Pershing Bikeway – North Park to Downtown

TRAFFIC AND SAFETY IMPACT ASSESSMENT

November 2016

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Executive Summary

This Traffic and Safety Impact Assessment analyzes the vehicular traffic impacts and bicycle and pedestrian safety impacts of the Pershing Drive Bikeway Project ("proposed project"). The assessment concludes that the proposed project would not result in any significant vehicular traffic impacts, as defined by the City of San Diego Significance Thresholds for Traffic Impacts. The proposed project also would not have any negative bicycle or pedestrian safety impacts. Preparation of this assessment is required before the San Diego Association of Governments (SANDAG), the project's lead agency, can make a determination that the proposed project is exempt from the California Environmental Quality Act (CEQA) under Public Resources Code Section 21080.20.5.

The proposed project would make it easier and safer for people of all ages and abilities to travel on bikes between San Diego's North Park neighborhood and Downtown San Diego. It also improves safety for people who walk and drive in the project area. The proposed project would include design elements and traffic safety measures that enhance the experience for people biking and walking, make streets safer for all users – including those who drive – and benefit people who live, recreate, work, and do business in the neighborhoods served by the proposed project. A description of the proposed project from south to north is provided below.

17th Street between C and B Streets

In this segment, the proposed project would install a buffered bike lane along one block of 17th Street from B Street to C Street. The bike lane would be located in existing parallel parking spaces on the west side of this southbound, one-way street. On the east side of the street, the existing parallel parking spaces would be replaced with angled parking spaces.

19th Street between C Street and Broadway

In this segment, the proposed project would replace the existing parallel parking on the west side of the block with angled parking. Parallel parking on the east side of the street will be maintained.

19th Street between B and C Streets

In this segment, the proposed project would install a two-way separated bikeway. The separated bikeway would be located in existing parallel parking spaces on the west side of this northbound, one-way street. Those parallel spaces would then be relocated between the bikeway and the travel lanes. The roadway segment would be reconfigured to one through lane, with a dedicated left turn lane and one shared through lane/right turn lane provided at the intersection. The project would modify the existing traffic signal at the intersection of 19th Street and B Street to provide an exclusive phase for people walking and biking. This includes the installation of a diagonal bicycle crossing, connecting the two-way separated bikeway on the west side of 19th Street to the two-way separated bikeway on the east side of Pershing Drive.

Pershing Drive between B Street and Florida Drive/26th Street

In this segment, the proposed project would install a two-way separated bikeway and a paved sidewalk along the east side of northbound Pershing Drive from B Street to Florida Drive/26th Street. Along southbound Pershing Drive, the proposed project would replace the existing Class II bike lanes with a buffered bike lane. The travel lanes would be designed at a minimum width of 10 feet.

As northbound Pershing Drive approaches the intersection with Florida Drive/26th Street, the bikeway and sidewalk would shift east, outside of the existing paved roadway, so that people on bikes are more visible to drivers at the intersection. The project also proposes a new northbound, dedicated right-turn vehicle lane from Pershing Drive to 26th Street to improve the movement of motor vehicles through this intersection and to provide a protected crossing of 26th Street for people walking and biking.

The existing traffic signal at the intersection of Pershing Drive and Florida Drive/26th Street would be modified to include an exclusive phase for people walking and people biking. High-visibility crosswalks are also proposed for all four legs of this intersection.

Pershing Drive between Florida Drive/26th Street and Redwood Street

In this segment, the proposed project would install a two-way separated bikeway, a paved sidewalk, and an unpaved footpath along the east side of Pershing Drive from Florida Drive/26th Street to Redwood Street. A raised median, which could include trees and landscaping, would separate the proposed bikeway from the travel lanes. Along the west side of Pershing Drive, a buffered bike lane would be installed. To accommodate the proposed project, this segment of Pershing Drive would change from four travel lanes to two travel lanes. This segment also would include new pedestrian crossings (e.g., marked crosswalks, RRFBs median refuge islands) across Pershing Drive.

Pershing Drive between Redwood Street and Upas Street

In this segment, the proposed project would install a two-way separated bikeway, a paved sidewalk, and an unpaved footpath along the east side of Pershing Drive from Redwood Street to Upas Street. A raised median, which could include trees and landscaping, would separate the proposed bikeway from the travel lanes. Along the west side of Pershing Drive, a bike lane would be installed. Where space allows, the bike lane would include a painted buffer.

Where Redwood Street intersects with Pershing Drive, an urban compact roundabout is proposed to replace the existing minor street stop controlled intersection. The segment of Pershing Drive from Redwood Street to Upas Street would remain two travel lanes. In addition, a neighborhood traffic circle with all-way yield control is proposed at the intersection of Redwood Street and 28th Street to replace the existing four-way stop controlled intersection.

Where Jacaranda Place intersects with Pershing Drive, a new pedestrian crossing (e.g., high-visibility crosswalk with RRFB) would be provided across Pershing Drive connecting to Morley Field. Jacaranda Place would be realigned to meet Pershing Drive at a right angle to create a "T intersection."

At the intersection of Pershing Drive and Upas Street, curb extensions would be installed to shorten pedestrian crossing distances, provide protected crossing for people on bikes, and by squaring up the intersection angles, reduce the existing uncertainty about which driver has the right-of-way at this intersection.

Upas Street between Pershing Drive and Utah Street

In this segment, the proposed project would install a two-way separated bikeway on the south side of a single block of Upas Street from Pershing Drive to Utah Street. In order to accommodate the proposed improvements, the proposed project would remove the existing dedicated eastbound left-turn lane on Upas Street to Utah Street. Motor vehicles would still be able to turn left onto Utah Street from Upas Street from a shared through lane/turn lane. In addition, the intersection of Upas Street and Utah Street would be improved with a raised median and new pedestrian crossings (e.g., new crosswalks, RRFB) to facilitate the movement of people walking and biking through this intersection.

Utah Street between Upas Street and Landis Street

In this segment, the proposed project would install painted buffers along the existing Class II bikes lanes to create buffered bike lanes along both sides of Utah Street from Upas Street to Landis Street. The new painted buffers would be installed on both sides of the bike lanes to separate them from the travel lanes and parking lanes. The buffered bike lanes would continue to be located between the on-street parking lane and the travel lane.

Bicycle and Pedestrian Safety

The proposed project would not result in any adverse safety impacts for people walking and biking. In fact, the proposed project would have potential safety benefits for people that walk and bike – and also drive – in the project area. The proposed project would decrease the level of traffic stress for people walking and biking along and across roadways in the project area by installing separated bikeways and buffered bike lanes, sidewalks and footpaths, and other measures to calm and control motor vehicle traffic. Therefore, the proposed project would not result in any adverse bicycle and pedestrian safety impacts, and therefore no bicycle and pedestrian safety mitigation measures are needed.

Vehicular Traffic Impacts

The project area for assessing vehicular traffic conditions under implementation of the proposed project includes roadway segments and intersections directly affected by the proposed project. The analysis shows that all intersections and roadway segments in the project area would meet City of San Diego criteria for acceptable vehicular traffic conditions with implementation of the proposed project. The proposed project does not result in any vehicular traffic impacts as defined by the City of San Diego Significance Thresholds for Traffic Impacts. As a result, there is no need for the proposed project to implement any mitigation measures for traffic impacts.

Vehicular traffic conditions are described using the "level of service" (LOS) methodology, which categorizes traffic conditions for intersections and roadway segments from LOS A to LOS F. Free-flowing traffic conditions are represented by LOS A, whereas LOS F represents the highest level of traffic congestion. Because the project area is located within the City of San Diego, this assessment uses the City of San Diego's adopted criteria for evaluating vehicular traffic conditions at intersections and on roadway segments.

This study evaluates two time periods: 2015 and 2020. For each year, the study looks at traffic conditions "with the project" and "without the project" to assess the proposed project's vehicular traffic impacts on roadway segments and intersections. The roadway segment analysis addresses how the proposed project would affect all-day traffic conditions; the intersection analysis addresses vehicle traffic conditions during peak traffic periods: 7:00 a.m. to 9:00 a.m. (the morning peak period) and 4:00 p.m. to 6:00 p.m. (the evening peak period).

1.0 Project Description

This chapter discusses the objectives of the proposed project, its safety features, and potential safety benefits and describes the proposed project's design features and related physical improvements.

1.1 Project Objectives

The proposed project is part of the San Diego Association of Governments (SANDAG) *Regional Bike Plan Early Action Program* (Bike EAP), a 10-year effort to expand the regional bike network and complete high-priority bikeway[1] projects approved in *Riding to 2050: The San Diego Regional Bike Plan* (Regional Bike Plan) (SANDAG 2010). The Regional Bike Plan and Bike EAP are part of larger goals for the region to increase transportation choices and to make riding a bike a viable, attractive transportation choice. In addition to closing gaps within the larger bikeway network being built throughout the region, the objectives of the proposed Pershing Bikeway project are to:

- Improve connections between North Park and Downtown for people walking and biking
- Improve connections within Balboa Park and its surrounding neighborhoods for people walking and biking
- Create safe operating space and improve safety for all roadway users

The proposed project involves approximately 2.6-miles of existing urban roadways, providing on-street bikeway connections between North Park and downtown San Diego through Balboa Park. The proposed project includes improvements to create safer conditions for all roadway users, including people who walk, bike, and drive. The proposed project would achieve this through traffic calming, a separated bikeway,[2] Class II buffered bike lanes, Class II bike lanes, an urban compact roundabout,[3] a neighborhood traffic circle[4], shortened street crossing distances, realigned curb ramps, improved sight distances, and traffic signal modifications.

There is clear and consistent policy direction on the local, regional, and state levels to enhance safety and connected infrastructure that supports biking and walking as viable choices for everyday trips and to reduce greenhouse gas and other air pollutant emissions, including but not limited to:

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[1] A bikeway is defined as a facility that is provided primarily for bicycle travel (Caltrans, 2012).

[2] A two-way separated bikeway consists of two bike lanes separated from travel lanes by a vertical element such as a raised curb, raised median, or on-street parking.

