Hillcrest Focused Plan Amendment

Mobility Technical Report

July 2024

Prepared By:

C+R ASSOCIATES

City of San Diego
Sustainability and Mobility Department

1.0 Executive Summary

The City of San Diego in conjunction with Chen Ryan Associates has prepared a mobility analysis of the proposed mobility improvements identified in the Hillcrest Focused Plan Amendment (FPA). The attached technical memos describe the quality of the environment for each of the four major travel modes. It is important to note that the industry has identified vehicle miles traveled as a way to measure the entire benefit of a transportation system; however, it is helpful to understand the benefits of each piece of the transportation system by understanding the tradeoffs and benefits of each mode of travel.

State law recognizes vehicle miles traveled (VMT) as the metric for analyzing the transportation system. The SANDAG Activity Based Model was used to measure the existing and future VMT with focused growth in the future for the FPA. Results from the travel modeling indicate that VMT per capita will be reduced. Hillcrest is already a walkable community where many choose to walk for their trips throughout the day, focusing growth in this area and making walking, biking, and transit more enjoyable, convenient, and accessible has proven to reduce vehicle miles traveled and has also been linked to a reduction of greenhouse gases and reduced risks of heart disease, stroke, diabetes, depression, and other public health issues.

1.1 Transportation Network Features

Each mobility network and planned improvement were selected to provide residents, employees, and visitors of all ages and abilities with more modal options primarily aimed at walking, biking, and transit as these are more sustainable modes of travel. More specifically, the planned improvements in the Hillcrest FPA will make transit reliable and more time-competitive with driving. In addition, low stress bicycle facilities connecting major destinations within the community to nearby neighborhoods and employment centers will encourage more people to cycle for some, if not all, of their daily trips. The Plan's strategically focused growth into mixed-use activity centers supports the City of Villages strategy which will facilitate more walking within the community, as destinations are placed in closer proximity and the quality of the walking environment is improved.

Some key features of the Hillcrest Focus Plan Amendment (FPA) are the complete street along University Avenue, one-way conversion along a portion of University Avenue and Robinson Avenue, as well as the Normal Street Promenade. The complete street along University Avenue will rebalance space along the roadway to provide for dedicated transit facilities, wider sidewalks with landscaping and pedestrian amenities, Class IV cycle tracks in each direction and two vehicular travel lanes converting the auto-centric roadway into public space that can be enjoyed by people taking different modes of transportation. Similar to complete streets, one-way streets help to best use street widths by organizing vehicular traffic for improved operation and circulation and by reducing vehicular and pedestrian conflicts. Along a portion of University Avenue and Robinson Avenue, the Hillcrest FPA plans to convert two roadways that are currently traversable in both directions for vehicles to one-way for the eastbound direction along a portion of Robinson Avenue and one-way for the westbound direction along a portion of University Avenue. This one-way conversion will complement the complete street and other multimodal connections in the community by accommodating cycling and transit within a narrower street width. Vehicles would only be able to operate in one direction on each of these street segments while bicyclists and transit would continue to operate in both directions. Pedestrians along these streets will benefit from reduced conflicts with vehicles at intersections and crossings, and the planned urban parkway will provide a wider sidewalk area in some locations with landscaping or street trees for buffer and shading. Prior to the implementation of the one-way couplet, it is recommended through a future capital improvement project to conduct a corridor study to evaluate detailed alternatives for the proposal, including operational analysis to determine queues and level of service, site access constraints, pedestrians and bicycle intersection improvements, transit operations (where applicable), as well as necessary environmental clearances. Lastly, the Normal Street Promenade is a focal point and highlight in the Uptown Community Plan as the promenade would repurpose a four-lane roadway into a two-lane roadway with a separated two-way cycle track and a public pedestrian promenade with street trees, decorative pavement, and expanded gathering spaces.

There are several existing City programs and groups that support mobility within this community. The Uptown Community Parking District (CPD), which includes Hillcrest, helps implement parking management strategies within the community. The Uptown CPD promotes multiple mobility options for residents, business patrons, employees, and visitors. The CPD has programs in place to manage parking supply and demand and contributes to mobility infrastructure in the community such as the Normal Street Promenade, landscaped buffers for the 4th and 5th Avenue cycle tracks, accessible curb ramps, and illuminated crossings to Balboa Park. In addition to the CPD, there are citywide programs that help to provide San Diegans with more mobility options and promote safe and convenient transportation choices. These programs and groups, in conjunction with the policies, land-use, and transportation facilities planned for the area will contribute to the attainment of Climate Action Plan goals.

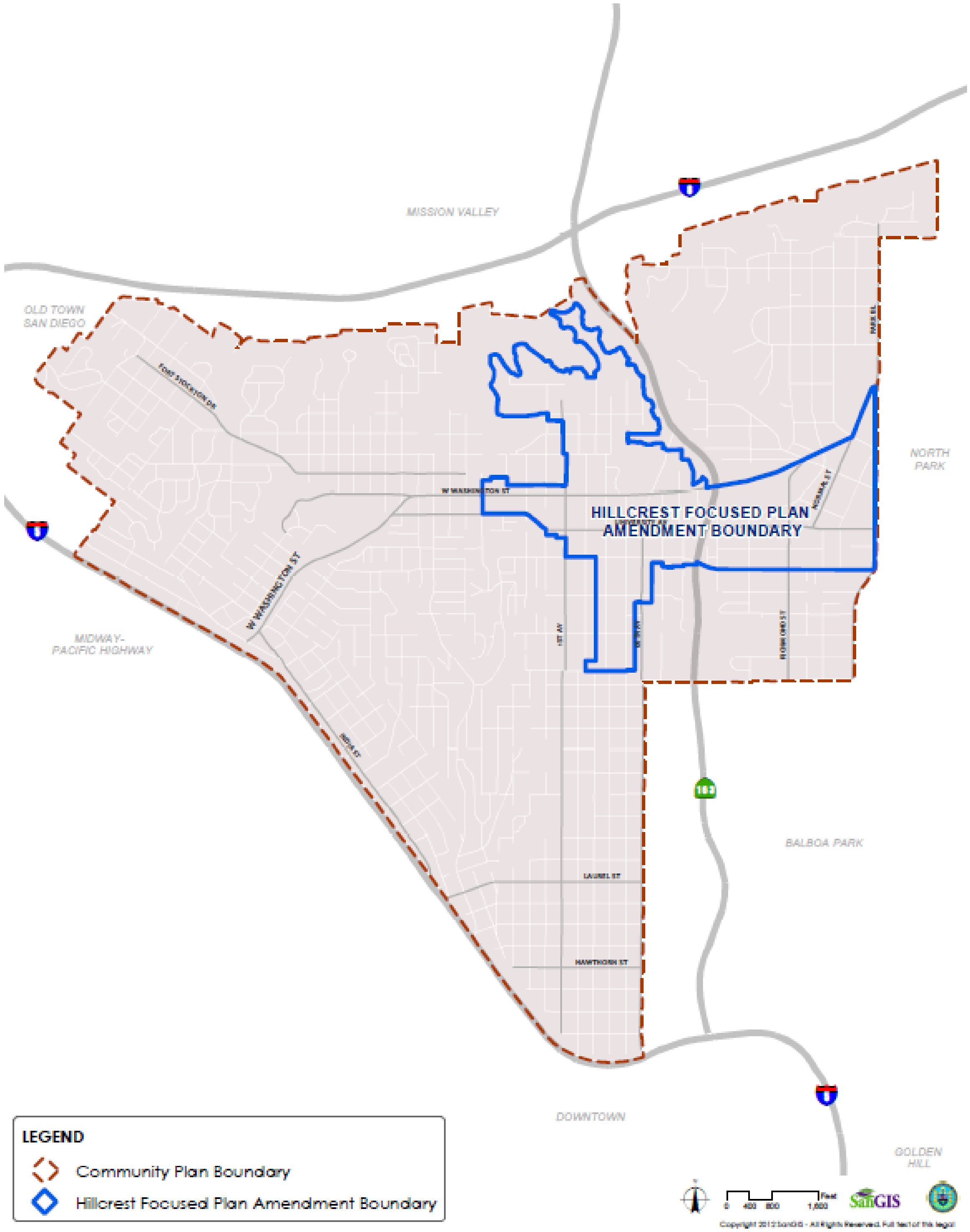
All of these planned improvements in the Hillcrest FPA, as well as existing programs and policies, will provide more mobility options for residents, employees, and visitors which can result in shifts to other modes of travel. Lastly, the benefit of placing more destinations within closer proximity encourages and facilitates more walking in support of the City of Villages strategy. All of which can reduce vehicle miles traveled and help meet mode share goals of the Climate Action Plan.

