route length of improvements. For Alternatives 2, 3, and 4, this is slightly different from the alignment length due to the presence of the one-way couplet in Downtown Santa Ana, which adds about 1.9 miles to the length of constructed improvements. The cost per mile estimates are based on the order of magnitude cost estimates presented in Section 4.

Cost per rider is obtained by dividing the annualized construction cost by the annualized ridership forecast for each alternative. Annualized construction costs are obtained by multiplying the total project construction cost by 0.08 to annualize the figure over the expected useful life of the improvements. Ridership is annualized by multiplying the weekday boarding figure by 300 to estimate an annual figure.

The evaluation uses the annualized ridership forecasts for each alternative summarized in Section 3 and the order of magnitude capital cost estimates identified in Section 4 to identify the cost per mile and cost per rider for each alternative. Table 5-8 summarizes the cost effectiveness data. Table 5-9 presents the rankings received by each alternative under the two cost criteria.

TABLE 5-8 – PE ROW TRANSIT SERVICE ALTERNATIVES COST EFFECTIVENESS DATA

Alternative	Total Capital Cost Estimate (millions)	Total Year 2030 Annual Ridership Forecast	Estimated Cost per Mile (millions)	Estimated Capital Cost per Rider
Grade Separated BRT	\$740	3,600,000	\$37	\$16
Elevated BRT	\$1,835	4,200,000	\$84	\$35
Elevated LRT	\$3,021	5,400,000	\$100	\$42
Hybrid LRT/BRT	\$1,485	1,950,000	\$58	\$62
High Speed Rail	\$4,100 to \$6,800	2,670,000	\$120 to \$200	\$115 to \$191

TABLE 5-9 – COST EFFECTIVENESS EVALUATION MATRIX

Evaluation Criteria	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Cost Effectiveness					
Capital Cost per Mile	4	3	2	4	1
Capital Cost per Rider	5	5	4	4	1
<i>Overall Cost Effectiveness Rating</i>	<i>9</i>	<i>8</i>	<i>6</i>	<i>8</i>	<i>2</i>

Comparison of Alternatives

The rankings assigned to each alternative using the criteria outlined in this initial assessment have been totaled to obtain an overall score for each of the five alternatives. The overall score summarizes the performance of each alternative under this initial assessment and evaluation. The scores can be used to identify alternatives the merit further consideration in a future more detailed study and those alternatives that may require some refinement in order to be considered for future evaluation and study. Table 5-10 summarizes the results of the evaluation of the five PE ROW transit service alternatives.

TABLE 5-10 – OVERALL EVALUATION CRITERIA MATRIX

Evaluation Criteria	Alternative 1 Grade Separated Rapid Transit	Alternative 2 Elevated Bus Rapid Transit	Alternative 3 Elevated Light Rail Transit	Alternative 4 Elevated Hybrid BRT/ LRT	Alternative 5 High-Speed Transit
Mobility Improvements	17	19	24	10	14
Connectivity	13	11	14	11	8
Visual Impacts	4	3	3	4	2
Traffic Impacts	7	7	7	6	10
Cost Effectiveness	9	8	6	8	2
AGGREGATE POINTS	50	48	54	39	36

Alternative 3 performed the best in this initial evaluation with Alternatives 1 and 2 ranked close behind. Each of these alternatives provides good connectivity to the existing regional transit system and is forecast to serve the highest number of riders. Alternative 1 further benefited from the lower capital cost associated with having portions of the alignment operate at-grade. The ridership forecasts developed using OCTAM show a strong link between population centers in West Orange County and Southeast Los Angeles County to employment centers in Central and West Orange County. Each of these three alternatives performs well at serving this travel market.

Alternative 4 did not perform as well due to the substantially lower ridership forecast compared to the other alternatives. The change in modes proposed for this alignment has a substantial impact on ridership, particularly across the OC/LA county line. This alternative does show a strong link between the Cypress College area and Central Santa Ana. Should the coordination of a transit serve across the OC/LA county line prove challenging, an initial operating segment located wholly within Orange County operating in the PE ROW between these two destinations does merit further study to determine an appropriate transit technology, station locations, and profile (at-grade vs. elevated) for this shorter alignment.

Alternative 5 scored the lowest in part due to the higher construction costs compared to the other alternatives and the lower ridership forecast. These two factors weighed down the benefits associated with a fully elevated alignment with regard to minimizing traffic impacts. Refinements could be made to this alternative in terms of additional stations and/or changes to terminus points, which could improve the ridership forecasts. However, these changes may impact the travel time benefits associated with higher speed operations. Additionally, the higher construction cost associated with this technology may limit the performance in terms of cost effectiveness in comparison to other transit technologies.

6 CONCLUSIONS

This assessment report is intended to be an initial analysis and evaluation of selected transit service alternatives for the West Santa Ana Branch of the PE ROW between Orange County and Los Angeles County. The report has described the five transit service alternatives considered in this assessment and summarizes the evaluation completed based on the operating characteristics of each alternative, preliminary ridership forecasts developed by OCTA, and the order of magnitude cost estimates included in this report. The key findings of this initial assessment are:

- The ridership forecasts and origin and destination forecasts developed using OCTAM suggest that there is demand for travel between Orange and Los Angeles counties in areas surrounding the PE ROW corridor.
- The transit service options attract significantly more trips from Los Angeles County to Orange County than in the reserve direction.
- Alternatives 1, 2, 3, and 4 perform well at serving travel demand from West Orange County and Southeast Los Angeles County to Central Santa Ana, the South Coast Metro area, and the Irvine Business Complex.
- Alternative 5 performs well at serving travel demand between Southeast Los Angeles County and Downtown Los Angeles.
- Alternative 5 is competitive with the Metrolink OC Line, diverting about 1,000 riders per day.
- Alternatives 2 and 3 are forecast to serve the greatest number of total riders and riders per mile, while Alternatives 4 and 5 have the lowest forecast ridership and riders per totals.
- Connections to the Metro Green Line and Metro Blue Line LRT are important. These connections extend the ridership catchment areas for Alternatives 1, 2, and 3. Alternative 3's direct connection to the Metro Blue Line assists in further extending the ridership catchment area into south central Los Angeles County.
- Alternative 1 (Grade Separated BRT) has the lowest cost and cost per rider due to at-grade alignment in portions of the PE ROW.
- Future studies would need to consider Renewed Measure M Project S (Go Local) recommendations for transit services using the PE ROW.

Based on the evaluation presented in this technical report, Alternatives 1, 2, and 3 appear to warrant further analysis as part of a future study. Alternative 4 does provide some travel benefits within Orange County and could be considered as an initial operating segment for an LRT service between Santa Ana and the Cypress College area if the institutional challenges associated with transit operations across the county line prove difficult to overcome in the near term. On a cost per mile and cost per rider basis, BRT services would likely benefit from at-grade operations within the PE ROW as much as feasible. An at-grade alignment significantly reduces the capital costs associated with implementing the service.

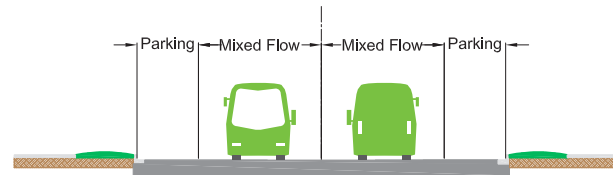
Alternative 5 would require refinement to be potentially competitive with the other alternatives. This alternative did not perform well in attracting trips from Orange County into Los Angeles

County. If a high speed transit alternative is studied in the future, alternative alignments or station locations may need to be considered.

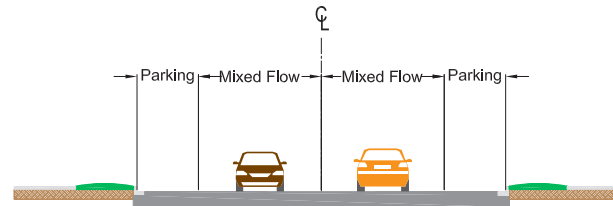
Additional transit service alternatives may also be considered by OCTA and Metro. These alternatives could include refinements to alignments, station locations, terminus points and transit technologies. It is recommended that at a minimum the Alternatives 1, 2, and 3 presented in this report be incorporated into any future analysis in some form based on their performance and potential for serving travel demand in and near the PE ROW corridor.