[3] An urban compact roundabout is defined as a single lane roundabout in an urban setting with an inscribed circle diameter of 115 feet or less, and exit radii of 39 feet or less (Caltrans, 2012).

[4] A neighborhood traffic circle is defined as a traffic calming feature in the form of a raised island in the middle of an intersection around which traffic circulates. It is meant to prevent driver speeding by making it difficult to pass straight through intersections (Brown, 2011).

- *The City of San Diego Bicycle Master Plan*
- *The City of San Diego Climate Action Plan*
- *The SANDAG Regional Bike Plan*
- *San Diego Forward: The Regional Plan*
- *The SANDAG Climate Action Strategy*

Analysis of ninety large American cities confirmed a positive correlation between how many people ride bikes and the supply of bike paths and lanes, even when controlling for other factors such as city size, climate, topography, vehicle ownership, income, and student population (Buehler 2012). Building facilities for people that walk and bike enhances safety for all roadway users, especially for women, senior citizens, and people who do not have experience riding bikes (FHWA 2015). A major reason existing ridership levels in the region are not higher is because of the high levels of perceived and actual risks associated with riding a bike on the street (SANDAG 2010). Based on case studies nationwide, the population currently interested in biking, but concerned about safety, is expected to begin to ride and to ride more often when served by a network of safe bikeways and low stress streets (NITC 2014).

Based on factors such as its direct connection between the North Park neighborhood and downtown, ability to improve connections to Balboa Park, incidence of collisions, and public comments, Pershing Drive was identified by SANDAG as a location where investments in bikeway infrastructure would have the most benefits. As a result, the proposed project is ranked as "high-priority" in the Bike Plan (SANDAG 2010).

1.2 Project Safety Features and Potential Safety Benefits

One of the major goals of the proposed project is to improve safety for all roadway users in the project area, including people walking and bicycling of all ages and abilities, and also people driving. The proposed project aims to improve safety with separated bikeways, buffered bike lanes, sidewalks, and footpaths that physically separate people biking and walking from motor vehicles. In addition, the proposed project would include traffic calming features that promote safe motor vehicle speeds. The project also would improve conditions at intersections to enhance safety for people on bikes, walking, and driving. These facilities provide varying degrees of perceived and actual safety desired by people who are interested in biking for transportation, but are concerned about the safety of riding on streets with higher levels of traffic stress.

Separated Bikeways

A separated bikeway is an exclusive bicycle facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. Separated bikeways are located in roadway right-of-way and separated from travel lanes by a vertical element such as on-street parking, raised curbs or medians, bollards, landscaping, or planters. Separated bike lanes can be designed to provide for one-way or two-way travel adjacent to vehicular travel lanes and are exclusively for use by people on bikes.

Buffered Bike Lanes

Buffered bike lanes are facilities located in roadway right-of-way and separated from travel lanes with a painted buffer.

Class II Bike Lanes

Class II bike lanes are facilities located in roadway right-of-way and separated from travel lanes with a painted stripe.

Traffic Calming and Other Project Features

The proposed project also includes various traffic calming measures and traffic control modifications such as high-visibility crosswalks, an urban compact roundabout, a neighborhood traffic circle, mid-block crosswalks, two-stage crosswalks with raised pedestrian median islands, rectangular rapid flashing beacon (RRFB) systems, curb extensions, raised medians, and narrowed travel lane widths.

These measures would encourage safe motor vehicle speeds, shorten pedestrian crossing distances and exposure, and increase pedestrian visibility, thereby improving safety for people biking, walking, and driving. These features also would generally promote efficient travel for people on bikes and driving motor vehicles.

Encouraging safe motor vehicle speeds through traffic calming helps attract a greater number of people to walk and bike. In addition, scientific studies have shown reduced severity of injuries and significantly lower risk of fatalities for people walking and biking when motor vehicle speeds on streets are maintained at less than 25 to 30 mph (Department for Transport 2010). For example, as shown in **Figure 1**, a pedestrian hit by a motor vehicle traveling at 25 mph has an 89 percent chance of survival, but the likelihood of survival decreases to 68 percent if the motor vehicle is traveling at 35 mph, and decreases further to 35 percent if the motor vehicle is traveling at 45 mph (Tefft, 2013).

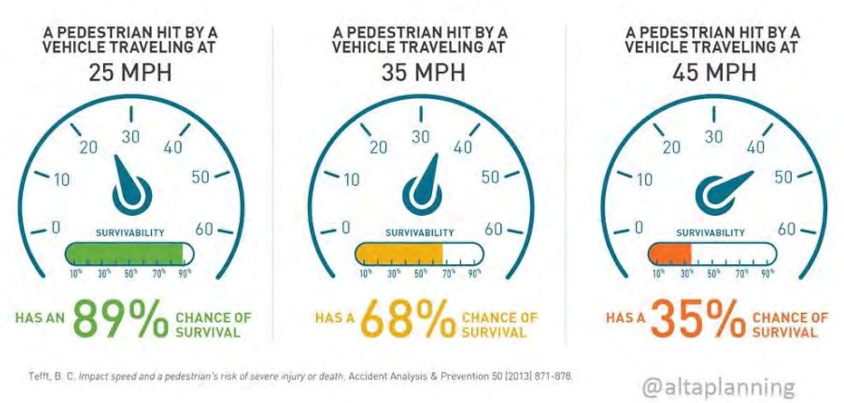

Figure 1 - Pedestrian Survival Rate by Motor Vehicle Speed

Figure 2 was prepared by the National Association of City Transportation Officials (NACTO) to highlight the impact of a motorists' speed on their vision cone. In general, a driver's visual focus diminishes as speed increases.

Figure 2 - Vision Cone

1.3 Description of Design Features and Related Physical Improvements

A description of the proposed project from south to north is provided below and the proposed project alignment is illustrated in **Figure 3**. Typical cross sections are provided in **Appendix A**. The following description is based on the proposed project's current level of design and would be finalized during the final engineering design phase before construction.

17th Street between C and B Streets

In this segment, the proposed project would install a buffered bike lane along one block of 17th Street from B Street to C Street. The bike lane would be located in existing parallel parking spaces on the west side of this southbound, one-way street. On the east side of the street, the existing parallel parking spaces would be replaced with angled parking spaces. See **Appendix A, Figure 1**, for a typical cross section of this block.

19th Street between C Street and Broadway

In this segment, the proposed project would replace the existing parallel parking on the west side of the block with angled parking. Parallel parking on the east side of the street will be maintained. See **Appendix A, Figure 2**, for a typical cross section of this block.

19th Street between B and C Streets

In this segment, the proposed project would install a two-way separated bikeway. The separated bikeway would be located in existing parallel parking spaces on the west side of this northbound, one-way street. Those parallel spaces would then be relocated between the bikeway and the travel lanes. The roadway segment would be reconfigured to one through lane, with a dedicated left turn lane and one shared through lane/right turn lane provided at the intersection.

The project would modify the existing traffic signal at the intersection of 19th Street and B Street to provide an exclusive phase for people walking and biking. This includes the installation of a diagonal bicycle crossing, connecting the two-way separated bikeway on the west side of 19th Street to the two-way separated bikeway on the east side of Pershing Drive. See **Appendix A, Figure 3**, for a typical cross section of this block.

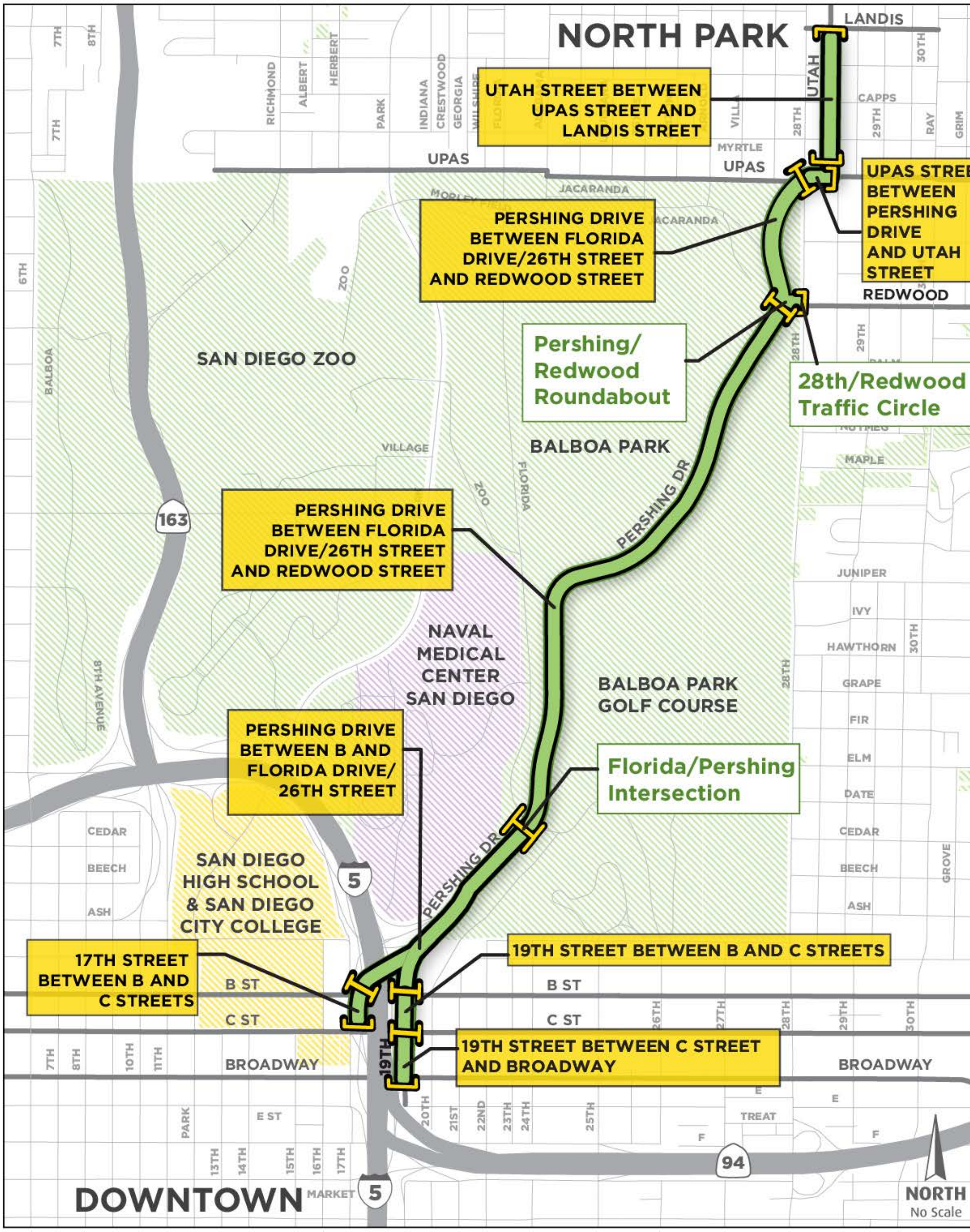

Figure 3 – Proposed Project Alignment

Pershing Drive between B Street and Florida Drive/26th Street

In this segment, the proposed project would install a two-way separated bikeway and a paved sidewalk along the east side of northbound Pershing Drive from B Street to Florida Drive/26th Street. Along southbound Pershing Drive, the proposed project would replace the existing Class II bike lanes with a buffered bike lane. The travel lanes would be designed at a minimum width of 10 feet.