2.0 Background

The Uptown Community Plan was adopted on November 14, 2016, and provides the framework to guide development in the Uptown Community. Since the adoption there have been Council approved amendments to the 2016 Uptown Community Plan related to restoring proposed residential density at a specific site in the Bankers Hill neighborhood, addressing zoning and land use inconsistency that would allow the community plan density to match higher density allowed in the former Planned District and establishing a Community Plan Implementation Overlay Zone (CPIOZ) for residential areas within areas of the former MR 1500 zone in University Heights neighborhood.

In 2020 the City initiated the Hillcrest Focused Plan Amendment (FPA) to build upon the 2016 Uptown Community Plan to address housing, mobility and public space opportunities that can strengthen the business district and bring neighborhoods benefits where needed most. The FPA area encompasses approximately 380 acres of the Hillcrest and Medical Complex neighborhoods **(Figure 1)**. The FPA describes the community's vision and identifies strategies for enhancing public spaces, providing opportunities for new homes within mixed-use and residential areas, celebrating the cultural diversity and history of the LGBTQ+ community, identifying mobility opportunities that improve walking, rolling, biking and transit connections, promoting urban greening to address stormwater runoff and climate change and promoting local hospital and employment uses as economic drivers connected to regional transit. It also aligns with the City of San Diego's goals and policies detailed in the General Plan, Climate Action Plan, as well as state mandates on housing and mobility practices. After adoption, the Hillcrest FPA will be incorporated into the Uptown Community Plan.

Figure 1 – Hillcrest Focused Plan Amendment Boundary



2.1 Organization of the Report

This Mobility Technical Report summarizes the physical and operational conditions of the planned mobility system outlined in the Mobility Element. This report is one component of the Hillcrest FPA (Amendment to the Uptown Community Plan), identifying the planned mobility improvements culminating with an analysis of all travel modes under the proposed plan horizon year of 2050. The Proposed Plan is a strategy to address existing and forecast deficiencies related to the transportation system within the Hillcrest community. It also strives to improve personal mobility through a balanced, multimodal transportation network, which supports the updated land use vision for Hillcrest and aligns with the City's General Plan, Blueprint SD, and Climate Action Plan (CAP). The mobility system is comprised of roadway and freeway system, pedestrian and bicycle infrastructure, and public transit. The following Technical Memorandums comprise the Mobility Technical Report for the Hillcrest Focused Plan Amendment:

- **Technical Memo 1 – Active Transportation Analysis**
- **Technical Memo 2 – Transit and Traffic Operations Analysis**

Both technical memos analyze the planned mobility networks for separate modes of travel; however, the benefits of having several mobility options and a balanced multimodal transportation network can have greater impacts to the mobility system. **Technical Memo 2** builds off the Mobility Adjustment Tool that was developed to calibrate the regional travel forecast modeling results to conditions in the Hillcrest FPA. Documentation on the Mobility Adjustment Tool can be found in **Appendix B**.

Additionally, **Appendix A Existing Conditions Report** describes the methodology used to determine the study area and analyze the transportation system for the Hillcrest area. Since the adoption of the 2008 California Complete Streets Act (AB 1358), the City of San Diego has employed multimodal analysis procedures to assess mobility needs for pedestrians, cyclists, and transit users.

Appendix A – Existing Conditions Report

3900 5th Avenue, Suite 310 ◆ San Diego, CA 92103 ◆ 619-795-6086
www.CRAmobility.com

Existing Mobility Assessment

Hillcrest Focused Plan Amendment

Table of Contents

Appendices

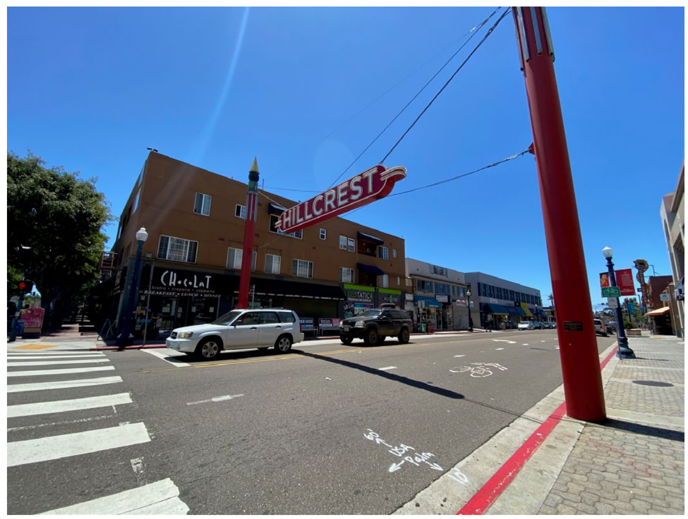
List of Tables

List of Figures

1.0 Existing Conditions

Hillcrest is located two miles north of Downtown San Diego. It is just over a half square mile in area and is bisected by the State Route (SR) 163 freeway. It is one of several distinct neighborhoods within the Uptown Community Planning Area. An update to Uptown Community Plan was adopted by City Council on November 2016 and was last amended in June 2018. The current Hillcrest Focused Amendment effort is to prepare a focused plan amendment for the Hillcrest neighborhood to provide additional housing capacity and to build upon the mobility recommendations of the current Uptown Plan.

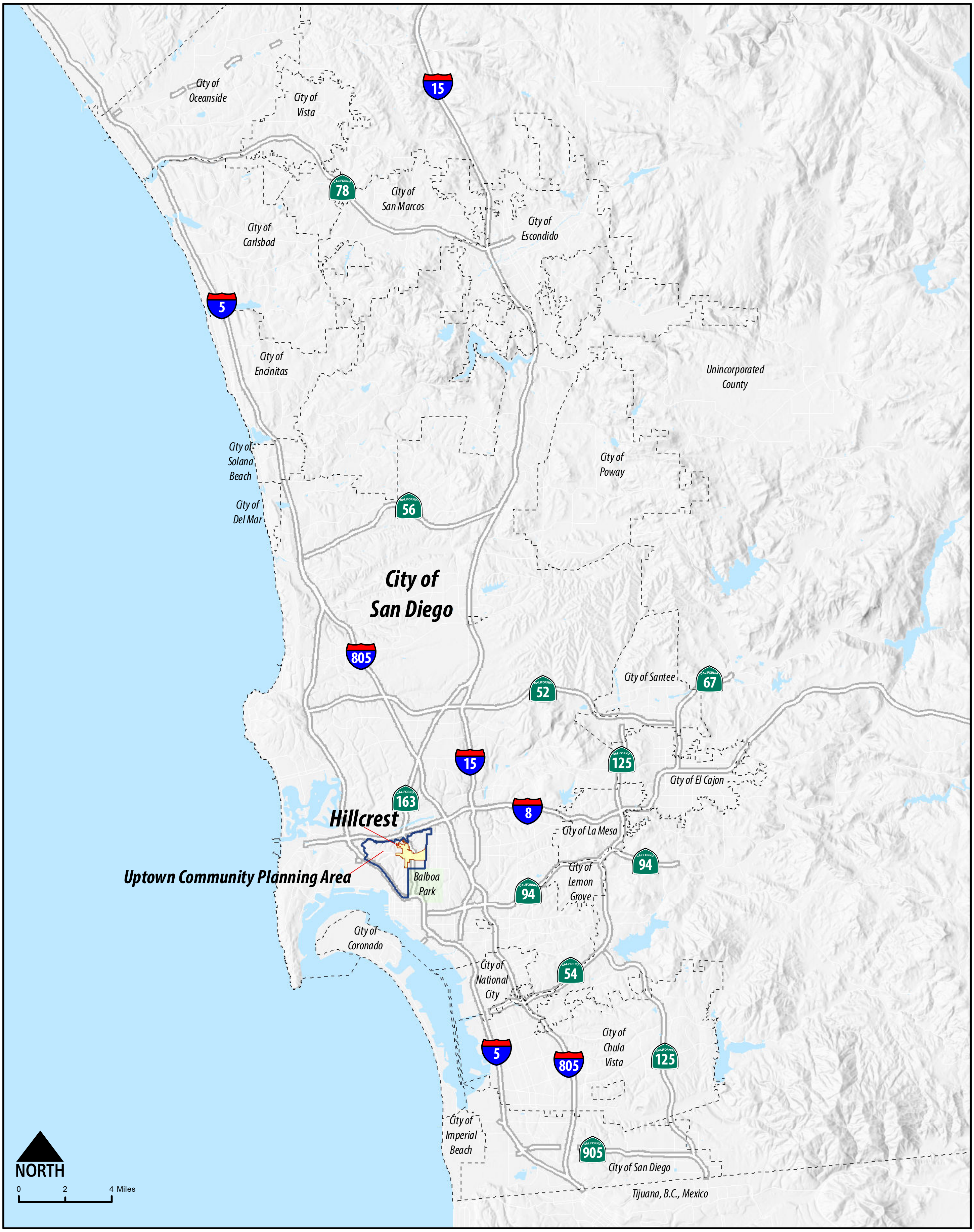
Figure 1-1 shows the location of the Hillcrest Focused Plan Amendment study area within the San Diego region, while **Figure 1-2** illustrates the study area extent, as well as location of the study roadway segments and intersections.