APPENDIX

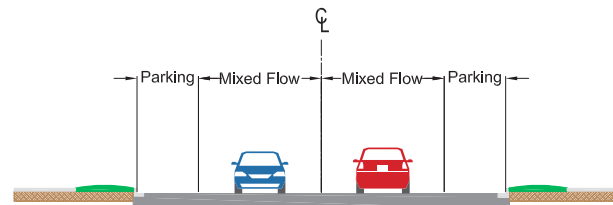
Alternative			1		2		3		4	
Mode			Grade Separated BRT		Elevated BRT		Elevated LRT		Hybrid LRT/BRT	
Alignment Terminus in LA County			Norwalk Green Line Station		Norwalk Green Line Station		Wilmington Blue/Green Line Station		LRT to Cypress College BRT to Norwalk Station	
Item	Units	Unit Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
ALIGNMENT BREAKDOWN										
Surface (median or mixed flow)	MI		2.8		0.0		0.0		8.0	
Existing freeway/HOV lanes	MI		3.2		3.2		0.0		4.2	
New exclusive lane at-grade	MI		0.0		4.7		4.7		4.7	
Surface (rail ROW) new construction	MI		13.5		0.0		0.0		0.0	
Elevated (guideway)	MI		0.5		14.0		19.1		8.8	
Shared w/existing rail ROW	MI		0.0		0.0		6.4		0.0	
Surface crossings (streets)	EA		18		0		0		0	
Elevated crossings (streets)	EA		28		46		55		27	
Elevated crossings (freeway/bridge)	EA		1		1		3		1	
Total Length	MI		20.0		21.9		30.2		25.7	
CIVIL SITE MODIFICATIONS										
Intersection mod - signal priority	EA	\$ 12,500	11	\$ 137,500	19	\$ 237,500	19	\$ 237,500	19	\$ 237,500
Intersection mod - modify signals	EA	\$ 110,000	0	\$ -	19	\$ 2,090,000	19	\$ 2,090,000	19	\$ 2,090,000
New at-grade crossing/intersection	EA	\$ 450,000	18	\$ 8,100,000	0	\$ -	0	\$ -	0	\$ -
New grade separated crossing (street)	EA	\$ 5,000,000	28	\$ 140,000,000	0	\$ -	0	\$ -	0	\$ -
New grade separated crossing (freeway)	EA	\$ 10,000,000	1	\$ 10,000,000	0	\$ -	0	\$ -	0	\$ -
Freeway direct connector ramps	EA	\$ 5,000,000	2	\$ 10,000,000	2	\$ 10,000,000	0	\$ -	0	\$ -
New street guideway at-grade	FT	\$ 1,800	59,080	\$ 106,344,000	0	\$ -	0	\$ -	0	\$ -
Total Civil Site Modifications			\$ 274,581,500		\$ 12,327,500		\$ 2,327,500		\$ 2,327,500	
GUIDEWAY AND TRACK										
Surface track embedded in street	FT	\$ 1,600	0	\$ -	0	\$ -	24,816	\$ 39,705,600	24,816	\$ 39,705,600
Dual track aerial	FT	\$ 800	0	\$ -	0	\$ -	100,848	\$ 80,678,400	46,464	\$ 37,171,200
Elevated guideway structure (long span	FT	\$ 13,600	2,640	\$ 35,904,000	73,920	\$ 1,005,312,000	100,848	\$ 1,371,532,800	46,464	\$ 631,910,400
Total Guideway and Track			\$ 35,904,000		\$ 1,005,312,000		\$ 1,491,916,800		\$ 708,787,200	
STATIONS										
Surface stations	EA	\$ 2,150,000	8	\$ 17,200,000	5	\$ 10,750,000	4	\$ 8,600,000	12	\$ 25,800,000
Aerial stations	EA	\$ 5,500,000	13	\$ 71,500,000	10	\$ 55,000,000	14	\$ 77,000,000	5	\$ 27,500,000
Parking structure	SPACE	\$ 20,000	2,250	\$ 45,000,000	2,250	\$ 45,000,000	3,000	\$ 60,000,000	1,750	\$ 35,000,000
Total Stations			\$ 133,700,000		\$ 110,750,000		\$ 145,600,000		\$ 88,300,000	
SYSTEMS										
Substations	EA	\$ 2,000,000	0	\$ -	0	\$ -	24	\$ 48,000,000	14	\$ 28,000,000
Overhead catenary w/ foundations	FT	\$ 400	0	\$ -	0	\$ -	125,664	\$ 50,265,600	71,280	\$ 28,512,000
Communications/signals	FT	\$ 400		\$ -		\$ -	125,664	\$ 50,265,600	71,280	\$ 28,512,000
Lighting	FT	\$ 100	73,920	\$ 7,392,000	115,632	\$ 11,563,200	125,664	\$ 12,566,400	71,280	\$ 7,128,000
Total Systems			\$ 7,392,000		\$ 11,563,200		\$ 161,097,600		\$ 92,152,000	
FACILITIES										
Maintenance/storage	LS		1	\$ 4,000,000	1	\$ 4,000,000	1	\$ 12,000,000	1	\$ 6,000,000
Operations control	EA	\$ 4,250,000	1	\$ 4,250,000	1	\$ 4,250,000	1	\$ 4,250,000	1	\$ 4,250,000
Total Facilities			\$ 8,250,000		\$ 8,250,000		\$ 16,250,000		\$ 10,250,000	
A. CONSTRUCTION SUBTOTAL			\$ 459,827,500		\$ 1,148,202,700		\$ 1,817,191,900		\$ 901,816,700	
B. ENVIRONMENTAL MITIGATION			% of A	2%	\$ 9,196,550	\$ 22,964,054	\$ 36,343,838	\$ 18,036,334		
C. DESIGN & CONSTRUCTION COST CONTINGENCY			% of (A+B)	25%	\$ 117,256,013	\$ 292,791,689	\$ 463,383,935	\$ 229,963,259		
D. VEHICLES										
Transit buses	EA	\$ 650,000	10	\$ 6,500,000	10	\$ 6,500,000	0	\$ -	5	\$ 3,250,000
Light rail vehicles	EA	\$ 3,000,000	0	\$ -	0	\$ -	34	\$ 102,000,000	12	\$ 36,000,000
Spare parts	%	10%		\$ 650,000		\$ 650,000		\$ 10,200,000		\$ 3,925,000
Total Vehicles			\$ 7,150,000		\$ 7,150,000		\$ 112,200,000		\$ 43,175,000	
E. VEHICLE COST CONTINGENCY			% of D	10%	\$ 715,000	\$ 715,000	\$ 11,220,000	\$ 4,317,500		
F. PROGRAM IMPLEMENTATION (Agency Costs and Fees)										
Design and construction	% of (A+I	31%		\$ 145,397,456		\$ 363,061,694		\$ 574,596,079		\$ 285,154,441
Vehicle procurement	% of D	5%		\$ 357,500		\$ 357,500		\$ 5,610,000		\$ 2,158,750
Total Program Implementation			\$ 145,754,956		\$ 363,419,194		\$ 580,206,079		\$ 287,313,191	
G. TOTAL CAPITAL COST (A+B+C+D+E+F)			\$ 739,900,000		\$ 1,835,240,000		\$ 3,020,550,000		\$ 1,484,620,000	
Cost per mile			\$ 37,000,000		\$ 83,800,000		\$ 100,000,000		\$ 57,800,000	



PROPOSED YEAR 2030 CONDITION






BASELINE YEAR 2030 CONDITION



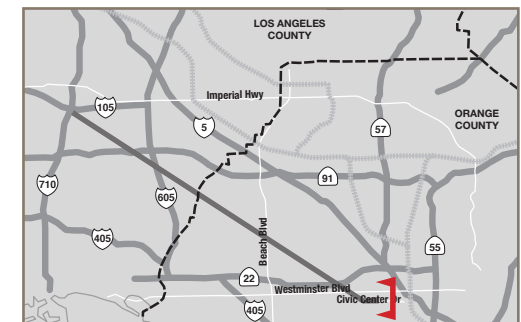
EXISTING YEAR 2008 CONDITION

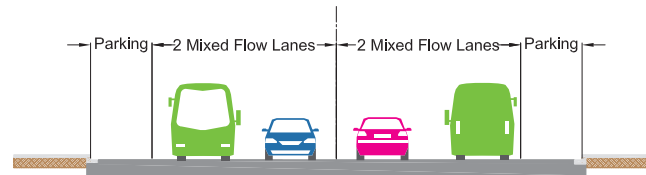
Legend

-  Proposed Year 2030 improvements in addition to any Baseline improvements
-  Baseline Year 2030 transportation projects that have a committed funding source
-  Existing Year 2008 condition

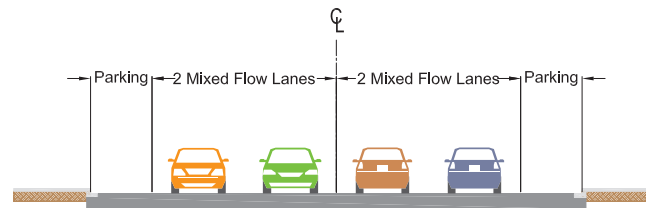
Notes:

There are no scheduled Baseline improvements along this route. The existing median in this segment is a striped two-way left-turn lane (TWLTL). The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.