As northbound Pershing Drive approaches the intersection with Florida Drive/26th Street, the bikeway and sidewalk would shift east, outside of the existing paved roadway, so that people on bikes are more visible to drivers at the intersection. The project also proposes a new northbound, dedicated right-turn vehicle lane from Pershing Drive to 26th Street to improve the movement of motor vehicles through this intersection and to provide a protected crossing of 26th Street for people walking and biking.

The existing traffic signal at the intersection of Pershing Drive and Florida Drive/26th Street would be modified to include an exclusive phase for people walking and people biking. High-visibility crosswalks are also proposed for all four legs of this intersection. See **Appendix A, Figure 4, Figure 5,** and **Figure 6** for typical cross sections of this roadway segment.

Pershing Drive between Florida Drive/26th Street and Redwood Street

In this segment, the proposed project would install a two-way separated bikeway, a paved sidewalk, and an unpaved footpath along the east side of Pershing Drive from Florida Drive/26th Street to Redwood Street. A raised median, which could include trees and landscaping, would separate the proposed bikeway from the travel lanes. Along the west side of Pershing Drive, a buffered bike lane would be installed. To accommodate the proposed project, this segment of Pershing Drive would change from four travel lanes to two travel lanes.

This segment also would include new pedestrian crossings (e.g., marked crosswalks, RRFBs median refuge islands) across Pershing Drive. See **Appendix A**, **Figure 7** and **Figure 8**, for typical cross sections of this roadway segment.

Pershing Drive between Redwood Street and Upas Street

In this segment, the proposed project would install a two-way separated bikeway, a paved sidewalk, and an unpaved footpath along the east side of Pershing Drive from Redwood Street to Upas Street. A raised median, which could include trees and landscaping, would separate the proposed bikeway from the travel lanes. Along the west side of Pershing Drive, a bike lane would be installed. Where space allows, the bike lane would include a painted buffer.

Where Redwood Street intersects with Pershing Drive, an urban compact roundabout is proposed to replace the existing minor street stop controlled intersection. The segment of Pershing Drive from Redwood Street to Upas Street would remain two travel lanes. In addition, a neighborhood traffic circle with all-way yield control is proposed at the intersection of Redwood Street and 28th Street to replace the existing four-way stop controlled intersection.

Where Jacaranda Place intersects with Pershing Drive, a new pedestrian crossing (e.g., high-visibility crosswalk with RRFB) would be provided across Pershing Drive connecting to Morley Field. Jacaranda Place would be realigned to meet Pershing Drive at a right angle to create a "T intersection."

At the intersection of Pershing Drive and Upas Street, curb extensions would be installed to shorten pedestrian crossing distances, provide protected crossing for people on bikes, and by squaring up the intersection angles, reduce the existing uncertainty about which driver has the right-of-way at this intersection. See **Appendix A, Figure 9 and Figure 10**, for typical cross sections of this roadway segment.

Upas Street between Pershing Drive and Utah Street

In this segment, the proposed project would install a two-way separated bikeway on the south side of a single block of Upas Street from Pershing Drive to Utah Street. In order to accommodate the proposed improvements, the proposed project would remove the existing dedicated eastbound left-turn lane on Upas Street to Utah Street. Motor vehicles would still be able to turn left onto Utah Street from Upas Street from a shared through lane/turn lane. In addition, the intersection of Upas Street and Utah Street would be improved with a raised median and new pedestrian crossings (e.g., new crosswalks, RRFB) to facilitate the movement of people walking and biking through this intersection. See **Appendix A, Figure 11**, for a typical cross section of this roadway segment.

Utah Street between Upas Street and Landis Street

In this segment, the proposed project would install painted buffers along the existing Class II bikes lanes to create buffered bike lanes along both sides of Utah Street from Upas Street to Landis Street. The new painted buffers would be installed on both sides of the bike lanes to separate them from the travel lanes and parking lanes. The buffered bike lanes would continue to be located between the on-street parking lane and the travel lane. See **Appendix A, Figure 12**, for a typical cross section of this roadway segment.

Other Physical Improvements

In general, other physical improvements that may be installed as part of the proposed project could include painted markings for new or relocated on-street parking stalls, new painted crossings at intersections or at mid-block, RRFBs, new painted or raised medians, curb extensions, accessible curb ramps, sidewalks, pedestrian refuge islands, modifications to existing curbs, gutters and drainage inlets, colored concrete and/or colored pavement, new signage, re-striping of travel lanes, new trees, landscaping or other measures to treat stormwater, slope retention (e.g., minor retaining wall), relocating existing underground utilities, new bikeway lighting at priority locations, and similar minor physical improvements.

2.0 Traffic and Safety Assessment Methodology

This assessment of bicycle and pedestrian safety and vehicular traffic conditions is based on the Level of Traffic Stress (LTS) methodology based on Mineta Transportation Institute *Report 11-19: Low-Stress Bicycling and Network Connectivity* (2012), the City of San Diego *Traffic Impact Study Manual* (1998), and City of San Diego *Significance Determination Thresholds*, Development Services Department (2011).

2.1 Bicycle and Pedestrian Safety Methodology

This assessment uses the LTS methodology for the assessment of bicycle and pedestrian safety impacts. The methods used for the LTS Analysis were adapted from the 2012 Mineta Transportation Institute (MTI) *Report 11-19: Low-Stress Bicycling and Network Connectivity*. The approach outlined in the MTI report uses roadway network data, including posted speed limit, the number of travel lanes, and the presence and character of bicycle lanes, as a proxy for bicyclist comfort level.

For this analysis, roadway segments and roadway crossings are classified into one of four levels of traffic stress to characterize the actual and perceived safety of roadways for people walking and biking. The lowest level of traffic stress, LTS 1, is assigned to roads that would be tolerable for most children to ride, as well as to multi-use trails or physically separated bicycle facilities that are restricted for motor vehicle traffic use. LTS 2 roads are those that could be comfortably ridden by the mainstream adult population. The higher levels of traffic stress, LTS 3 and 4, correspond to types of cyclists who will tolerate higher motor vehicle traffic volumes and speeds (Geller, 2005). LTS 3 is the level assigned to roads that would be acceptable for current "enthused and confident" cyclists and LTS 4 is assigned to segments that are only acceptable to "strong and fearless" bicyclists.

Table 2-1 and **Table 2-2** identify the LTS criteria for roadway segments with and without bikeways or bike lanes, respectively. To evaluate the level of traffic stress for people walking or biking along roadway segments in the project area, the analysis takes into account several factors, including the presence or absence of bikeways or bike lanes, the presence or absence of physical separation between a bikeway and the roadway, the presence or absence of a parking lane, the number of travel lanes, the width of bike lanes and parking lanes, the speed limit, and how often a bike lane is blocked.

Table 2-1 - Level of Traffic Stress Criteria for Roadway Segments with Bikeways or Bike Lanes

Criteria	LTS ≥ 1	LTS ≥ 2	LTS ≥ 3	LTS ≥ 4
Physically Separated Bikeway[1]				
Physical Separation Present	Yes	N/A	N/A	N/A
Bike Lanes Alongside Parking Lanes				
Through Lanes Per Direction	1	N/A	2+	N/A
Bike & Parking Lane Combined Width (feet)	≥ 15	14 to 14.5	≤ 13	N/A
Speed Limit (MPH)	≤ 25	30	35	≥ 40
Bike Lane Blockage	Rare	N/A	Frequent	N/A
Bike Lanes Not Alongside Parking Lanes				
Through Lanes Per Direction	1	2 with median	≥ 2, 2 without median	N/A
Bike Lane Width (feet)	≥ 6	≤ 5.5	N/A	N/A

Source: Mekuria, 2012
Note:
1. Physically separated bikeways automatically receive an LTS score of 1, regardless of other conditions. Since the LTS methodology does not distinguish between physical separation and striped separation, a striped buffer of greater than 2 feet in width is considered physical separation for the LTS analyses.

Table 2-2 Level of Traffic Stress Criteria for Roadway Segments without Bikeways or Bike Lanes

Speed Limit (MPH)	2-3 Lanes	4-5 Lanes	6≥ Lanes
≤ 25	LTS 1 or 2[1]	LTS 3	LTS 4
30	LTS 2 or 3[1]	LTS 4	LTS 4
≥ 35	LTS 4	LTS 4	LTS 4

Source: Mekuria, 2012
Note:
1. The lower LTS value is assigned to residential streets with no centerline striping.

Table 2-3 and **Table 2-4** identify the LTS criteria for intersection crossings with and without a median refuge island, respectively. To evaluate the level of traffic stress for people walking or biking across a roadway in the project area, the analysis takes into account the presence or absence of a median refuge island, the number of travel lanes, and the speed limit.