This chapter describes activity patterns and analyzes the quality and performance of facilities for all core modes of transportation in Hillcrest, including pedestrian, bicycling, public transportation, and vehicular. The contributions provided by various emerging mobility products such as shared micro-mobility, ride-hailing services, and dynamic curbside management will also be assessed as a part of this planning effort. The various methodologies utilized to analyze the Hillcrest Focused Plan Amendment study area mobility network are included in **Appendix A**. Since the adoption of the 2008 California Complete Streets Act (AB 1358), the City of San Diego has employed multimodal analysis procedures to assess mobility needs for pedestrians, cyclists, and transit users.

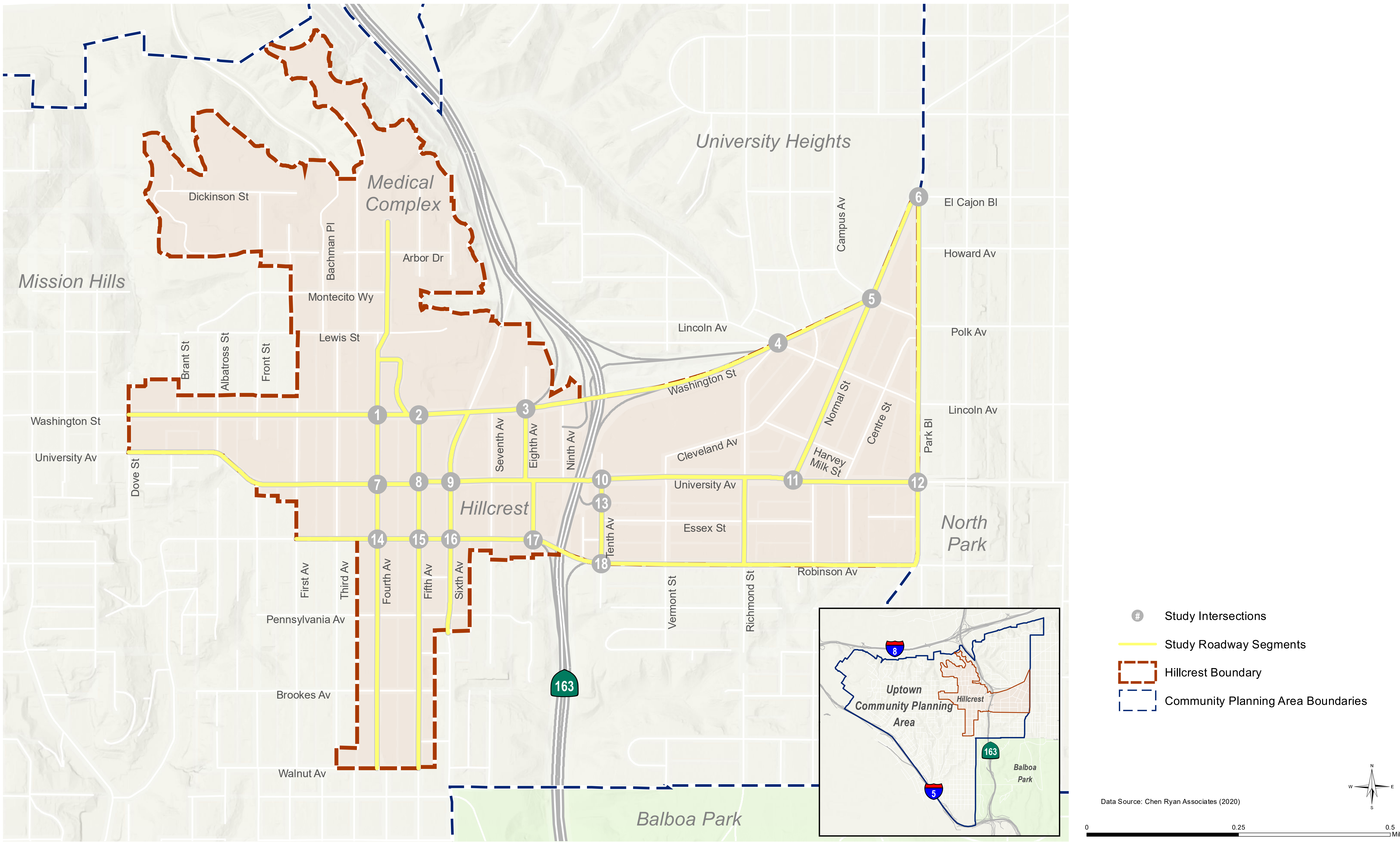
1.1 Pedestrian Mobility

Every trip taken, regardless of primary travel mode, begins and ends as a pedestrian. Ensuring adequate pedestrian access and quality facilities helps contribute to a safe and comfortable walking environment. The degree to which people walk for transportation and leisure is influenced by the comfort, safety, and pleasantness of the walking environment. Pedestrian comfort is influenced by factors including separation from vehicular traffic, adequate and accessible facilities, topography, and climate. Safety is influenced by factors including speed and volume of vehicular traffic, crossing distances and street widths, traffic control, number of conflict points, and infrastructure design. A pleasant walking environment may be influenced by many subjective factors, however directness and proximity to destinations are also objectively influential. Connectivity provides directness and diversity of land uses enhances proximity to destinations.



Hillcrest Focused Plan Amendment
Existing Mobility Assessment
CHEN RYAN

Figure 1-1
Hillcrest within the Region



University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Normal St
Centre St
Harvey Milk St
Park Bl
Campus Av
El Cajon Bl
Howard Av
Polk Av
163
Uptown Community Planning Area
Balboa Park
8
5
Study Intersections
Study Roadway Segments
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

2008 City of San Diego General Plan Mobility Element – Walkability Goals:

- *A city where walking is a viable travel choice, particularly for trips of less than one-half mile.*
- *A safe and comfortable pedestrian environment.*
- *A complete, functional, and interconnected pedestrian network, that is accessible to pedestrians of all abilities.*
- *Greater walkability achieved through pedestrian friendly streets, sites and building design.*

The City of San Diego increased its emphasis on the role of pedestrian mobility in the future with the adoption of its Climate Action Plan (CAP) in December 2015. The CAP sets a target to "achieve walking commuter mode share of 4% by 2020 and 7% by 2035 in Citywide Transit Priority Areas". Transit Priority Areas (TPAs) include areas within one-half mile of existing or planned rail stations or bus stops served by two or more high frequency bus routes, each having a frequency of service of 15 minutes or less during the morning and afternoon peak commute periods. Hillcrest is entirely within the existing TPA coverage of the City.