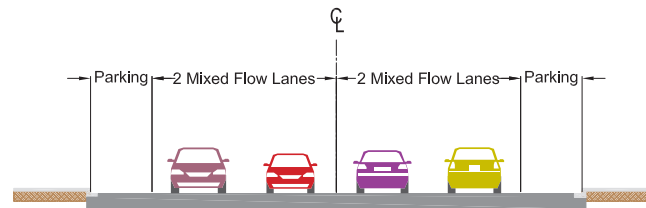




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



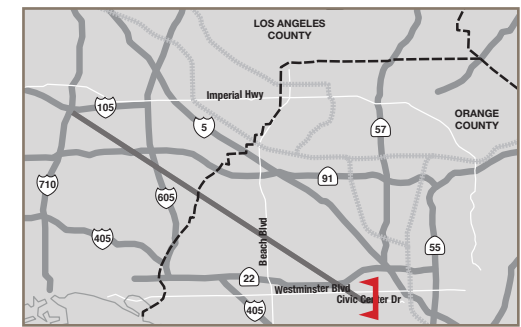
EXISTING YEAR 2008 CONDITION

Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

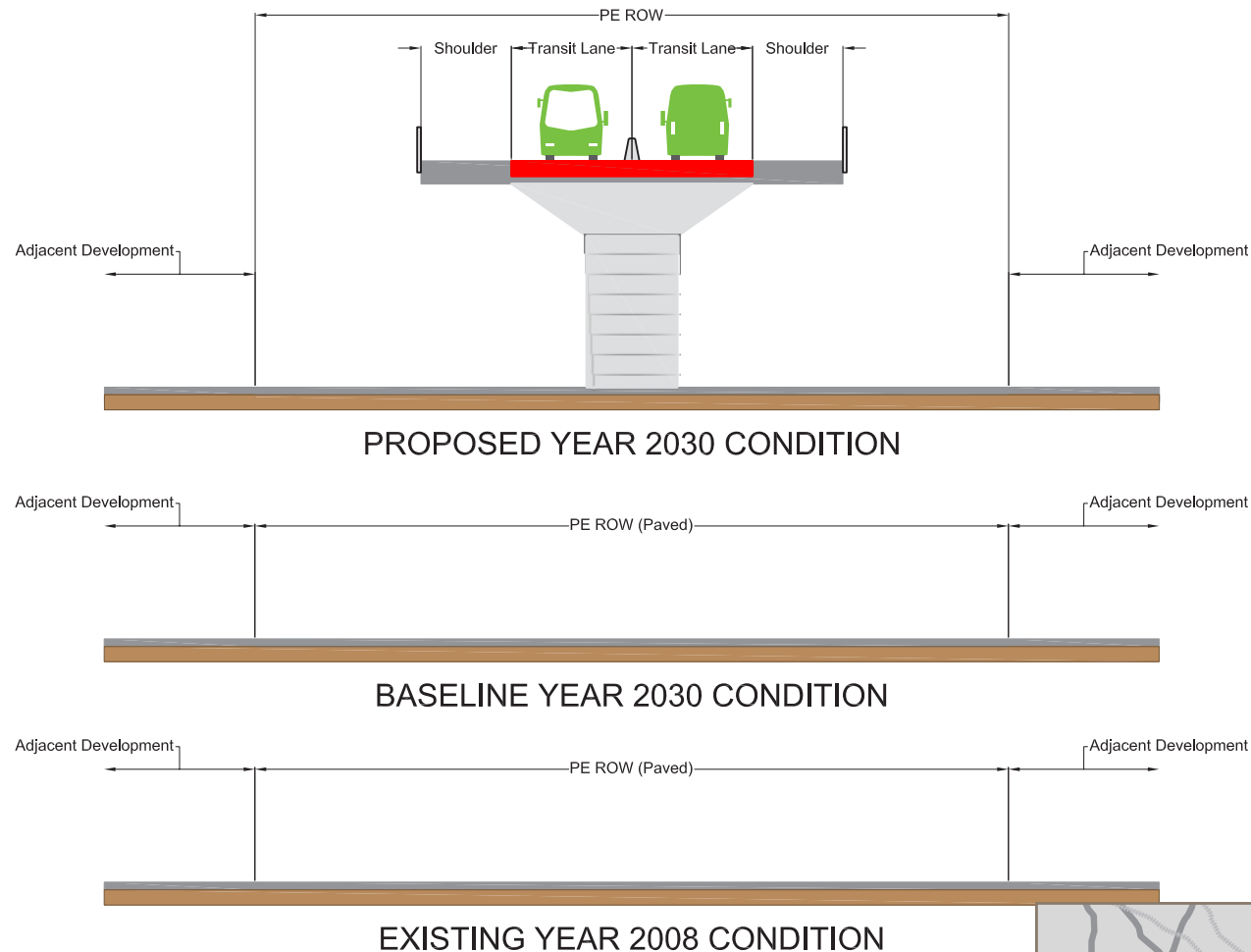
Notes:

There are no scheduled Baseline improvements along this route. The existing median in this segment is a striped two-way left-turn lane (TWLTL). The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.



Pacific Electric ROW Alternative 1 - Grade Separated BRT

Location: Pacific Electric ROW - paved segment through the Costco and Home Depot parking lots in Garden Grove



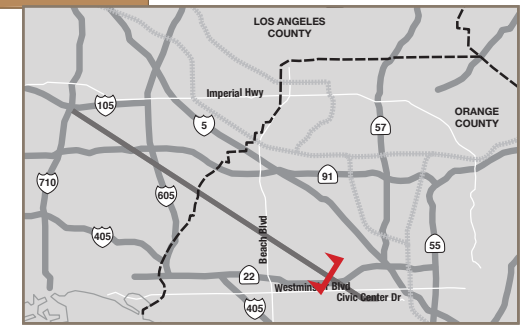
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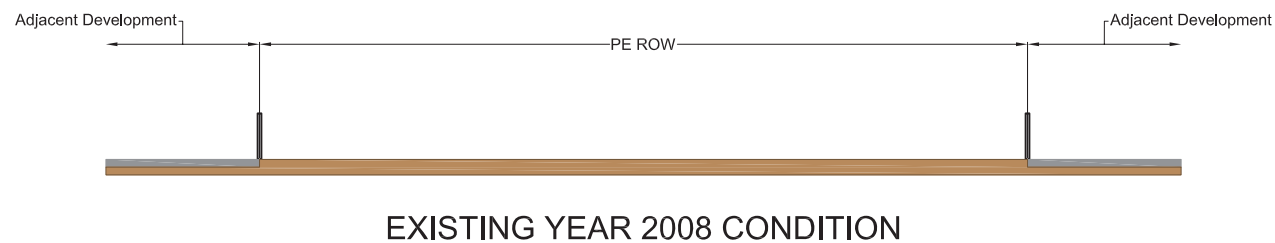
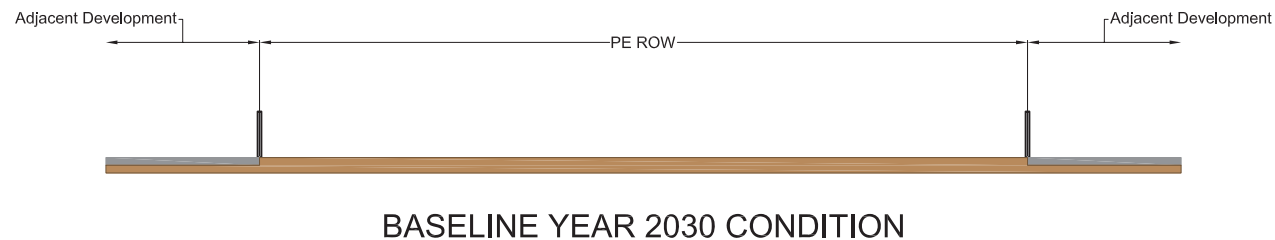
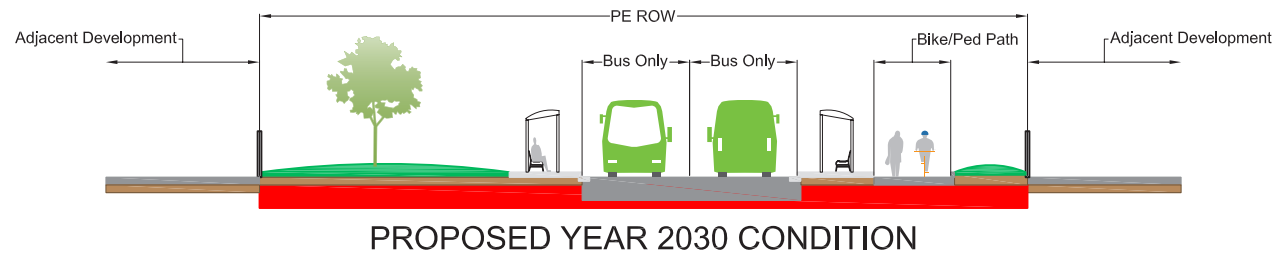
- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