Table 2-3 - Level of Traffic Stress Criteria for Intersection Crossings Without a Median Refuge Island

Speed Limit (Street Crossed)	Number of Lanes		
	≤ 3	4-5	6≥
≤ 25 MPH	LTS 1	LTS 2	LTS 4
30 MPH	LTS 1	LTS 2	LTS 4
35 MPH	LTS 2	LTS 3	LTS 4
≥ 40 MPH	LTS 3	LTS 4	LTS 4

Source: Mekuria, 2012

Table 2-4 Level of Traffic Stress Criteria for Intersection Crossings with a Median Refuge Island

Speed Limit (Street Crossed)	Number of Lanes		
	≤ 3	4-5	6≥
≤ 25 MPH	LTS 1	LTS 1	LTS 2
30 MPH	LTS 1	LTS 2	LTS 3
35 MPH	LTS 2	LTS 3	LTS 4
≥ 40 MPH	LTS 3	LTS 4	LTS 4

Notes:
Physically separated bikeways automatically receive an LTS score of 1, regardless of other conditions. Since the LTS methodology does not distinguish between physical separation and striped separation, a striped buffer of greater than 2 feet in width is considered equal to physical separation for the LTS analyses.
For signalized intersections, the presence of a pedestrian or bicycle exclusive phase automatically receives an LTS of 1.
Source: Mekuria, 2012

Pedestrian and Bicycle Collisions

Pedestrian and bicycle collisions were assessed as a part of the analysis of the "Existing Conditions without the Project" scenario. Collision data was collected from the *Statewide Integrated Traffic Records System* (SWITRS) of the State of California, maintained by the California Highway Patrol. Collision data was assessed for the corridors and intersections within the project area from 2004 to 2014, the most recent data available. Collisions being assessed included collisions with bicyclists and pedestrians with motor vehicles, identifying injuries and fatalities associated with these collisions.

2.2 Vehicular Traffic Methodology

The vehicular traffic operations study methodology and analysis are consistent with the City of San Diego *Traffic Impact Study Manual* (1998) and City of San Diego *Significance Determination Thresholds*, Development Services Department (2011).

Four study scenarios were analyzed. Intersections were analyzed for the morning peak period (7:00 a.m. to 9:00 a.m.) and evening peak period (4:00 p.m. to 6:00 p.m.). The intersection analysis is based on the busiest one hour of traffic during each peak period. The roadway segment analysis examines daily roadway capacity over a 24-hour period. The four scenarios assessed are:

1. Existing (2015) Conditions without the Project ("Existing without Project")
2. Existing (2015) Conditions with the Project ("Existing with Project")
3. Future (2020) Conditions without the Project ("Future without Project")
4. Future (2020) Conditions with the Project ("Future with Project")

A combination of traffic modeling based on SANDAG's *Series 13 Regional Growth Forecast* (SANDAG 2010) and observed traffic counts were used to determine the traffic volumes for each study scenario. The traffic modeling uses regional forecasts of population, housing, land use, and economic growth based on local jurisdiction land use plans and input along with roadway capacities to estimate future traffic volumes on roadways in the project area. The analysis uses 2015 data because it was the year the proposed project's traffic analysis was commenced; 2020 data are used to show how the proposed project would affect future traffic conditions if it is built.

A field review was conducted to determine the existing intersection and roadway segment capacities. The field review identified existing intersection geometry, traffic control devices, and traffic signal phasing. The intersections and roadway segments selected for vehicular traffic analysis are listed in **Chapter 3.0** and **Chapter 4.0**, and the methodologies used to calculate roadway segment and intersection traffic volumes for each study scenario are described in more detail in **Chapter 3.0** and **Chapter 4.0**.

Traffic Modeling Limitations

When estimating future traffic volumes with implementation of the proposed project, the methodology does not assume any future trips would change from other travel modes (e.g., driving, transit, carpool) to biking or walking. While research indicates that the proposed project would encourage people to shift from other travel modes to biking or walking, the transportation model used for this analysis is not able to accurately quantify reductions in future motor vehicle trips associated with implementation of the proposed project. [5] As a result, the analysis of future motor vehicle traffic volumes does not assume any mode shift as a result of proposed project implementation. Therefore, this analysis likely overestimates future traffic volumes and future motor vehicle delay as a result of the proposed project.

2.3 Methodologies for Intersection and Roadway Segment Capacity Analysis

Roadway operating conditions are typically described in terms of "level of service." Level of service is a report card-type scale used to indicate the quality of traffic flow at intersections and on roadway segments. Level of service (LOS) ranges from LOS A (free flow, little congestion) to LOS F (forced flow, extreme congestion). LOS definitions, analysis methodologies, and City of San Diego criteria for acceptable traffic conditions are discussed below and provided in **Appendix B**.

Intersection and Roadway Count Methodology

Segment counts involved laying tubes across roadway segments to count the number of motor vehicles during a 24-hour cycle. Intersection turning movement counts involved the use of video counters to determine the total number of motor vehicles entering and exiting an intersection by movement (e.g., turning, through) during the weekday morning peak period from 7:00 a.m. to 9:00 a.m. and evening peak period from 4:00 p.m. to 6:00 p.m. For both segment and intersection counts, data were collected in May 2015. **Appendix C** contains the individual roadway segment and intersection traffic counts.

Intersection Capacity Analysis

Analysis of intersections is based upon the City of San Diego *Traffic Study Guidelines*. Signalized and unsignalized intersections were analyzed using the *Highway Capacity Manual* (HCM) 2000 methodology, in addition to HCM 2010 methodology for specific intersections outlined below.

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[5] The extensive data sets required for accurate modeling travel behavior in response to bikeway projects are not available at this time. Implementation of safe connected networks of bicycle facilities to facilitate biking as a viable mode of transportation are relatively new and associated data collection has been conducted on a less formal, less regular basis than for driving or transit. Travel modeling for bikeways is in its infancy. As more bikeways are built, and more formal and frequent counts and surveys are conducted, the data required for modeling and demand forecasting will be available.

This methodology calculates the average delay in seconds that a driver is expected to experience at an intersection based on the traffic demand and configuration of the intersection. **Appendix B** contains the HCM delay and level of service criteria for signalized and unsignalized intersections in table format.

Synchro software was used f to calculate the motor vehicle Level of Service (LOS) and control delay for the following intersections:

- Pershing Drive and Redwood Street Egress
- Pershing Drive and Redwood Street Ingress
- 28th Street and Redwood Street
- Pershing Drive and Florida Drive/26th Street
- Pershing Drive/19th Street and B Street
- 19th Street and C Street

However, due to limitations with the Synchro software, Traffix software was used to assess the intersections of 17th Street and C Street and Pershing Drive/17th Street and B Street. These two study intersections are five-legged all-way stop controlled intersections with more than two lanes per leg, which Synchro is unable to accurately evaluate.

Signalized Intersections

Control delay at signalized intersections is defined as time lost to a motor vehicle driver at a signalized intersection as a result of the signal operations (e.g., a motor vehicle waiting for a traffic signal to change to a green face), intersection geometry (e.g., time lost due to reducing speeds to make turning movements), or traffic conditions (e.g., a motor vehicle waiting for other motor vehicles to clear the intersection before it clears the intersection).

The HCM methodology recognizes the standard maximum saturation flow of a single lane at an intersection with a signal control as being 1,900 motor vehicles per hour of green time, per lane, per direction. This saturation is automatically modified to match each individual intersection and approach as a result of input factors, such as the presence of parking, pedestrian volumes, large motor vehicle percentages, transit presence or actions, and traffic movements. The saturated flow is then compared against the traffic model generated by the signal timings and traffic volumes, which creates the delay and level of service calculations.

Unsignalized Intersections

Control delay for unsignalized intersections is based upon geometric design of intersections and the interactions of motor vehicles. There are two unsignalized intersection types that can be assessed by the HCM 2000 Methodologies: all-way stop-controlled intersections and minor-street stop-controlled intersections.

All-Way Stop Controlled

The HCM 2000 method for analyzing all-way stop-controlled intersections is based on conflicting traffic for motor vehicles stopped at an intersection. Average control delay is calculated using a weighted average of the delays by volume distributed across all motor vehicles entering the intersection.

Minor-Street Stop Controlled

The HCM 2000 method for analyzing minor-street stop-controlled intersections is based on the concept of gap acceptance and the presence of conflicting traffic for motor vehicles stopped on the minor street approaches. Control delay and level of service for the "worst" approaches are reported, as opposed to average intersection LOS and delay.

Yield Controlled Roundabout

The HCM 2000 method for assessing yield controlled roundabouts does not provide overall intersection LOS grades or volume-to-capacity (V/C) ratios. In order to compensate for this, the HCM 2010 method was utilized, which offers both of these factors for roundabouts. This method was used for the urban compact roundabout proposed at the intersection of Pershing Drive at Redwood Street and the neighborhood traffic circle proposed at 28th Street at Redwood Street.

Control delay for a roundabout is dependent upon the geometry of the intersection (e.g. the inscribed circle diameter and exit radii) and the interaction of traffic in the form of entry flow, exit flow, and conflicting flow.[6] In order for vehicles to enter a roundabout, they must find a critical gap in the conflicting flow, where they may comfortably pass into the conflicting flow.

Two-legged Approaches at All-Way Stops

The HCM 2000 methodology is not capable of assessing the level of service or delay at all-way stop controlled intersections with more than one lane per approach. This fault in the methodology was corrected in the HCM 2010 methodology, which was expansive upon the HCM 2000 base methodology. As a result, the HCM 2010 methodology was used to assess 19th Street and B Street.

Roadway Segment Capacity Analysis

The roadway segment capacity analysis identifies the LOS score for each roadway segment in the project area. It does so by comparing the design capacity of each roadway with the existing or future daily traffic volumes that occur or are expected to occur on that roadway segment. The analysis then uses City of San Diego criteria to determine the LOS score for each roadway segment based on the comparison of volume to capacity. For more information on the City of San Diego criteria, please see **Appendix B**.