1.1.1 Pedestrian Demand

A snapshot of pedestrian demand was developed utilizing the City of San Diego Pedestrian Priority Model, commute mode share data from the American Community Survey, and peak period pedestrian counts.

Figure 1-3 displays the City's Pedestrian Priority Model within Hillcrest and the surrounding area. The model is a composite of three submodels, including trip attractors, trip generators, and trip detractors. The pedestrian attractor and generator submodels approximate latent demand for pedestrian activity. The demand submodels combine with the detractor submodel (approximating barriers to walking), to signify areas in the City of the greatest pedestrian priority or need.

As shown, the entire study area is shaded in red, orange, and yellow – which is above the citywide Pedestrian Priority Model average score. Most of the Hillcrest village area, between Washington Street and University Avenue, as well as Medical Complex subarea west of Fourth Avenue, measure in the highest (symbolized in red) category of the model.

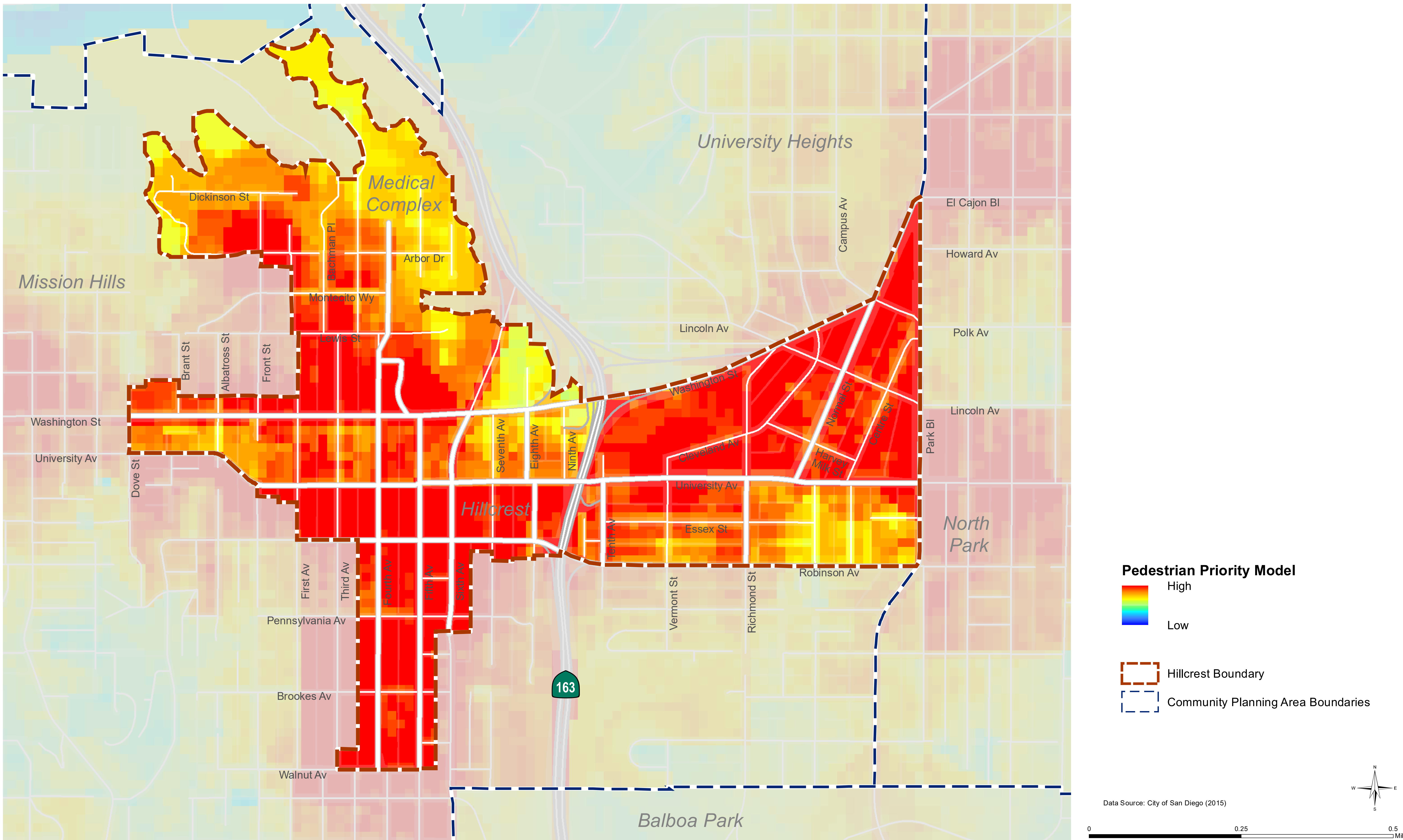

University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Pedestrian Priority Model
High
Low
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: City of San Diego (2015)
0
0.25
0.5
Miles

Table 1-1 provides a comparison of pedestrian commute mode share between Hillcrest, the City and the San Diego County region. Hillcrest has a pedestrian commute mode share of 6.5%, which is more than twice as high as the citywide pedestrian commute mode share. Hillcrest's 6.5% pedestrian mode share is above the CAP's year 2020 mode share goal of 4% for Citywide TPAs and almost meets the year 2035 goal of 7%.

Table 1-1 Pedestrian Commute Mode Share Comparison

	Hillcrest	City of San Diego	San Diego County
Total Pedestrian Commuters	286	21,680	46,313
Total Workers	4,373	714,312	1,603,486
Pedestrian Commute Mode Share	6.5%	3.0%	2.9%

Source: US Census, 2018 American Community Survey 5-Year Estimates

Figure 1-4 displays AM, midday, and PM peak period pedestrian movements observed at study intersections. Counts were conducted on weekdays of typical conditions in February of 2020, from 7 AM to 9 AM, 11 AM to 1 PM, and 4 PM to 6 PM, representing AM, midday, and PM peak periods, respectively. Data collection count sheets for each study intersection are provided in **Appendix B**. **Table 1-2** summarizes the pedestrian volumes counted during the AM, PM and midday peak periods crossing the street at the 18 study intersections within the community.

Table 1-2 Existing AM / Midday / PM Peak Period Pedestrian Counts

Intersection	AM Peak	Midday	PM Peak	Combined Peak
1: Fourth Avenue & Washington Street	242	262	462	966
2: Fifth Avenue & Washington Street	220	261	372	853
3: Eighth Avenue / SR-163 SB Off-Ramp & Washington Street	32	34	58	124
4: SR-163 On-Ramp / Richmond Street & Washington Street	1	0	1	2
5: Normal Street / Washington Street & Campus Avenue / Polk Avenue	66	54	86	182
6: Park Boulevard & Normal Street / El Cajon Boulevard	50	47	134	231
7: Fourth Avenue & University Avenue	273	332	638	1,243
8: Fifth Avenue & University Avenue	356	426	834	1,616
9: Sixth Avenue & University Avenue	180	285	500	965
10: Tenth Avenue & University Avenue	218	251	558	1,027
11: Normal Street & University Avenue	102	150	261	513
12: Park Boulevard & University Avenue	289	238	435	962
13: Tenth Avenue & SR-163 NB On-Ramp	46	64	136	246
14: Fourth Avenue & Robinson Avenue	209	245	404	858
15: Fifth Avenue & Robinson Avenue	290	320	653	1,263
16: Sixth Avenue & Robinson Avenue	106	169	245	520
17: Eighth Avenue / SR-163 SB On-Ramp & Robinson Avenue	77	55	106	238
18: Tenth Avenue / SR-163 NB Off-Ramp & Robinson Avenue	63	50	104	217