There are no scheduled Baseline improvements along this route.

The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.





Legend

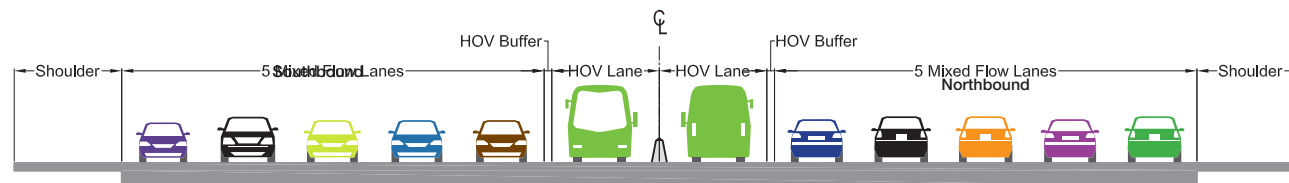
- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

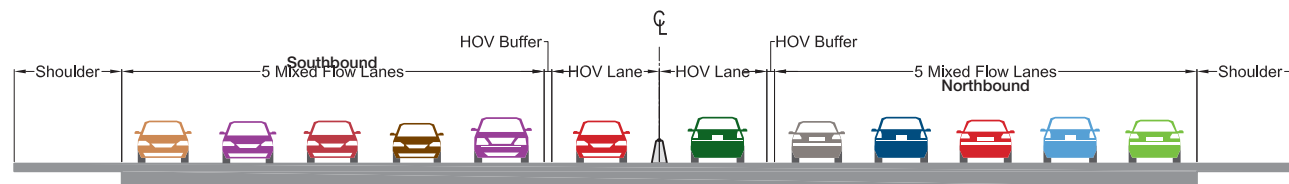
There are no scheduled Baseline improvements along this route.

The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.

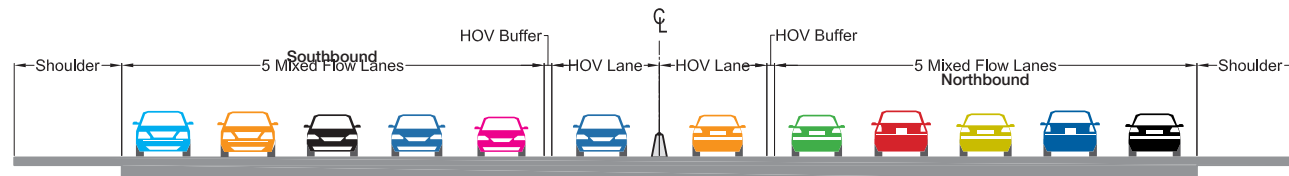




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



EXISTING YEAR 2008 CONDITION

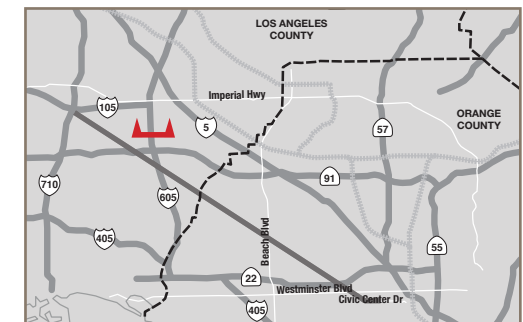
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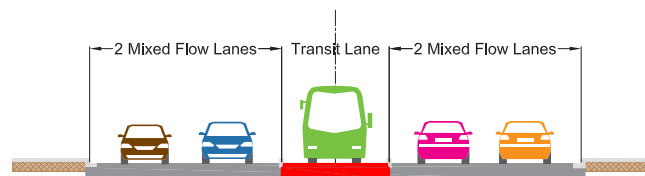
- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

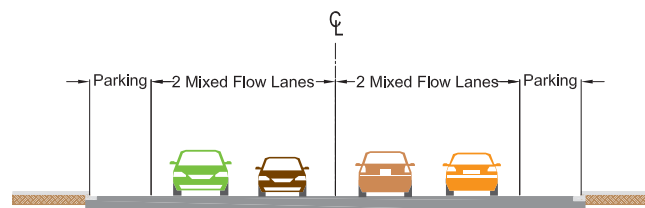
There are no scheduled Baseline improvements along this route.

The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.

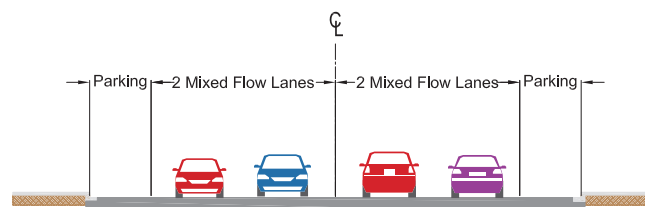




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



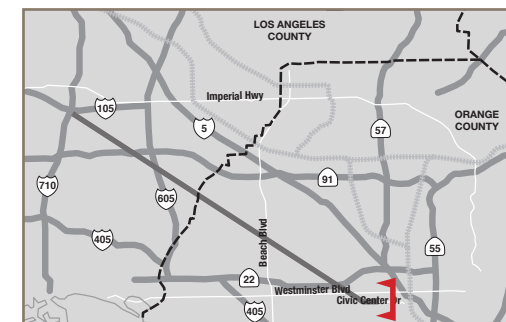
EXISTING YEAR 2008 CONDITION

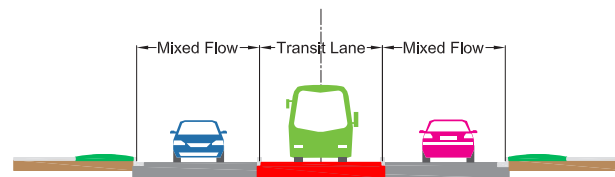
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

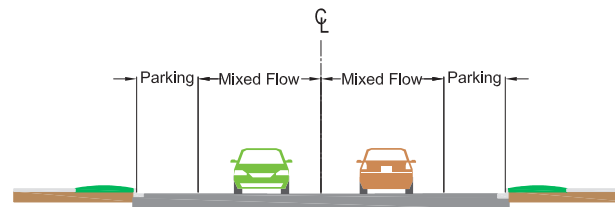
Notes:

There are no scheduled Baseline improvements along this route. The existing median in this segment is a striped two-way left-turn lane (TWLTL). The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.