[6] Entry flow is defined as the rate of motor vehicles entering the roundabout at a given approach. Exit flow refers to the rate of motor vehicles that exit the roundabout at a given approach. Conflicting flow represents vehicles who pass an approach while within the roundabout. Entering vehicles must yield to the conflicting flow.

City of San Diego Criteria for Traffic Conditions

The City of San Diego has established criteria to evaluate traffic conditions along roadway segments and intersections per the City of San Diego *Traffic Impact Study Manual* (1998) and City of San Diego *Significance Determination Thresholds* (2011).

For intersections, the criteria are based on how much delay increases (in seconds) for the average driver as a result of the proposed project. When an intersection performs at LOS E, an increase in average delay of 2.0 or more seconds is considered "unacceptable." If an intersection performs at LOS F, an increase in average delay of 1.0 or more seconds is considered "unacceptable."

For roadway segments, changes to the V/C ratio become more stringent as LOS worsens and delay increases. For example, if a segment is performing at LOS E, the increase in V/C ratio that the City defines as "acceptable" is 0.02 or less. At LOS F, an increase in V/C ratio of 0.01 or less is considered "acceptable." The City of San Diego criteria for traffic conditions are provided in **Appendix B**.

3.0 Existing Conditions with and without the Project

This chapter describes bicycle and pedestrian safety conditions and motor vehicle traffic conditions (roadway segments and intersections) under the "Existing Conditions without the Project" and "Existing Conditions with the Project" scenarios.

3.1 Existing Conditions without the Project (Year 2015)

This section describes existing conditions as of 2015 for intersections and roadway segments in the project area without implementation of the proposed project, including existing pedestrian facilities and safety, bicycle facilities and safety, and motor vehicle traffic conditions including volumes, the roadway network, intersection level of service, roadway segment level of service, and traffic control devices (e.g., traffic signals, stop signs).

Pedestrian Facilities

The presence of pedestrian facilities, including sidewalks, footpaths, curb ramps, and crosswalks, varies throughout the project area. Sidewalks are present on the northern and southern end of the project area along both sides of the following roadway segments:

- Utah Street (Landis Street to Myrtle Avenue)
- Utah Street (Myrtle Avenue to Upas Street)
- 28th Street (Landis Street to Myrtle Avenue)
- Redwood Street (28th Street to Granada Avenue)
- 17th Street (B Street to C Street)
- 19th Street (B Street to C Street)

In addition, there is a continuous sidewalk along the east side of 28th Street from Upas Street to Redwood Street, and an intermittent sidewalk along the west side of this segment. There are no sidewalks along either side of Pershing Drive for the approximately 1.5-mile stretch from Florida Drive/26th Street to Upas Street. However, there are informal paths along the curbed shoulders on both sides of the roadway, which is evidence of regular pedestrian use (**Figure 4**).

Existing intersections with sidewalks also have curb ramps. Both signalized intersections in the project area have pedestrian signals heads with push-button activation. The following intersections also have crosswalks (approaches with crosswalks are identified in parentheses):

- Pershing Drive & Upas Street/28th Street (north, east, south, west)
- Pershing Drive and Florida Drive/26th Street (east, south, west)
- Pershing Drive/19th Street & B Street (east, south)
- Pershing Drive/17th Street & B Street (north)

Figure 4 - Pershing Drive Informal Path (source: Google Earth)

However, crosswalks are lacking in other parts of the project area. For one, there are no crosswalks along the approximately 1.5-mile segment of Pershing Drive from Florida Drive/26th Street to Upas Street. In fact, for the approximately two-mile segment of Pershing Drive from B Street to Upas Street, there is only one crosswalk, which is located at the intersection with Florida Drive/26th Street. In addition, many intersections do not have crosswalks across all approaches, causing people walking to detour from their desired path of travel.

Pedestrian Collisions

There was a total of four collisions involving pedestrians within the project area. There was one fatal collision involving a pedestrian reported in the project area during the time frame of 2004 through 2014 (SWITRS). This collision occurred at the intersection of Pershing Drive and Florida Drive.

<u>Bicycle Facilities</u>

Existing bicycle facilities in the project area include Class II bike lanes on Utah Street from Upas Street to Landis Street and Class II bike lanes on Pershing Drive. The bike lanes on the southbound side of Pershing Drive are intermittent; they disappear at intersections and when crossing driveways. There is also a buffered bike lane for on the northbound side of Pershing Drive just north of the intersection with Florida Drive/26th Street. The buffered bike lane facility exists for approximately 500 feet along the curve of the roadway before transitioning back to a standard Class II bike lane without a buffer.

Bicycle Collisions

From 2004 to 2014, there were 13 collisions between vehicles and people on bikes within the project area. Two of these collisions resulted in severe injuries (in 2008 and 2014), and the remaining collisions resulted in some other type of visible or felt injury. There were no reported fatalities during the study period. The intersection with the highest occurrence of vehicle-bicycle collisions is Pershing Drive and Florida Drive, accounting for seven of the 13 collisions during the ten-year period (SWITRS).

<u>Vehicular Traffic Conditions</u>

This section describes existing (2015) conditions without the project ("Existing Conditions without the Project") for intersections and roadway segments in the project area, including existing motor vehicle traffic volumes and levels of service, intersection turning movements, roadway classifications, and traffic control devices (e.g., traffic signals, stop signs).

Roadway Network

The principal roadways in the project area are described below. The description includes the physical characteristics and traffic control devices along these roadways. **Appendix D** shows existing roadway classifications in the project area, and **Appendix E** shows the existing and proposed intersection geometry and traffic control.

Pershing Drive functions as a north-south four-lane major arterial from the Interstate 5 ramps to Redwood Street, winding through Balboa Park. It also acts as a two-lane major arterial from Redwood Street to its northern terminus at Upas Street, and from the Interstate 5 ramps to its southern terminus of 19th Street/17th Street. The stretch from the Interstate 5 ramps to 17th Street is classified as a freeway on-off ramp. Pershing Drive connects to the North Park neighborhood, the Downtown neighborhood, Balboa Park, the San Diego Naval University and Medical Center via Florida Drive, and Interstate 5. It has a bike lane on either side and a posted speed limit of 50 miles per hour.

Utah Street is a two-lane collector corridor that runs from Upas Street as its southern terminus to Copley Ave as its northern terminus. Class II bike lanes and parallel parking are located on both sides of the street.

Upas Street is a two-lane, east-west collector that connects Boundary Street to Alabama Street, intersecting with Pershing Drive, 28th Street, Utah Street, and other roadways.

Redwood Street operates as a two-lane, east-west collector, connecting Pershing Drive to Boundary Street. There is on-street parking for the majority of its length, with the exception of its ingress and egress at Pershing Drive, where it terminates in the form of a Y-Intersection.

28th Street functions as a north-south, two-lane collector that connects local streets. It is primarily a residential street, with on-street parking and driveways.

19th Street functions as a north-south, two-lane collector that also provides connections to Pershing Drive, Interstate 5, and local streets.

17th Street functions as a southbound, two-lane collector that connects local traffic with Interstate 5 and Pershing Drive. It permits one-way, southbound travel, and has on-street parking in the form of parallel and diagonal parking.

Intersection Level of Service

Existing (2015) morning and evening peak period levels of service for the eight intersections in the project area are shown in **Table 3-1**. The intersection analysis worksheets for existing conditions without the project are provided in **Appendix F**.

Table 3-1 Intersection Level of Service - Existing Conditions without the Project

Intersection	Intersection Control	Delay (seconds)	LOS
A.M. Peak Period			
Pershing Dr. and Redwood St. Egress	MSS	60.6	F
Pershing Dr. and Redwood St. Ingress	MSS	0.2	A
28th St. and Redwood St.	AWS	14.4	B
Pershing Dr. and Florida St./26th St.	TS	>80.0[1]	F
Pershing Dr./17th St. and B St.	MSS	>80.0[1]	F
Pershing Dr./19th St. and B St.	TS	17.8	B
17th St. and C St.	MSS	13.9	B
19th St. and C St.	AWS	14.1	B
P.M. Peak Period			
Pershing Dr. and Redwood St. Egress	MSS	18.1	C
Pershing Dr. and Redwood St. Ingress	MSS	1.8	A
28th St. and Redwood St.	AWS	11.0	B
Pershing Dr. and Florida Dr./26th St.	TS	76.7	E
Pershing Dr. /17th St. and B St.	MSS	18.9	C
Pershing Dr./19th St. and B St.	TS	11.1	B
17th St. and C St.	MSS	29.4	D
19th St. and C St.	AWS	12.4	B

Source: Appendix G.

Notes:

1. The equations for HCM were established with validation up to 80 seconds and are not validated beyond that threshold so reporting the exact seconds of delay for values higher than 80 would be utilizing the equations beyond their capability or intent.

LOS = level of service
MSS = Minor Street Stop
AWS = All Way Stop
TS = Traffic Signal

In the morning, peak period, the following three intersections are operating at LOS F: Pershing Drive and Redwood Street Egress; Pershing Drive and Florida Drive/26th Street; and Pershing Drive/17th Street and B Street. The other five intersections are operating at LOS B or better in the morning peak period.

In the evening peak period, the intersection of Pershing Drive and Florida Drive/26th Street is operating at LOS E. The other seven intersections in the project area are operating at LOS D or better in the evening peak period.

Roadway Segment Level of Service

Existing (2015) levels of service for the roadway segments in the project area are shown in **Table 3-2**. The assessment was based upon existing roadway geometry, discussed in Section 2.3, and the daily traffic volumes for the segments.

One segment (Pershing Drive from Florida Drive/26th Street to I-5 Ramps) operates at an LOS of E under the "Existing Conditions without the Project" scenario, with its volume (37,476 motor vehicles per day) meeting 94 percent of its capacity (40,000 motor vehicles per day). All other roadway segments assessed operate at an LOS of C or higher, meeting 52 percent of their capacity or less.