Source: Counts Unlimited Inc., February 2020

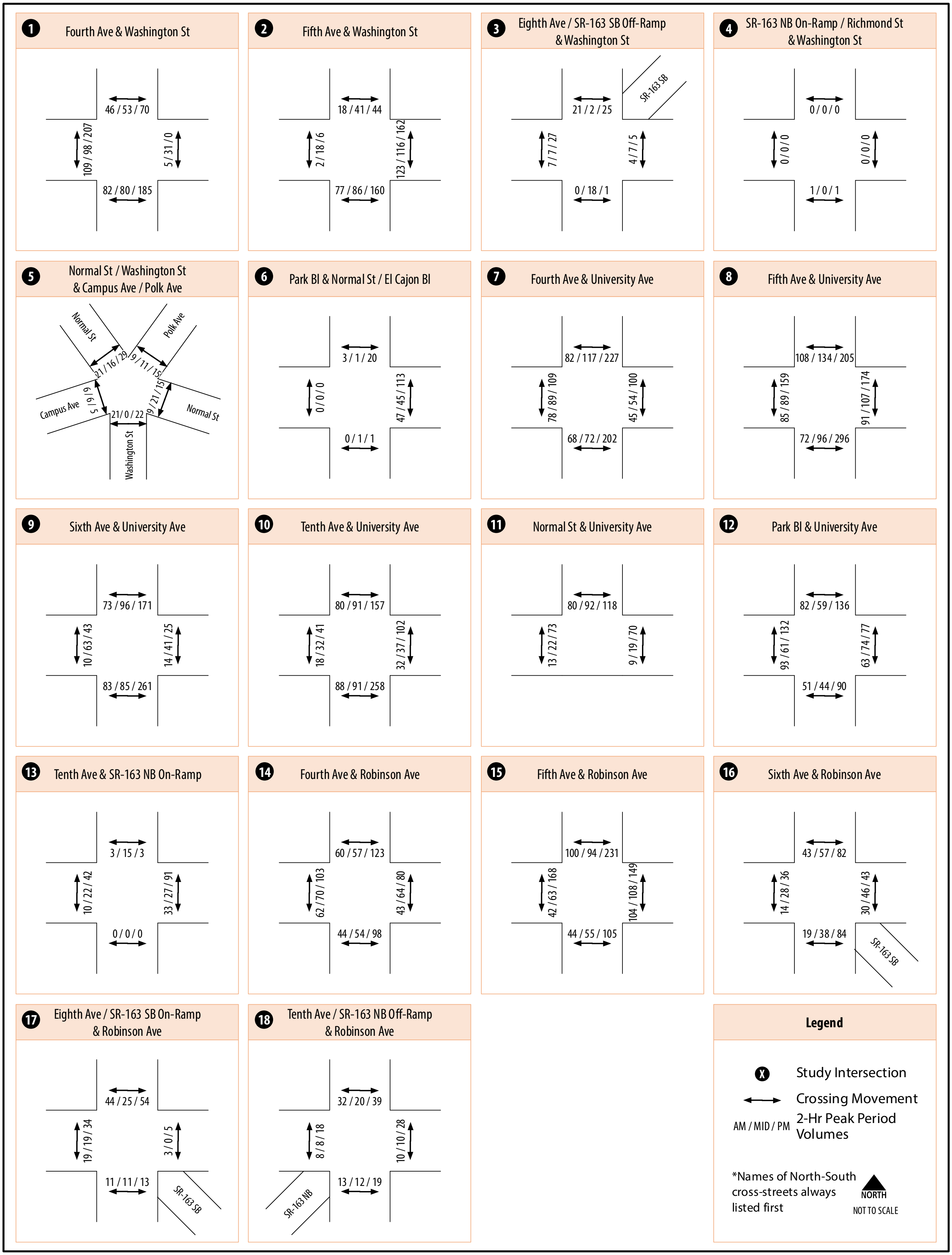


Figure 1-4
Existing Peak Period Pedestrian Counts

Intersections with the greatest observed combined pedestrian crossings during the three peak periods include the following nine (9) locations:

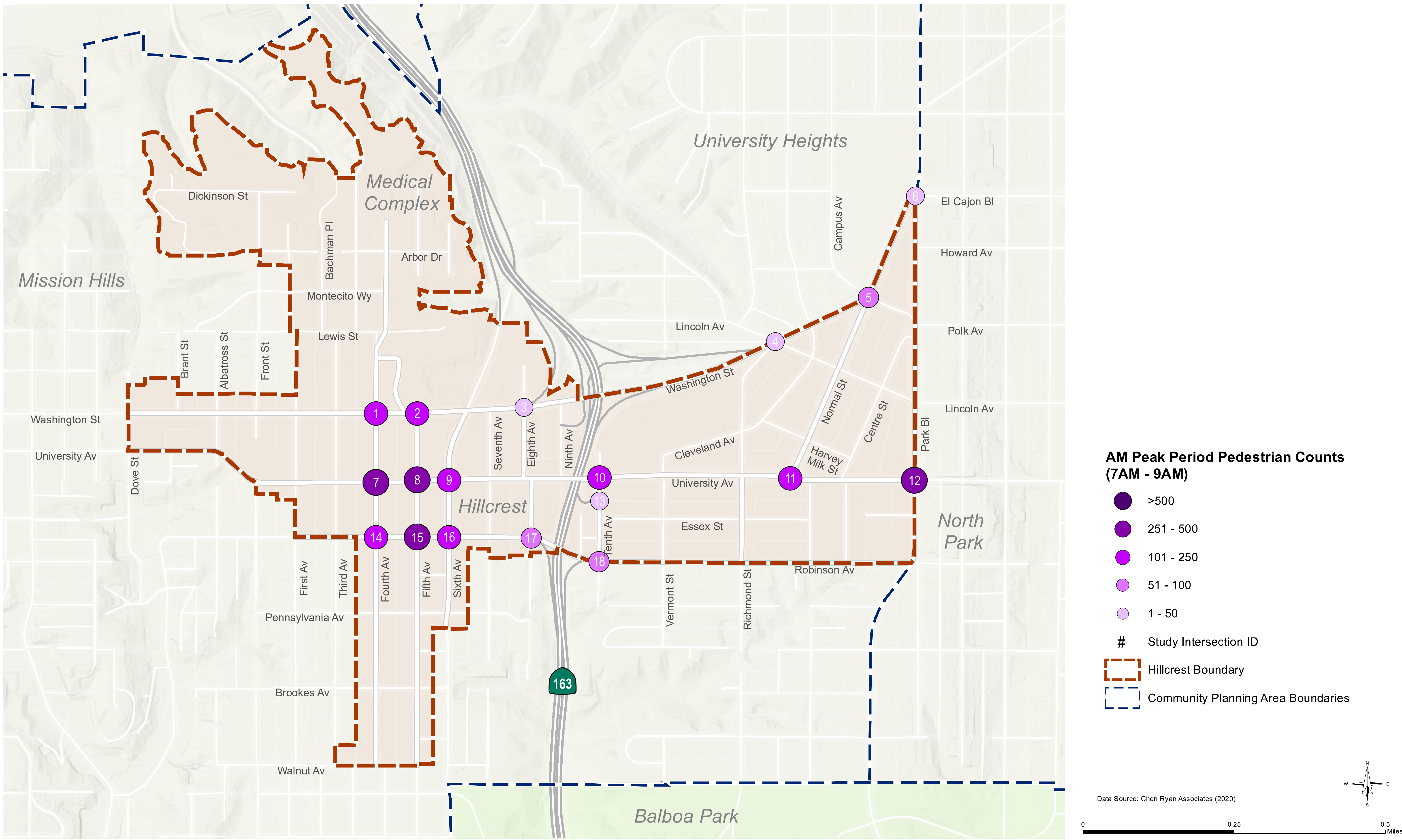
- #1: Fourth Avenue and Washington Street (966)
- #2: Fifth Avenue and Washington Street (853)
- #7: Fourth Avenue and University Avenue (1,243)
- #8: Fifth Avenue and University Avenue (1,616)
- #9: Sixth Avenue and University Avenue (965)
- #10: Tenth Avenue and University Avenue (1,027)
- #12: Park Boulevard and University Avenue (962)
- #14: Fourth Avenue & Robinson Avenue (858)
- #15: Fifth Avenue and Robinson Avenue (1,263)