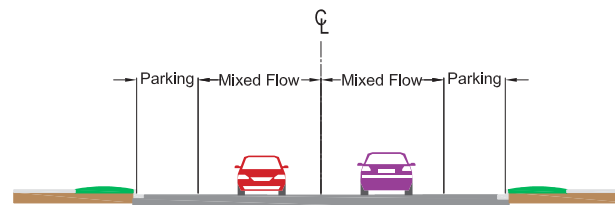




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



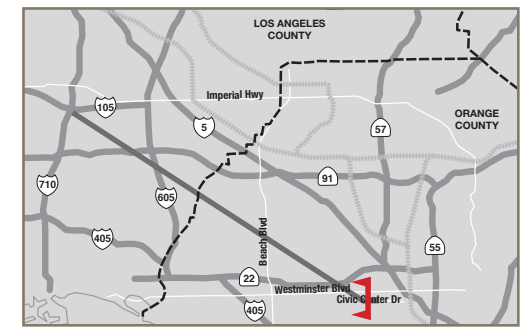
EXISTING YEAR 2008 CONDITION

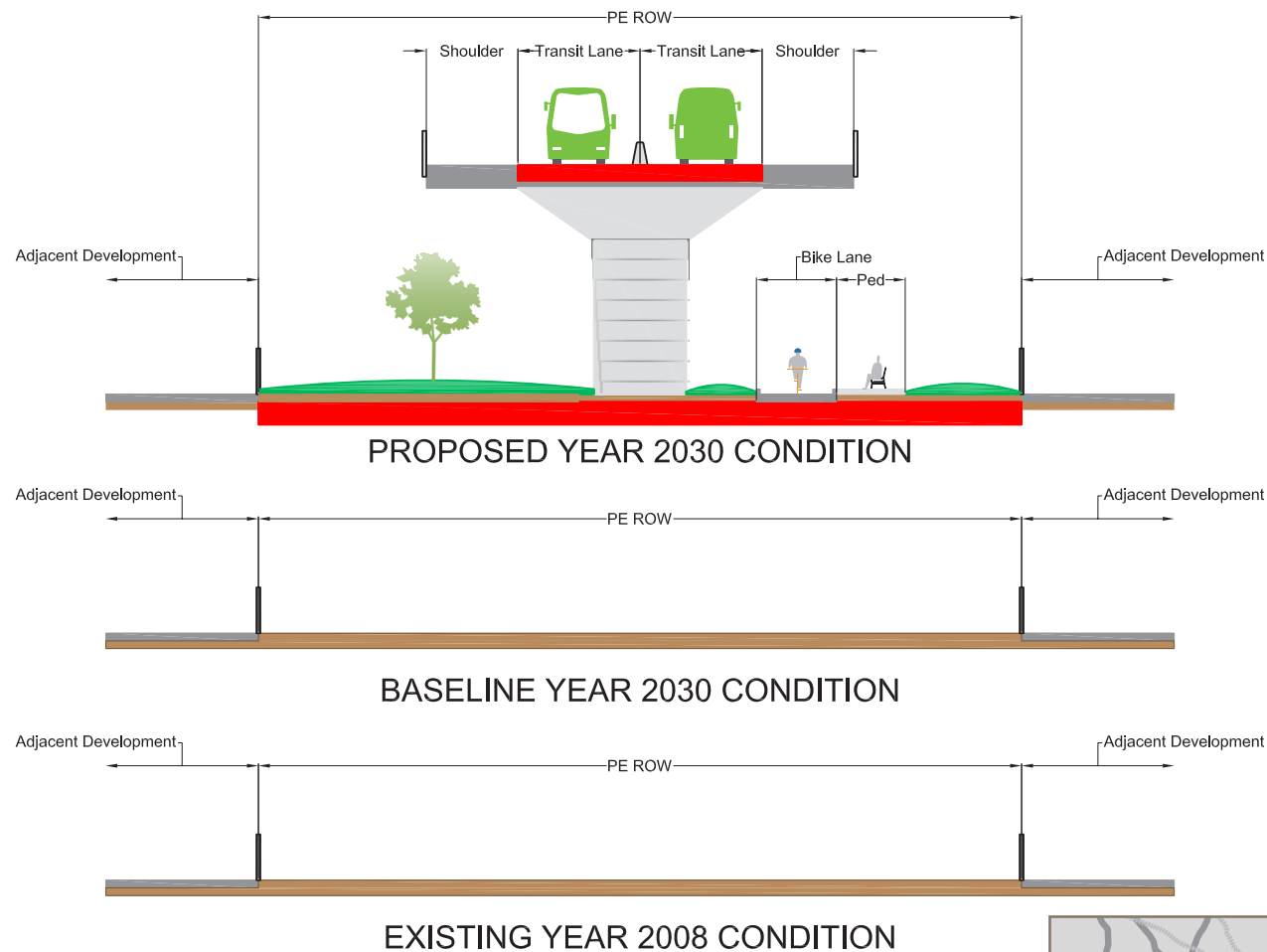
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

There are no scheduled Baseline improvements along this route. The existing median in this segment is a striped two-way left-turn lane (TWLTL). The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.





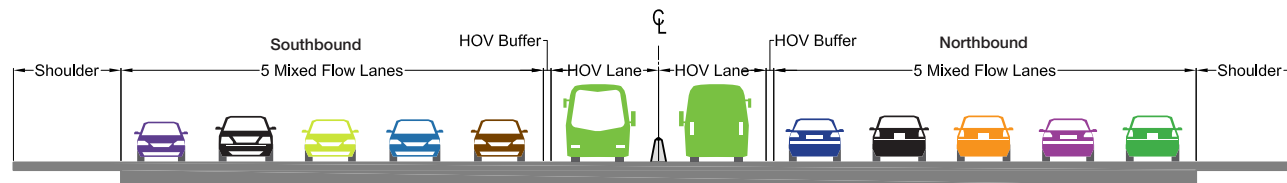
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

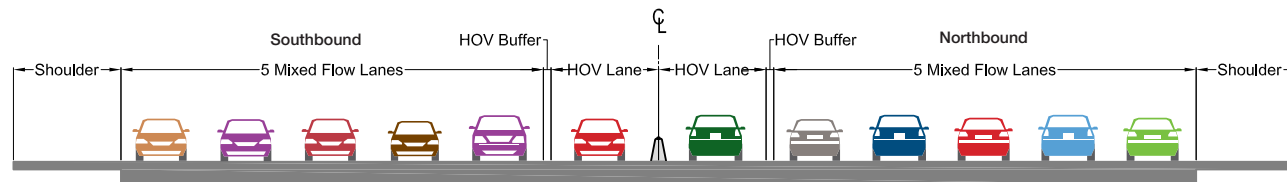
Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.

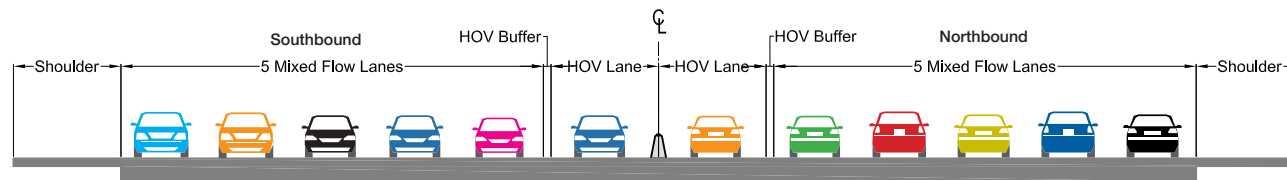




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



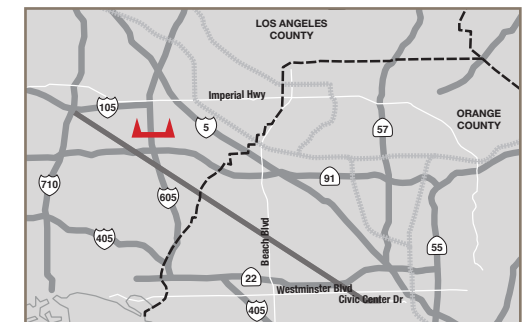
EXISTING YEAR 2008 CONDITION

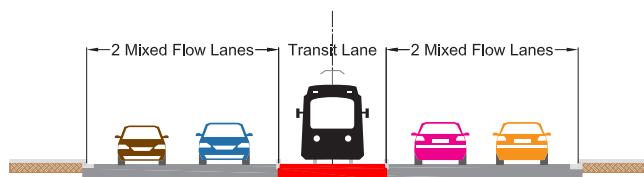
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

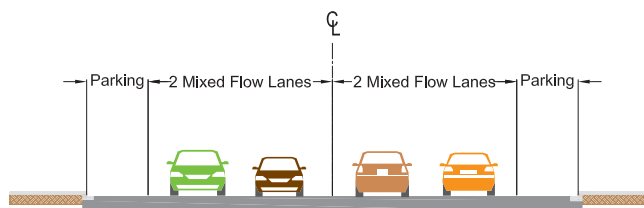
Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes Bus Rapid Transit service operating in mixed flow lanes on Civic Center Drive from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way to I-605 with grade separated crossings at 29 locations. The BRT service would then take an I-605 HOV lane direct access ramp and travel on I-605 to the Norwalk Green Line Station.