Table 3-2 Roadway Segment Level of Service - Existing Conditions without the Project

Segment	Volume (AADT)	Existing Conditions Without Project			
		Lanes	Capacity	V/C	LOS
Pershing Drive					
Upas St. to Jacaranda Pl.	7176	2-L C(SM)	15000	0.48	B
Jacaranda Pl. to Redwood St.	11855	3-L C (CL)	22500	0.53	C
Redwood St. to Florida Dr./26th St.	15735	4-L MA	40000	0.39	B
Florida Dr./26th St. to I-5 Ramps	37476	4-L MA	40000	0.94	E
I-5 Ramps to North of B St.	7488	3-L MA	30000	0.25	A
North of B St. to B St.[1]	7488	4-L MA	40000	0.19	A
17th Street					
B St. to C St.	2244	2-L C (OW)	15000	0.15	A
19th Street					
B St. to C St.	5364	2-L C (OW)	15000	0.36	B

Source: Appendix F.

Notes:

1. North of B Street refers to the area Pershing Drive approximately 200 feet north of B Street where Pershing Drive's southbound leg expands to two travel lanes.

LOS = level of service
V/C = volume-to-capacity ratio
AADT = annual average daily traffic
OW = one-way
C = collector
MA = major arterial
CL = center, turn lane
SM = separated median

3.2 Existing Conditions with the Project (Year 2015)

This section analyzes how existing motor vehicle traffic, bicycle, and pedestrian conditions in the project area would be affected if the proposed project were implemented.

Bicyclist and Pedestrian Conditions

The "Existing Conditions with the Project Improvements" scenario would not result in any adverse safety impacts for people walking and biking. In fact, the proposed project would have potential safety benefits for people that walk and bike – and also drive – in the project area. As shown below, the proposed project would decrease the level of traffic stress for people walking and biking along and across roadways in the project area by installing separated bikeways and buffered bike lanes, sidewalks and footpaths, and other measures to calm and control motor vehicle traffic. Therefore, the proposed project would not result in any adverse bicycle and pedestrian safety impacts, and therefore no bicycle and pedestrian safety mitigation measures are needed.

Level of Traffic Stress Along Roadway Segments

The level of traffic stress for each roadway segment addressed in the project area was assessed based upon the criteria identified in Section 2.1. **Table 3-3** compares the level of traffic stress results along roadway segments in the project area for "Existing Conditions without the Project" and "Existing Conditions with the Project."

Notably, Pershing Drive and the other roadway segments in the project area; including Utah, Upas, 17th, and 19th Streets, would improve from LTS 3 to an LTS 1 – the lowest level of traffic stress on the LTS scale. This means that with implementation of the proposed project, people of all ages and abilities would feel comfortable riding a bike or walking along Pershing Drive. This is opposed to the conditions of an LTS 3, which is comfortable for experienced bicyclists, but may not be comfortable for youth and elderly riders, newer riders, or less confident riders. For Pershing Drive, this sizable reduction in level of traffic stress is the result of proposed geometric changes to the roadway; specifically, the reduction in travel lanes from 4 to 2 and installation of landscaped medians, reduction in the posted speed limit, and implementation of separated bikeways and buffered bike lanes.

Utah Street and 17th Street would improve from LTS 3 to LTS 1 as a result of the increased separation resulting from buffers along the Class II bike lanes.

Table 3-3 Roadway Segment Level of Traffic Stress - Existing Conditions with and without the Project

Roadway Segment		Existing Conditions without the Project		Existing Conditions with the Project		
		Traffic Stress	Bicycle Facilities	Traffic Stress	Proposed Safety Features	Potential Safety Benefits
Utah St.	Landis St. to Myrtle St.	High (3)	Class II Bikeway	Low (1)	Striped buffers installed on bike lanes	Striped barrier separating the bike lanes and the parking lanes and travel lanes, reduced travel lane widths reduce motor vehicle speeds.
	Myrtle St. to Upas St.	High (3)	Class II Bikeway	Low (1)	Striped buffers installed on bike lanes	Striped barrier separating the bike lanes and the parking lanes and travel lanes, reduced travel lane widths reduce motor vehicle speeds.
Upas St.	Pershing Dr. to Utah St.	High (3)	None	Low (1)	Separated bikeway with Raised Median	Separated bikeway with physical barrier, Class II facility separated by striped buffer, reduced travel lane widths reduce motor vehicle speeds.
Pershing Dr.	Upas St. to Jacaranda Pl.	High (3)	Class II Bikeway	Low (1)	Separated bikeway with Raised Median & Class II Bikeway with Partially Striped Buffer, Lower Speed Limit	Separated bikeway with physical barrier, Class II facility separated by striped buffer, reduced travel lane widths reduce motor vehicle speeds.
	Jacaranda Pl. to Redwood St.	High (3)	Class II Bikeway	Low (1)	Separated bikeway with Raised Median & Class II Bikeway with Striped Buffer, Lower Speed Limit	Separated bikeway with physical barrier, Class II facility separated by striped buffer, reduced travel lane widths reduce motor vehicle speeds.
	Redwood to Florida Dr./26th St.	High (3)	Class II Bikeway	Low (1)	Separated bikeway with Raised Median & Class II Bikeway with Striped Buffer, Lower Speed Limit	Separated bikeway with physical barrier, Class II facility separated by striped buffer, reduced travel lane widths reduce motor vehicle speeds.
	Florida Dr./26th St. to I-5 Ramps	High (3)	Class II Bikeway	Low (1)	Separated bikeway with Raised Median & Class II Bikeway with Striped Buffer, Lower Speed Limit	Separated bikeway with physical barrier, Class II facility separated by striped buffer, reduced travel lane widths reduce motor vehicle speeds.

Roadway Segment		Existing Conditions without the Project		Existing Conditions with the Project		
		Traffic Stress	Bicycle Facilities	Traffic Stress	Proposed Safety Features	Potential Safety Benefits
Pershing Dr.	I-5 Ramps to north of B St.	High (3)	Class II Bikeway	Low (1)	Separated bikeway with Raised Median & Class II Bikeway with Striped Buffer, Lower Speed Limit	Separated bikeway with physical barrier, Class II facility separated by striped buffer, reduced travel lane widths reduce motor vehicle speeds.
	North of B St. to B St.	High (3)	Class II Bikeway	Low (1)	Separated bikeway with Raised Median & Class II Bikeway with Striped Buffer, Lower Speed Limit	Separated bikeway with physical barrier, Class II facility separated by striped buffer, reduced travel lane widths reduce motor vehicle speeds.
17th St.	B St. to C St.	High (3)	None	Low (1)	Class II Bikeways with Striped Buffer	Striped barrier separating the bike lanes from travel lanes, reduced travel widths reduce motor vehicle speeds, reduced parking reduces number of conflict areas.
19th St.	B St. to C St.	High (3)	None	Low (1)	Separated bikeway with Raised Median	Separated bikeway with physical barrier, reduced travel lane widths reduce motor vehicle speeds, reduced parking reduces number of conflict areas.

Source: Mekuria, 2012

Level of Traffic Stress for Intersection Crossings

Table 3-4 compares the level of traffic stress results for intersection crossings in the project area for "Existing Conditions without the Project" and "Existing Conditions with the Project." The LTS score for intersections represent the highest LTS score of intersection approaches that would be changed by the proposed project. Approaches within the intersections that would not be affected by the proposed project are not included in the analysis because the level of traffic stress would not change as a result of the project. The table also identifies proposed safety features that may not affect the LTS scores, but could produce potential safety benefits. See **Section 2.1** for the methodology used to produce the LTS scores.

The resulting LTS created by the proposed project and illustrated in **Table 3-4** shows improved conditions for people biking throughout the project area, as all intersection crossings are improved to an LTS of 1, with the exception of the crossing at 19th Street and C Street, which remains at LTS 2.

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Table 3-4 Intersection Crossing Level of Traffic Stress - Existing Conditions with and without the Project

Intersection		Existing Conditions without Project		Existing Conditions with Project		
Major Street	Minor Street	Traffic Stress	Bicycle Facilities[1]	Traffic Stress	Proposed Safety Features[1]	Potential Safety Benefits
Pershing Dr.	Florida Dr.	High (4)	*Push Button Crossings, Crosswalks*	Low (1)	Separated Crossing with Raised Median, Exclusive Bicycle Signal Phase	Separated facility reduces conflict movements and mixing of traffic, the bicycle signal phase reduces movement conflicts at the intersection.
Pershing Dr./19th St.	B St.	High (4)	*Push Button Crossings, Crosswalks*	Low (1)	*Green Bicycle Diagonal Crossing,* Exclusive Bicycle Signal Phase	Diagonal crossing markings increase visibility of people on bicycles in the intersection, the bicycle signal phase reduces conflicts at the intersection.
Pershing Dr./28th St.	Upas St.	Low (1)	*Push Button Crossings, Crosswalks,* Striped Medians	Low (1)	*Green-Bicycle Crossing Markings,* Raised Medians, Curb Extensions	Bicycle crossing markings increase the visibility people on bicycles crossing the intersection, curb extensions reduce crossing distances.
Pershing Dr.	Redwood St.[2]	High (4)	*Southbound Bike Lane Through Intersection*	Low (1)	Separated Crossing with Raised Median, Urban Compact Roundabout Conversion	Separated facility reduces conflict movements with motor vehicles and pedestrians and reduces the mixing of traffic, the roundabout conversion slows down motor vehicle traffic.
Pershing Dr.	Jacaranda Pl.	High (3)	Northbound Bike Lane through the intersection, Southbound Dashed Bike Lane leading into the Intersection	Low (1)	Raised Median Installation, *High Visibility Crossing Installations, RRFB installations*, Southbound Bike Lane with Striped Buffer leading into Intersection, Two-way separated bikeway Installed on East Side of Roadway through the intersection, *Green Bicycle Markings*	Raised median provides refuge for crossings, crossing markings increase visibility of people walking or biking, RRFB installation increases visibility of people crossing, buffered bike lane and two-way separated bikeway provides separation between people biking and motor vehicles.
Pershing Dr./17th St.	B Street	High (4)	*Crosswalk*	Low (1)	Bicycle Pocket Lane, Raised Median, *Bicycle Through Markings, Green Bicycle Markings*	Bicycle pocket lane separates people on bicycles from turning vehicles, bicycle crossing markings increase visibility of people on bicycles in the intersection, the raised median separates through and turning traffic.
19th St.	C Street	Low (2)	*Crosswalk*	Low (2)	*Striped Curb Extensions*	Striped curb extensions reduce the vulnerability of people on bicycles by reducing the travel lane crossing distances.