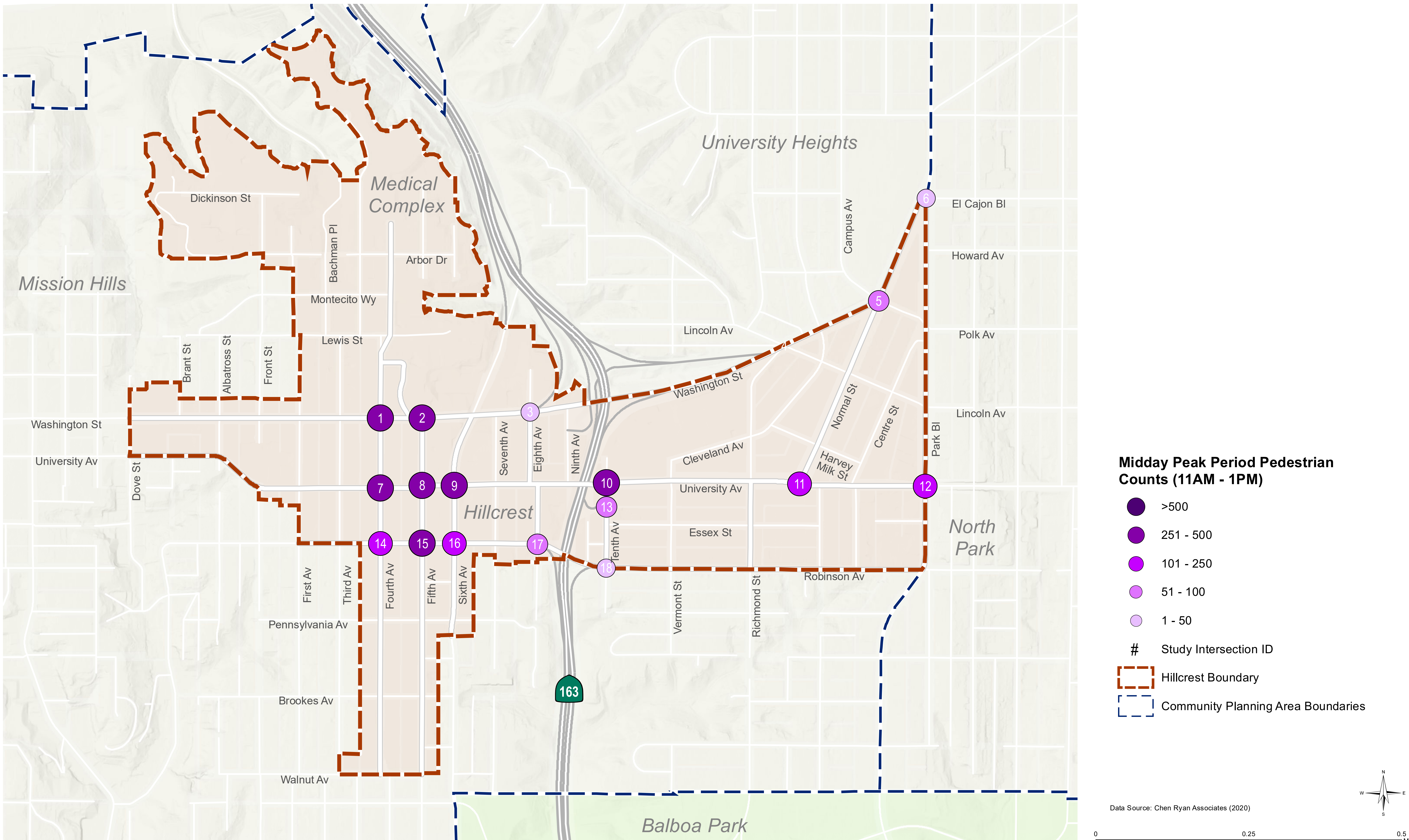
The busiest period for pedestrian crossing activity throughout the community occurs during the PM peak. The PM peak volumes nearly amount to the combined AM peak and midday totals. Notably, midday peak pedestrian activity in Hillcrest is greater than activity during the AM peak period. This could be explained by the community's concentration of restaurant and retail. Typically, the activity peaks of these destinations are closer aligned to the midday and PM periods.

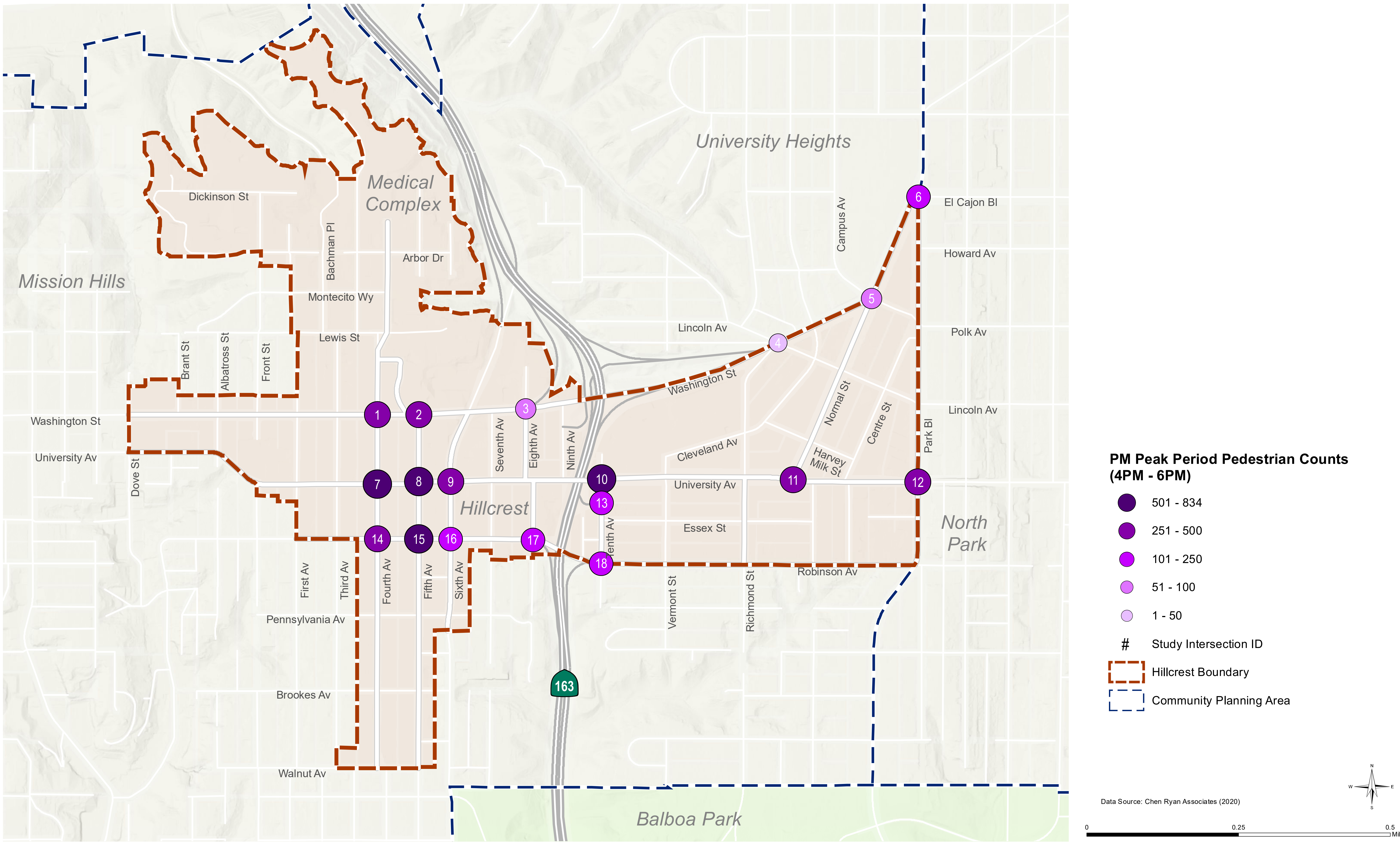
Figures 1-5A, **1-5B**, and **1-5C** display the locations of the 18 study intersections and their levels of pedestrian crossing activity during the AM, midday, and PM peak periods. Activity during each of the peak periods is strong in the Hillcrest village area from Washington Street to Robinson Avenue bounded between Fourth Avenue and Sixth Avenue. Outside of the Hillcrest village area, University Avenue also has high pedestrian volumes at intersections east of SR-163.