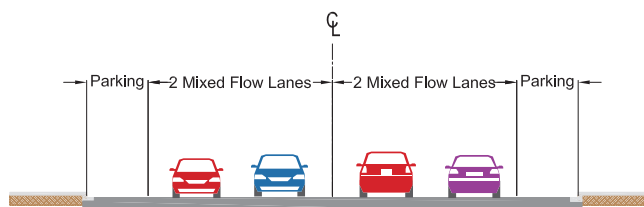




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



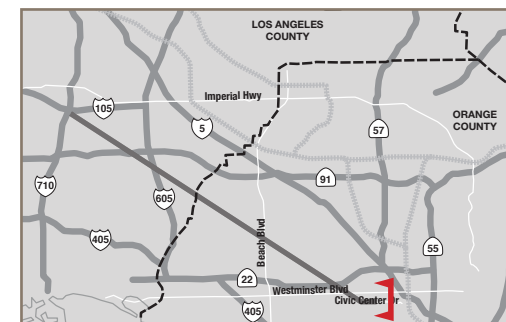
EXISTING YEAR 2008 CONDITION

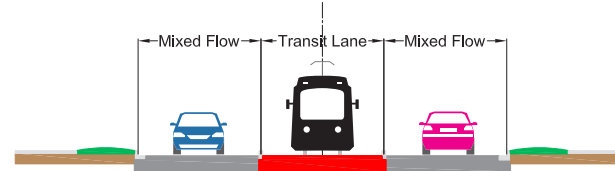
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

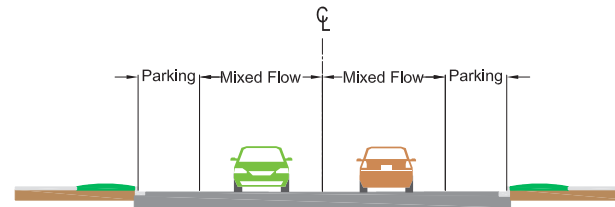
Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes Light Rail Transit service operating in exclusive transit lanes on Civic Center Drive and Santa Ana Boulevard from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way on an elevated guideway to I-105. The LRT service would then share the Green Line rail corridor to the Wilmington Avenue station.

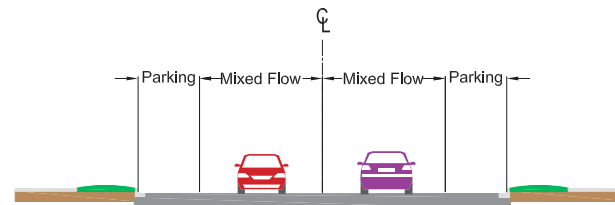




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



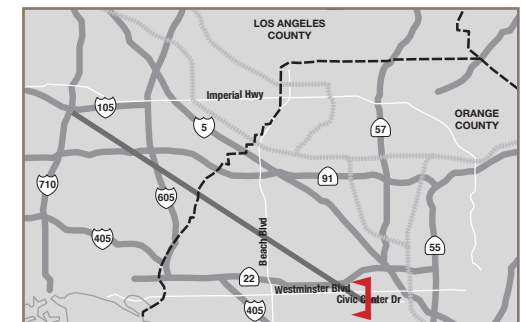
EXISTING YEAR 2008 CONDITION

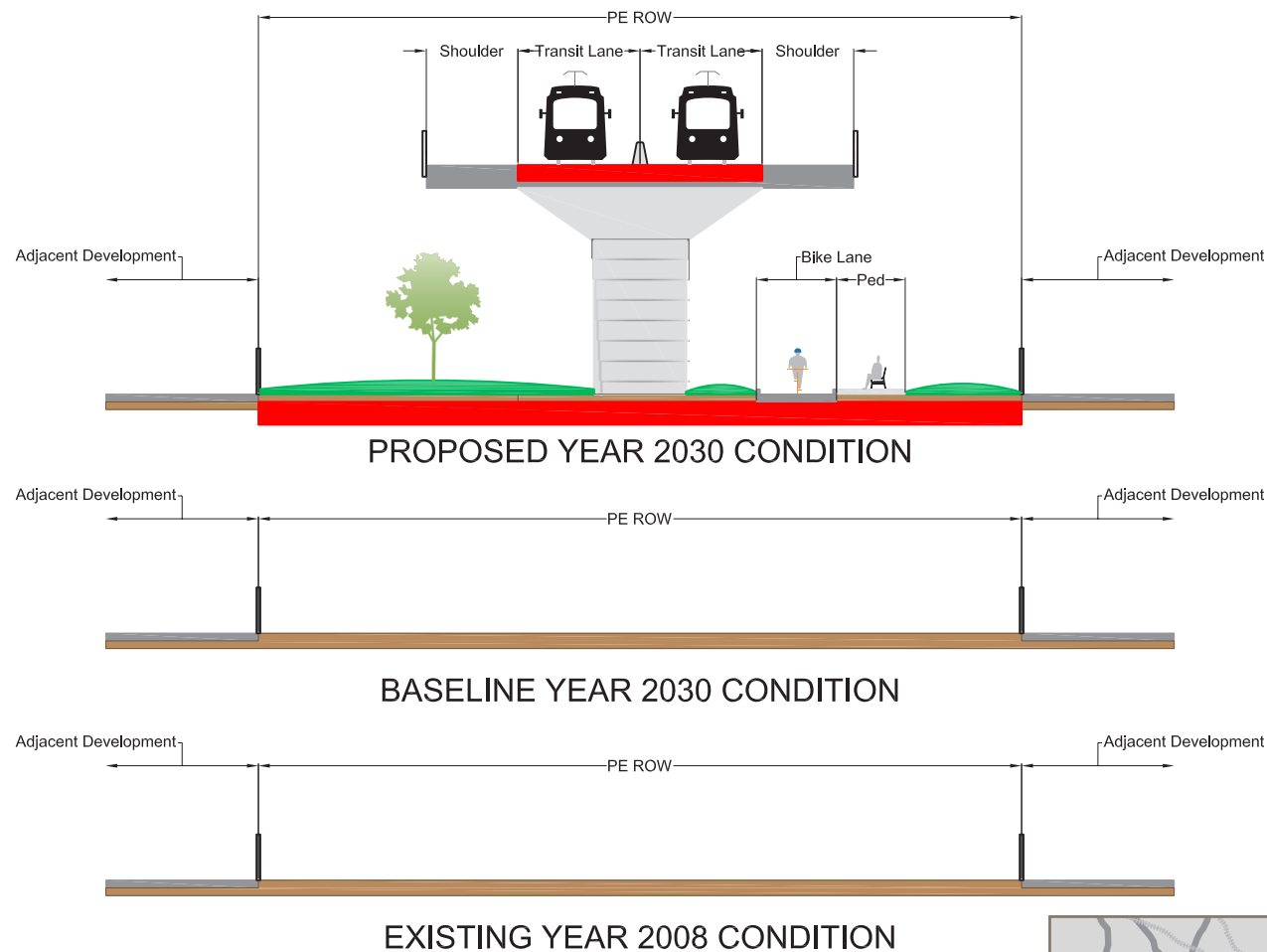
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes Light Rail Transit service operating in exclusive transit lanes on Civic Center Drive and Santa Ana Boulevard from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way on an elevated guideway to I-105. The LRT service would then share the Green Line rail corridor to the Wilmington Avenue station.



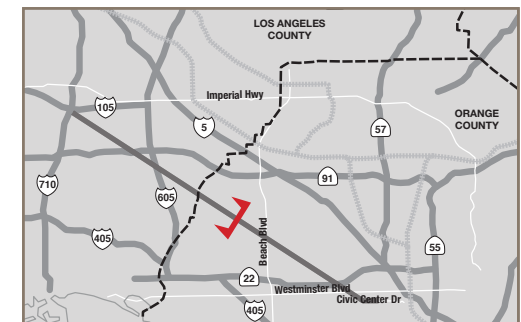


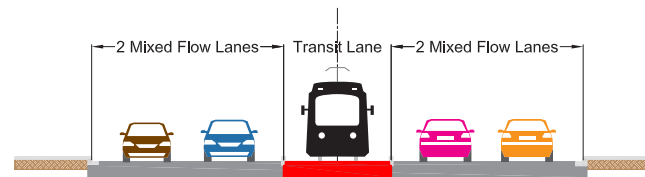
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

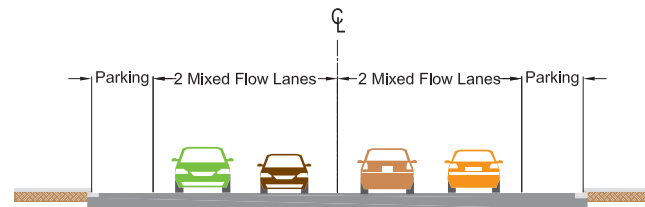
Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes Light Rail Transit service operating in exclusive transit lanes on Civic Center Drive and Santa Ana Boulevard from SARTC to Fairview Street, and then traveling along the Pacific Electric right-of-way on an elevated guideway to I-105. The LRT service would then share the Green Line rail corridor to the Wilmington Avenue station.