Source: Mekuria, 2012

Notes:

1. Italicized facilities and features represent aspects that do not affect the level of traffic stress score, but result in higher levels of comfort or safety for bicyclists.
2. The Redwood Street Ingress and Egress to Pershing Drive are treated as a single intersection for the Level of Traffic Stress assessment in order to reflect the proposed conditions with the installation of the urban compact roundabout.

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Rectangular Rapid Flashing Beacons

RRFBs are included at several locations in the project area. RRFBs are a high-visibility crossing treatment that use LED beacons, flashing in a designated pattern, while attached to pedestrian or trail crossing signage. They activate through pedestrian actuation to alert motor vehicle operators that a pedestrian or trail user is crossing the street, and the motor vehicle must yield. According to studies performed by the Federal Highway Administration, RRFBs have been highly successful at increasing motor vehicle compliance to crosswalk yielding, resulting in yielding compliances varying from 72 percent to 96 percent at crosswalks that had compliance rates of zero percent to 26 percent before RRFBs were installed (FHWA 2010).

RRFBs also have a minimal impact on motor vehicle level of service. The RRFBs do not function as a regulatory control over motor vehicle movement like a traffic signal or stop sign, rather they serve as a warning device, thus their effect on motor vehicle level of service is comparable that of a standard crosswalk.

<u>Vehicular Traffic Conditions</u>

The "Existing Conditions with the Project" scenario examines how implementation of the proposed project would affect motor vehicle traffic conditions along roadways segments and at intersections in the project area. The results of the roadway capacity and intersection capacity analyses are provided below.

Proposed Changes to Roadway Capacity

The proposed project would make the following changes to roadway capacity in the project area. The effect of these capacity changes on existing (2015) roadway segment level of service are evaluated in **Section 3.2**. The effect of these capacity changes on future (2020) roadway segment level of service are evaluated in **Section 4.2**.

- The segment of Pershing Drive from Jacaranda Place to Redwood Street would change from three lanes with a center turn lane to two travel lanes with striped median and no center turn lane.
- The segment of Pershing Drive from Redwood Street to Florida Drive/26th Street would change from four travel lanes to two travel lanes with landscaped medians near intersections.
- The segment of Pershing Drive from the I-5 Ramps to North of B Street would change from two travel lanes in each direction to two southbound travel lanes and one northbound travel lane.
- The segment of Pershing Drive North of B Street to B Street would change from four travel lanes, with two in each direction, to three travel lanes with two dedicated to southbound travel and one dedicated to northbound travel.
- The block of 19th Street from B Street to C Street would change from two northbound travel lanes to one northbound travel lane, and would remain a one-way facility.

Roadway Capacity Analysis

To determine whether the proposed project meets City of San Diego criteria for acceptable traffic conditions on roadway segments, the roadway capacity analysis evaluates whether the proposed project would result in:

1. Volume-to-capacity ratio to increase by more than 0.02 for LOS E roadway segments or 0.01 for LOS F roadway segments; or
2. Traffic conditions on any roadway segment to worsen from LOS D or better to LOS E or LOS F

Table 3-5 compares roadway segment level of service for existing conditions without the Project and existing conditions with the Project. As **Table 3-5** shows, the proposed project would not increase average daily traffic or volume-to-capacity (V/C) ratio on any LOS E or LOS F segments. In addition, the proposed project would not cause any roadway segment in the project area to worsen from LOS D or better to LOS E or LOS F. With implementation of the proposed project, all roadway segments in the project area would meet the City of San Diego criteria for acceptable traffic conditions based on existing (2015) conditions. Therefore, no mitigation measures for traffic impacts are required.

Table 3-5 Roadway Segment Level of Service - Existing Conditions without and with the Project

Segment	Volume (AADT)	Existing Conditions without Project				Existing Conditions with Project				Change in V/C	Exceeds City of San Diego Criteria?
		Lanes	Capacity	V/C	LOS	Lanes	Capacity	V/C	LOS		
Pershing Drive											
Upas St. to Jacaranda Pl.	7176	2-L C(SM)	15000	0.48	B	2-L C SM	15000	0.48	B	0.00	No
Jacaranda Pl. to Redwood St.	11855	3-L C (CL)	22500	0.53	C	2-L C SM	15000	0.79	D	0.26	No
Redwood St. to Florida Dr./26th St.	15735	4-L MA	40000	0.39	B	2-L MA	20000	0.79	D	0.39	No
Florida Dr./26th St. to I-5 Ramps	37476	4-L MA	40000	0.94	E	4-L MA	40000	0.94	E	0.00	No
I-5 Ramps to North of B St.[1]	7488	3-L MA	30000	0.25	A	2-L MA	20000	0.37	A	0.12	No
North of B St.[1] to B St.	7488	4-L MA	40000	0.19	A	3-L MA	30000	0.25	A	0.06	No
17th Street											
B St. to C St.	2244	2-L C (OW)	15000	0.15	A	2-L C (OW)	15000	0.15	A	0.00	No
19th Street											
B St. to C St.	5364	2-L C (OW)	15000	0.36	B	1-L C (OW)	7500	0.72	D	0.36	No

Source: Appendix F.

Notes:

1. North of B Street refers to the area Pershing Drive approximately 200 feet north of B Street where Pershing Drive's southbound leg expands to two travel lanes.

LOS = level of service
V/C = volume-to-capacity ratio
AADT = annual average daily traffic
OW = one-way

C = collector
MA = major arterial
CL = center, turn lane
SM = separated median

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Proposed Changes to Intersection Capacity

The proposed project would make the following changes to intersection capacity in the project area. The effect of these capacity changes on existing (2015) intersection levels of service are evaluated in the following section.

- Replace the minor-street stop control at the intersection of 17th Street and B Street with an all-way stop control.
- Implement an exclusive bicycle phase into the signal cycle on Pershing Drive/19th Street and B Street.
- Remove the center through lane for the northbound approach of the Pershing Drive/19th Street and B Street intersection.
- Install a northbound right-turn lane on Pershing Drive at Florida Drive/26th Street
- Implement an exclusive bicycle phase into the signal cycle on Pershing Drive at Florida Drive.
- Install an urban compact roundabout at the intersection of Pershing Drive and Redwood Street.
- Install a neighborhood traffic circle with all-way yield control at the intersection of 28th Street and Redwood Street and remove the all-way stop control.

Intersection Capacity Analysis

To determine whether the proposed project meets City of San Diego criteria for acceptable traffic conditions at intersections, the intersection capacity analysis evaluates whether the proposed project would result in:

1. An average delay increase of 2.0 or more seconds for intersections at LOS E or 1.0 or more seconds for intersections at LOS F; or
2. Traffic conditions at any intersection decreasing from LOS D or better to LOS E or LOS F.

As **Table 3-6** shows, the proposed project would not increase delay on any LOS E or LOS F intersections. For five of the eight intersections, overall control delay would decrease as a result of the proposed project. In addition, the proposed project would not cause any intersection in the project area to worsen from LOS D or better to LOS E or LOS F. With implementation of the proposed project, all intersections in the project area would meet City of San Diego criteria for acceptable traffic conditions based on existing (2015) conditions. Therefore, no mitigation measures for traffic impacts are required. See **Appendix H** for intersection analysis worksheets for "Existing Conditions with the Project."

Table 3-6 Intersection Level of Service - Existing Conditions Without and With the Project

Intersection	Intersection Control	Existing Without Project		Intersection Control	Existing with Project		Change in Delay	Exceeds City of San Diego Criteria?
		Delay	LOS		Delay	LOS		
A.M. Peak Hour								
Pershing Dr. and Redwood St. Egress	MSS	60.6	F	RA	20.1	C	-40.5	No
Pershing Dr. and Redwood St. Ingress	MSS	0.2	A					
28th St. and Redwood St.	AWS	14.4	B	TC	8.3	A	-6.1	No
Pershing Dr. and Florida Dr./26th St.	TS	>80.0[2]	F	TS	>80.0	F	0.0[3]	No
Pershing Dr./17th St. and B St.	MSS	>80.0[2]	F	AWS	42.1	E	-37.9	No
Pershing Dr./19th St. and B St.[1]	TS	17.8	B	TS	24.0	C	6.2	No
17th St. and C St.	MSS	13.9	B	AWS	9.3	A	-4.6	No
19th St. and C St.	AWS	14.1	B	AWS	14.5	B	0.4	No
P.M. Peak Hour								
Pershing Dr. and Redwood St. Egress	MSS	18.1	C	RA	13.9	B	-4.2	No
Pershing Dr. and Redwood St. Ingress	MSS	1.8	A					
28th St. and Redwood St.	AWS	11.0	B	TC	6.8	A	-4.2	No
Pershing Dr. and Florida Dr./26th St.	TS	76.7	E	TS	57.5	E	-19.2	No
Pershing Dr./17th St. and B St.	MSS	18.9	C	AWS	9.9	A	-9.0	No
Pershing Dr./19th St. and B St.	TS	11.1	B	TS	16.9	B	5.8	No
17th St. and C St.	MSS	29.4	D	AWS	12.5	B	-16.9	No
19th St. and C St.	AWS	12.4	B	AWS	12.9	B	0.5	No

Source: Appendix G, Appendix H.
Notes:

1. The intersection of Pershing Drive/19th Street and B Street includes the addition of a diagonal bike crossing with a dedicated signal phase as part of the 'Existing with Project" conditions.
2. The equations for HCM were established with validation up to 80 seconds and are not validated beyond that threshold so reporting the exact seconds of delay for values greater than 80 would be utilizing the equations beyond their capability or intent.
3. The proposed project would decrease the amount of delay at the intersection of Pershing Dr. and Florida Dr./26th St. However, because the amount of delay would be greater than 80 seconds in both the "without Project" and "with Project" scenarios, the exact decrease in seconds of delay is not reported in the above table. As explained above, HCM equations are not validated for values higher than 80 seconds.