1.1.2 Pedestrian Safety

The City of San Diego is implementing a Safe Systems approach to help achieve the Vision Zero initiative. The Safe Systems approach is to evaluate, plan, and design a transportation system which eliminates fatalities and severe injuries despite human mistakes. This approach applies to each of the core transportation modes. Collision history within Hillcrest was examined to evaluate pedestrian safety. A collision dataset was obtained from the Transportation Injury Mapping System (TIMS), an open data service provided by Safe Transportation Research and Education Center at University of California, Berkeley, for injury traffic collisions occurring between the years between 2014 and 2018.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
AM Peak Period Pedestrian Counts (7AM - 9AM)
>500
251 - 500
101 - 250
51 - 100
1 - 50
Study Intersection ID
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5 Miles


Midday Peak Period Pedestrian Counts (11AM - 1PM)
>500
251 - 500
101 - 250
51 - 100
1 - 50
Study Intersection ID
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles
University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
1
2
3
5
6
7
8
9
10
11
12
13
14
15
16
17
18


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Normal St
Centre St
Harvey Milk St
Park Bl
Campus Av
El Cajon Bl
Howard Av
Polk Av
163
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
PM Peak Period Pedestrian Counts (4PM - 6PM)
501 - 834
251 - 500
101 - 250
51 - 100
1 - 50
Study Intersection ID
Hillcrest Boundary
Community Planning Area
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

A total of 90 pedestrian-involved collisions resulting in injury were reported during this five-year period. **Figure 1-6** displays the where the collision locations occurred and where the pedestrian systemic safety hotspots are located. **Table 1-3** identifies the leading collision locations within the community.

Table 1-3 Most Frequent Pedestrian Collision Locations: 2014 – 2018

Rank	Intersection	Frequency
1	Third Avenue & Washington Street	5
1	Fourth Avenue & Robinson Avenue	5
1	Fifth Avenue & Washington Street	5
4	Fourth Avenue & University Avenue	4
4	Richmond Street & University Avenue	4
4	Park Boulevard & University Avenue	4
7	Front Street & Washington Street	3
7	Tenth Avenue & University Avenue	3
7	Sixth Avenue & Pennsylvania Avenue	3

Source: Transportation Injury Mapping System (TIMS)

Table 1-4 summarizes the primary collision causes for the 90 pedestrian-involved injury collisions in Hillcrest. Motorists failing to yield violating the pedestrian's right-of-way occurred in over one-third of the collisions. This was most the commonly attributed primary cause of all pedestrian-involved collisions occurring during the five-year period. Pedestrians violating the motorist's right-of-way ("pedestrian violation") was the close second leading cause, occurring 31% of the time. The third leading cause was motorist improper turning, which occurred in just over 10% of collisions involving pedestrians.

Table 1-4 Pedestrian Collision Primary Causes: 2014 –2018

Collision Primary Cause	Frequency	Percent of Total
Pedestrian Right-of-Way Violation	31	34.5%
Pedestrian Violation	28	31.1%
Improper Turning	10	11.1%
Not Stated	5	5.6%
Traffic Signals or Signs	5	5.6%
Unsafe Starting or Backing	4	4.4%
Unknown	3	3.3%
Automobile Right-of-Way Violation	2	2.2%
Unsafe Speed	1	1.1%
Wrong Side of Road	1	1.1%
Total	**90**	**100.0%**

Source: Transportation Injury Mapping System (TIMS)

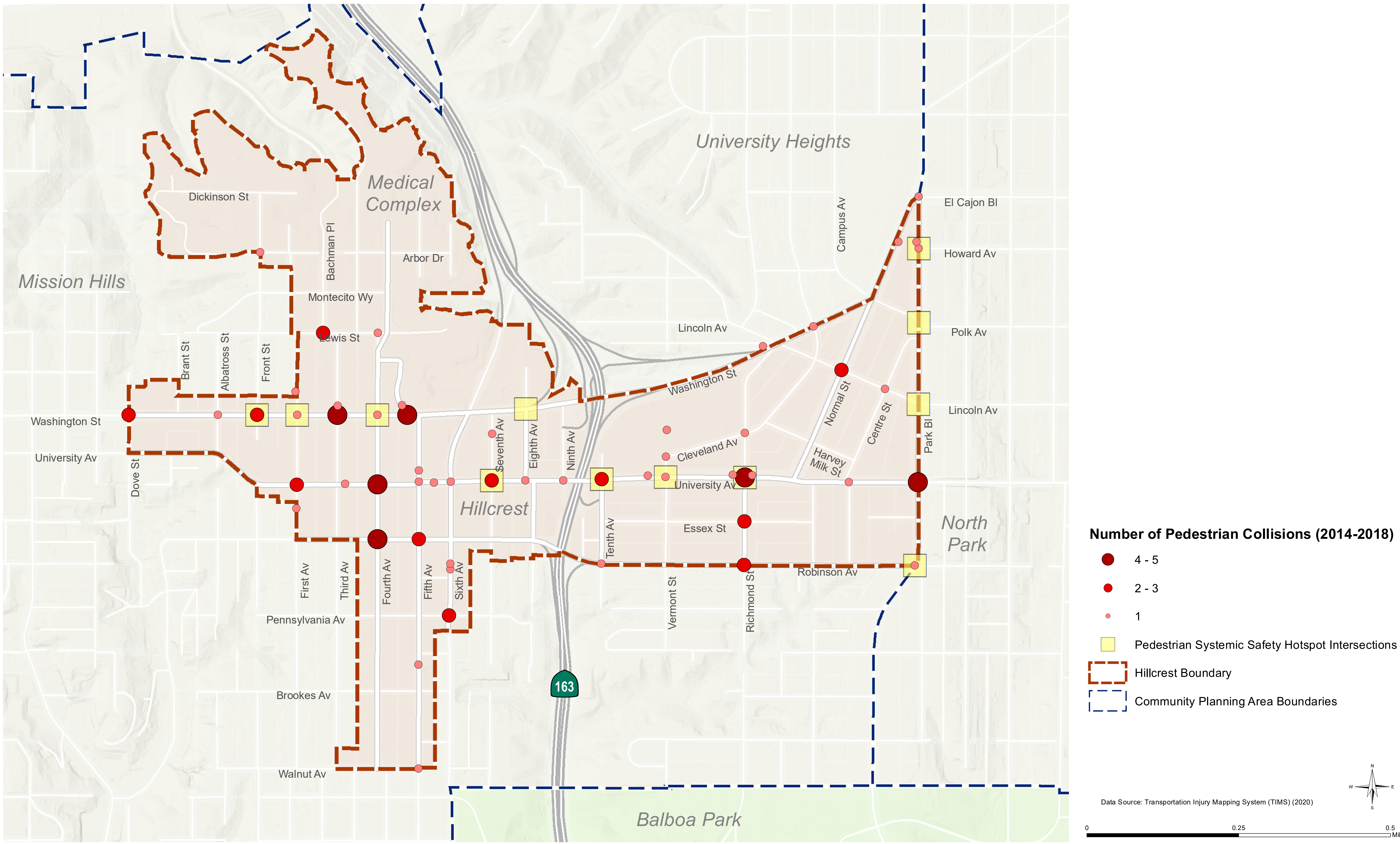

University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Centre St
Harvey Milk St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Number of Pedestrian Collisions (2014-2018)
4 - 5
2 - 3
1
Pedestrian Systemic Safety Hotspot Intersections
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Transportation Injury Mapping System (TIMS) (2020)
0
0.25
0.5
Miles

Table 1-5 categorizes the 90 collisions by their worst injury outcome. As shown, three fatality and four severe injury collisions occurred during the five-year period.