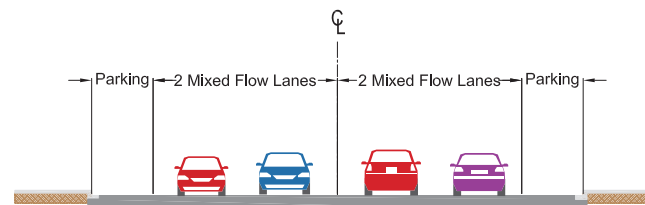




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



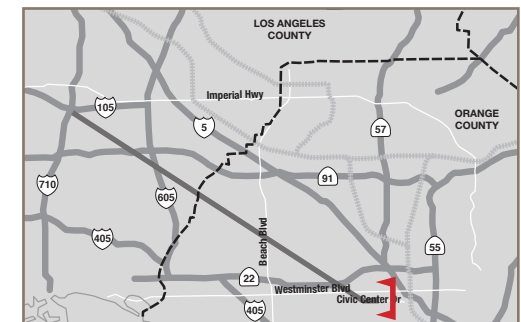
EXISTING YEAR 2008 CONDITION

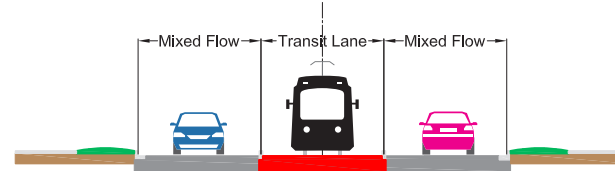
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

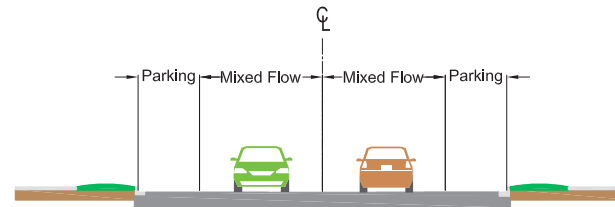
Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes LRT service operating at-grade in exclusive lanes between the SARTC and the PE ROW along Civic Center Drive and Santa Ana Boulevard. The LRT would then travel within the PE ROW on an elevated dual-track to Valley View Street. BRT service would operate in mixed flow lanes on Valley View Street from the PE ROW to Orangethorpe Avenue, then on Orangethorpe Avenue from Valley View Street to I-605. The BRT service would then travel on I-605 to the Norwalk Metro Green Line Station.

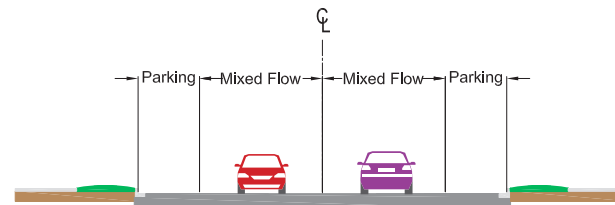




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



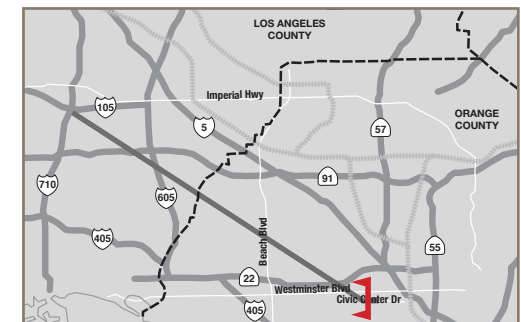
EXISTING YEAR 2008 CONDITION

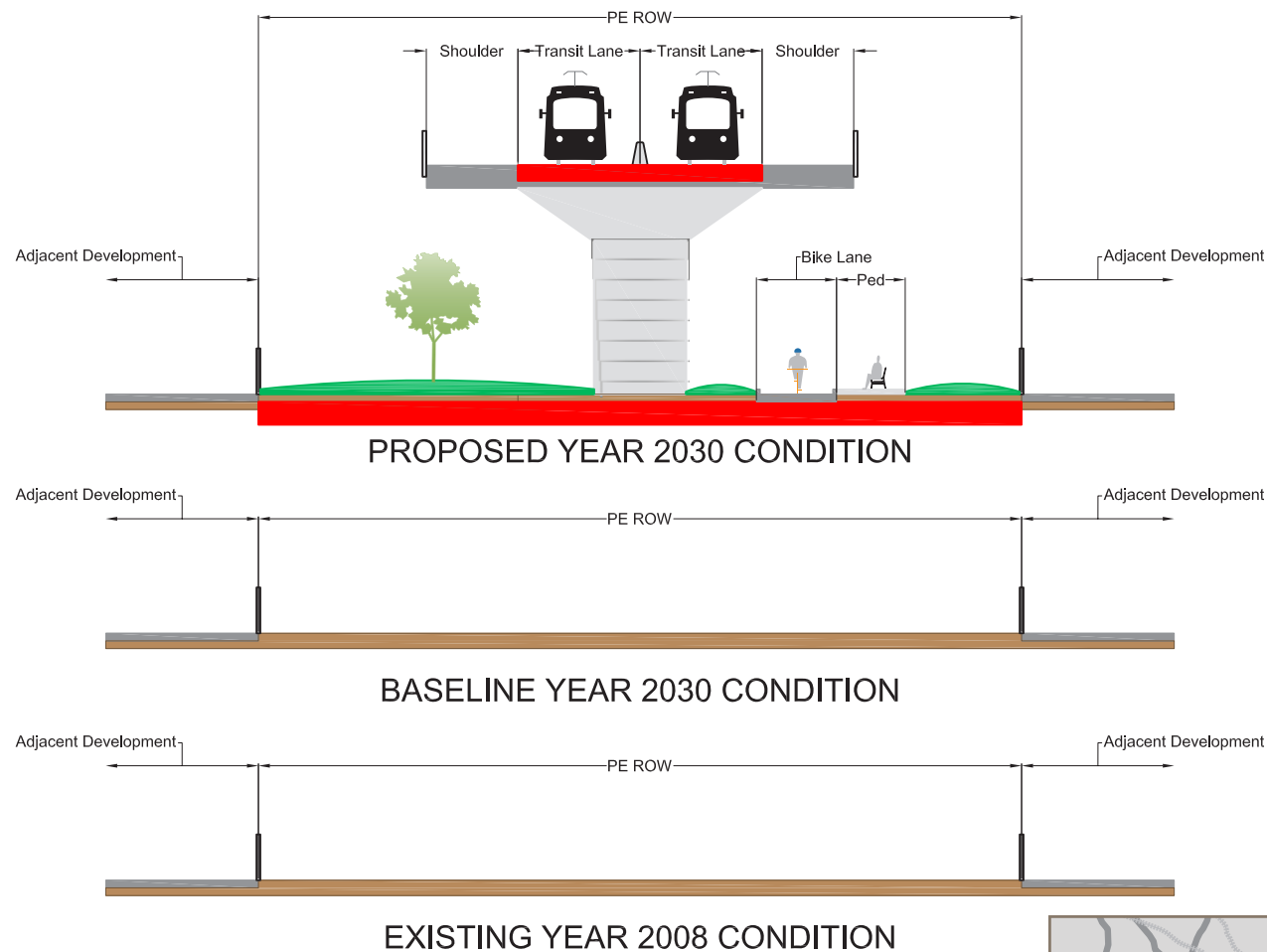
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes LRT service operating at-grade in exclusive lanes between the SARTC and the PE ROW along Civic Center Drive and Santa Ana Boulevard. The LRT would then travel within the PE ROW on an elevated dual-track to Valley View Street. BRT service would operate in mixed flow lanes on Valley View Street from the PE ROW to Orangethorpe Avenue, then on Orangethorpe Avenue from Valley View Street to I-605. The BRT service would then travel on I-605 to the Norwalk Metro Green Line Station.