LOS = level of service
MSS = Minor Street Stop
AWS = All Way Stop
TS = Traffic Signal
RA = Roundabout
TC = Traffic Circle

4.0 Future Conditions with and without the Project

This chapter describes bicycle and pedestrian safety conditions and motor vehicle traffic conditions (roadway segments and intersections) under the "Future Conditions without the Project" and "Future Conditions with the Project" scenarios.

4.1 Future Conditions without the Project (Year 2020)

This section describes future (2020) conditions without the proposed project for intersections and roadway segments in the study area, including existing pedestrian facilities and safety, bicycle facilities and safety, and vehicular traffic conditions including volumes, intersection turning movements, roadway classifications, and traffic control devices (e.g., traffic signals, stop signs).

Bicycle and Pedestrian Conditions

Without the proposed project, this study assumes that bicycle and pedestrian safety conditions in 2020 will remain substantially the same as the existing conditions described in **Section 3.1**.

Vehicular Traffic Conditions

Motor vehicle traffic volumes for the "Future Conditions without the Project" scenario were assessed using the SANDAG *Series 13 Traffic Model*, which forecasted rates of increase or decrease for motor vehicle volumes in the project area by 2020. These rates were then applied to the roadway segment volumes, intersection turning movement volumes, and intersection through movement volumes of the "Existing Conditions without the Project" to calculate traffic volumes for the "Future Conditions without the Project" scenario.

Proposed Changes to Roadway Capacity

No roadway capacity changes are anticipated for the year 2020 without the proposed project. As such, the roadway network for the Future without Project scenario is the same as the roadway network for the Existing without Project scenario described in **Section 3.1**.

Proposed Changes to Intersection Capacity

No intersection capacity changes are anticipated for the year 2020 without the proposed project. As such, the intersection capacities for the Future without Project scenario are the same as those analyzed in the Existing without Project scenario described in **Section 3.1**.

4.2 Future Conditions with the Project (Year 2020)

Future (2020) With Project conditions represent the conditions of the roadways and intersections within the project area in the year 2020 if the proposed project were implemented.

Bicycle and Pedestrian Conditions

The bicycle and pedestrian facility improvements for the Future with Project scenario would be the same as those described for the Existing with Project scenario in **Section 3.2**. As described in Chapter 3.0, the proposed project would not result in any adverse bicycle or pedestrian safety impacts in the project area. Therefore, no bicycle and pedestrian safety mitigation measures are needed.

Vehicular Traffic Conditions

The "Future Conditions with the Project" scenario examines how implementation of the proposed project would affect motor vehicle traffic conditions along roadways segments and at intersections in the project area. The results of the roadway capacity and intersection capacity analyses are provided below.

Proposed Changes to Roadway Capacity

No roadway capacity changes are anticipated for the year 2020 besides the changes proposed by the proposed project. Therefore, the Future with Project scenario assumes the same roadway capacity changes as the Existing with Project scenario described in **Section 3.1.**

Roadway Capacity Analysis

To determine whether the proposed project meets City of San Diego criteria for acceptable traffic conditions on roadway segments, the roadway capacity analysis evaluates whether the proposed project would result in:

1. Volume-to-capacity ratio to increase by more than 0.02 for LOS E roadway segments or 0.01 for LOS F roadway segments; or
2. Traffic conditions on any roadway segment to worsen from LOS D or better to LOS E or LOS F.

Table 4-1 shows that the proposed project would not increase average daily traffic (ADT) or volume-to-capacity (V/C) ratio on any LOS E or LOS F segments in the project area. In addition, the proposed project would not cause any roadway segment in the project area to worsen from LOS D or better to LOS E or LOS F. With implementation of the proposed project, all roadway segments in the project area would meet City of San Diego criteria for acceptable traffic conditions based on future (2020) conditions. Therefore, no mitigation measures for traffic impacts are required.

Table 4-1 Roadway Segment Level of Service - Future Conditions without and with the Project

Segment	Volume (AADT)	Future Conditions Without Project				Future Conditions With Project				Change in V/C	Exceeds City of San Diego Criteria?
		Lanes	Capacity	V/C	LOS	Lanes	Capacity	V/C	LOS		
Pershing Drive											
Upas St. to Jacaranda Pl.	6900	2-L C(SM)	15000	0.46	B	2-L C SM	15000	0.46	B	0.00	No
Jacaranda Pl. to Redwood St.	11399	3-L C (CL)	22500	0.51	C	2-L C SM	15000	0.76	D	0.25	No
Redwood Pl. to Florida Dr./26th St.	15130	4-L MA	40000	0.38	B	2-L MA	20000	0.76	D	0.38	No
Florida Dr./26th St. to I-5 Ramps	36035	4-L MA	40000	0.90	E	4-L MA	40000	0.90	E	0.00	No
I-5 Ramps to North of B St.[1]	7200	3-L MA	30000	0.24	A	2-L MA	20000	0.36	A	0.12	No
North of B St. to B St.[1]	7200	4-L MA	40000	0.18	A	3-L MA	30000	0.24	A	0.06	No
17th Street											
B St. to C St.	2158	2-L C (OW)	15000	0.14	A	2-L C (OW)	15000	0.14	A	0.00	No
19th Street											
B St. to C St.	5158	2-L C (OW)	15000	0.34	B	1-L C (OW)	7500	0.69	D	0.34	No

Source: Appendix I.

Note:

1. North of B Street refers to the area Pershing Drive approximately 200 feet north of B Street where Pershing Drive's southbound leg expands to two travel lanes.

LOS = level of service
V/C = volume-to-capacity ratio
AADT = annual average daily traffic
OW = one-way

C = collector
MA = major arterial
CL = center, turn lane
SM = separated median

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Proposed Changes to Intersection Capacity

No intersection capacity changes are anticipated for the year 2020 besides the changes proposed by the project. Therefore, the Future with Project scenario assumes the same intersection capacity changes as the Existing with Project scenario described in **Section 3.1**.

Intersection Capacity Analysis

To determine whether the proposed project meets City of San Diego criteria for acceptable traffic conditions at intersections, the intersection capacity analysis evaluates whether the proposed project would result in:

1. An average delay increase of 2.0 or more seconds for intersections at LOS E or 1.0 or more seconds for intersections at LOS F; or
2. Traffic conditions at any intersection decreasing from LOS D or better to LOS E or LOS F.

Table 4-2 shows that the proposed project would not increase delay on any LOS E or LOS F intersections. For five of the eight intersections, overall control delay would decrease as a result of the proposed project. In addition, the proposed project would not cause any intersection in the project area to worsen from LOS D or better to LOS E or LOS F. With implementation of the proposed project, all intersections in the project area would meet City of San Diego criteria for acceptable traffic conditions based on future (2020) conditions. Therefore, no mitigation measures for traffic impacts are required.

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Table 4-2 Intersection Level of Service - Future Conditions without and with the Project

Intersection	Intersection Control	Future Conditions Without the Project		Intersection Control	Future Conditions With the Project		Change in Delay	Exceeds City of San Diego Criteria?
		Delay	LOS		Delay	LOS		
A.M. Peak Hour								
Pershing Dr. and Redwood St. Egress	MSS	78.5	F	RA	25.3	D	-53.2	No
Pershing Dr. and Redwood St. Ingress	MSS	0.2	A					
28th St. and Redwood St.	AWS	15.6	C	TC	8.7	A	-6.9	No
Pershing Dr. and Florida Dr./26th St.	Signal	>80.0[2]	F	TS	>80.0	F	0.0[3]	No
Pershing Dr./17th St. and B St.	MSS	>80.0[2]	F	AWS	50.8	F	-29.2	No
Pershing Dr./19th St. and B St.[1]	Signal	18.8	B	TS	24.7	C	5.9	No
17th St. and C St.	MSS	14.9	B	AWS	9.4	A	-5.5	No
19th St. and C St.	AWS	15.0	B	AWS	15.4	C	0.4	No
P.M. Peak Hour								
Pershing Dr. and Redwood St. Egress	MSS	19.3	C	RA	15.6	C	-3.7	No
Pershing Dr. and Redwood St. Ingress	MSS	1.8	A					
28th St. and Redwood St.	AWS	11.5	B	TC	7	A	-4.5	No
Pershing Dr. and Florida Dr./26th St.	Signal	86.2	F	TS	63.6	E	-22.6	No
Pershing Dr./17th St. and B St.	MSS	20.0	C	AWS	10.1	B	-9.9	No
Pershing Dr./19th St. and B St.	Signal	11.2	B	TS	17.1	B	5.9	No
17th St. and C St.	MSS	32.8	D	AWS	13	B	-19.8	No
19th St. and C St.	AWS	12.8	B	AWS	13.4	B	0.6	No

Source: Appendix J, Appendix K.

Notes:

1. The intersection of Pershing Drive/19th Street and B Street includes the addition of a diagonal bike crossing with a dedicated signal phase as part of the 'Existing with Project" conditions.
2. The equations for HCM were established with validation up to 80 seconds and are not validated beyond that threshold so reporting the exact seconds of delay for values greater than 80 would be utilizing the equations beyond their capability or intent.
3. The proposed project would decrease the amount of delay at the intersection of Pershing Dr. and Florida Dr./26th St. However, because the amount of delay would be greater than 80 seconds in both the "without Project" and "with Project" scenarios, the exact decrease in seconds of delay is not reported in the above table. As explained above, HCM equations are not validated for values higher than 80 seconds.

LOS = level of service | TS = Traffic Signal
MSS = Minor Street Stop | RA = Roundabout
AWS = All Way Stop | TC = Traffic Circle

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