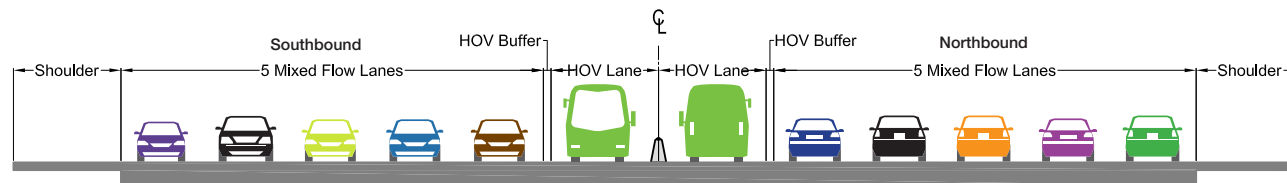
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

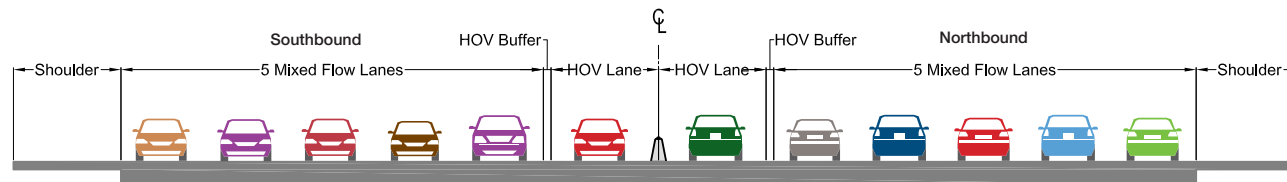
Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes LRT service operating at-grade in exclusive lanes between the SARTC and the PE ROW along Civic Center Drive and Santa Ana Boulevard. The LRT would then travel within the PE ROW on an elevated dual-track to Valley View Street. BRT service would operate in mixed flow lanes on Valley View Street from the PE ROW to Orangethorpe Avenue, then on Orangethorpe Avenue from Valley View Street to I-605. The BRT service would then travel on I-605 to the Norwalk Metro Green Line Station.

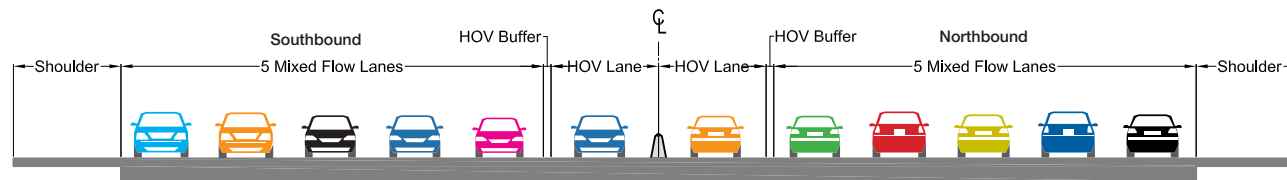




PROPOSED YEAR 2030 CONDITION



BASELINE YEAR 2030 CONDITION



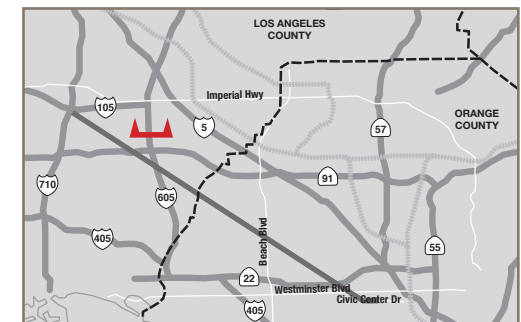
EXISTING YEAR 2008 CONDITION

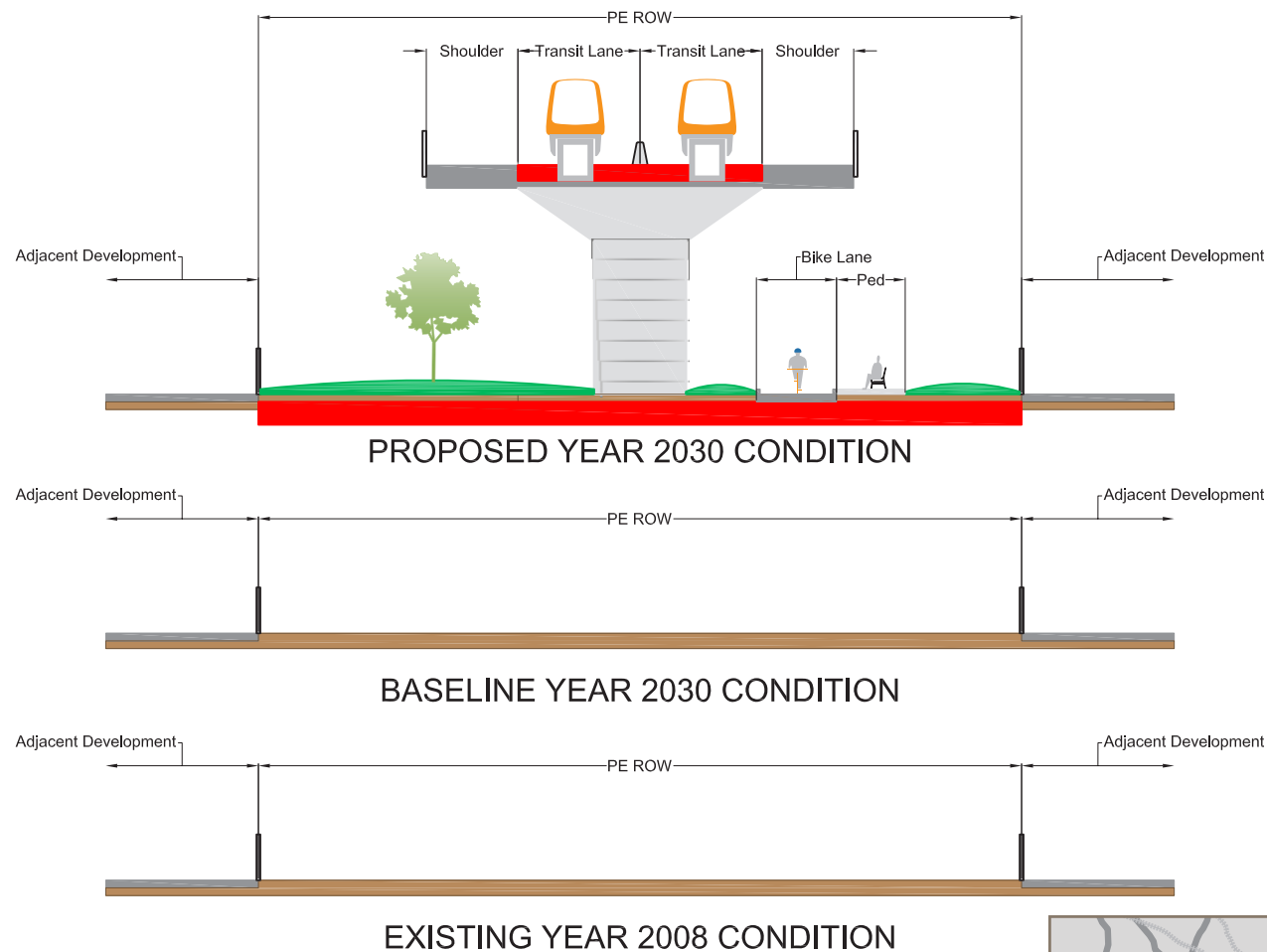
Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes LRT service operating at-grade in exclusive lanes between the SARTC and the PE ROW along Civic Center Drive and Santa Ana Boulevard. The LRT would then travel within the PE ROW on an elevated dual-track to Valley View Street. BRT service would operate in mixed flow lanes on Valley View Street from the PE ROW to Orangethorpe Avenue, then on Orangethorpe Avenue from Valley View Street to I-605. The BRT service would then travel on I-605 to the Norwalk Metro Green Line Station.





Legend

- Proposed Year 2030 improvements in addition to any Baseline improvements
- Baseline Year 2030 transportation projects that have a committed funding source
- Existing Year 2008 condition

Notes:

There are no scheduled Baseline improvements along this route. The Proposed condition includes a technology neutral high-speed transit service that would operate between the SARTC and the Union Station in Downtown Los Angeles on an elevated alignment along I-5, SR-22, the PE ROW, and the UP San Pedro Rail Subdivision and Los Angeles rail lines.