Table 1-5 Pedestrian Injury Severity by Outcome: 2014 – 2018

Collision Severity	Frequency	Percent of Total
Other Visible Injury	45	50.0%
Complaint of Pain	38	42.2%
Severe Injury	4	4.4%
Fatal	3	3.3%
Total	**90**	**100.0%**

Source: Transportation Injury Mapping System (TIMS)

The locations where pedestrian fatalities or severe injuries resulted occurred at:

- Richmond Street and Essex Street
- University Avenue, 150' west of Vermont Avenue
- Fifth Avenue, 100' north of Brookes Avenue
- Third Avenue and Washington Street
- Third Avenue, 50' north of Washington Street
- Richmond Street and University Avenue
- University Avenue, 100' west of Richmond Street

Table 1-6 summarizes pedestrian-involved collisions by party-at-fault. As shown, the driver was at-fault in 62% of the report collisions during the five-year period. Pedestrians were at-fault roughly one-third of the collisions. Two of the 90 pedestrian-involved collisions were between a cyclist and a pedestrian. In both instances, the cyclist was at fault.

Table 1-6 Pedestrian Collision Party Fault: 2014 – 2018

Party	Frequency	Percent of Total
Driver	56	62.3%
Pedestrian	31	34.4%
Bicyclist	2	2.2%
Unknown	1	1.1%
Total	**90**	**100.0%**

Source: Transportation Injury Mapping System (TIMS)

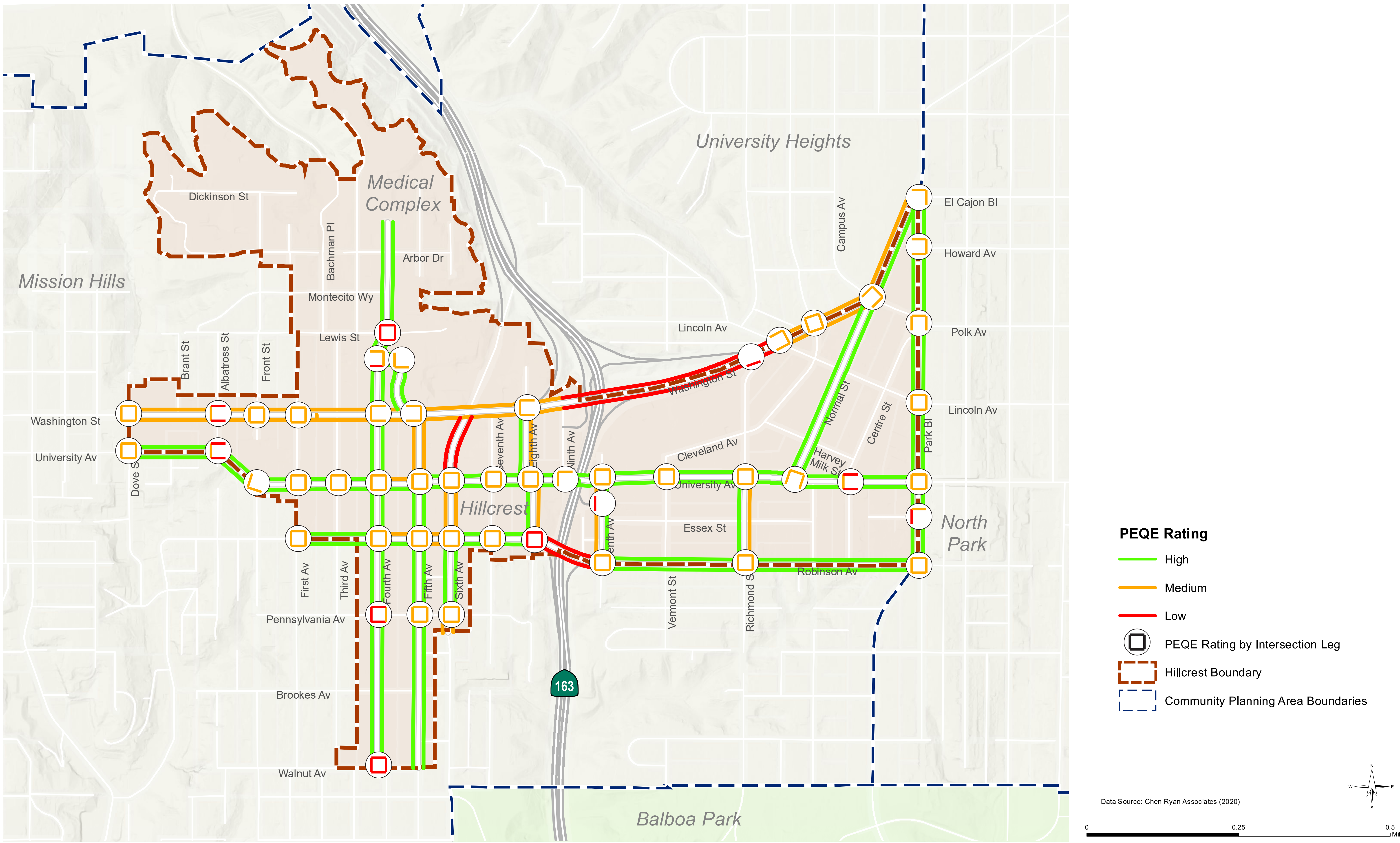
1.1.3 Pedestrian Environment Quality Evaluation (PEQE)

Pedestrian Environment Quality Evaluation (PEQE) provides an assessment of pedestrian facilities within the study area, measuring the quality of pedestrian conditions along roadway (midblock) segments and at select intersection crossings. PEQE segment evaluation and crossing evaluation each consider different inputs that are specific to those realms. Segment analysis criteria includes horizontal and vertical separation between the pedestrian and vehicular traffic, presence and type of street lighting, walkway accessibility, and the posted speed limit of the adjacent roadway. Intersection analysis criteria includes types of traffic control, physical features that serve as safety mechanisms (e.g. crosswalk features, curb extensions, advanced stop bars), types of operational features at the intersection (e.g. pedestrian countdown signals, pedestrian lead intervals, right turn on red restrictions, additional pedestrian signage), and presence of ADA standard curb ramps.

PEQE results for the study area within Hillcrest are shown in **Figure 1-7**. The pedestrian environmental quality along roadway segments and select crossing locations are classified as Low, Medium, or High quality based on the characteristics above as applied using PEQE methodology.

As shown, low-scoring roadway segments occurred along three segments in the community, each at a location that interfaces with SR-163: Washington Street between Ninth Avenue and Lincoln Avenue; Robinson Avenue between Eighth Avenue and Tenth Avenue; and Sixth Avenue, north of University Avenue.

The University Avenue, Robinson Avenue (excluding Eighth Avenue to Tenth Avenue), Fourth Avenue, Fifth Avenue, and Park Boulevard segments typically scored high. Washington Street segments (excluding Ninth Avenue to Lincoln Avenue) typically scored medium. PEQE criteria input tables for the Hillcrest study area are provided in **Appendix C**.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Lincoln Av
Campus Av
El Cajon Bl
Howard Av
Polk Av
Normal St
Centre St
Park Bl
Cleveland Av
Harvey Milk St
Essex St
Robinson Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Vermont St
Richmond St
Pennsylvania Av
Brookes Av
Walnut Av
163
PEQE Rating
High
Medium
Low
PEQE Rating by Intersection Leg
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles
N
W
E
S

PEQE analysis results for roadway segments are presented in **Table 1-7**. Segments with low scores were typically influenced by lack of walkway accessibility (missing sidewalk or obstructions of the clear pedestrian zone). High scoring segments were typically bolstered by large horizontal and vertical separation provided from sidewalk buffers and on-street parking, as well as slower posted speed limits.

Table 1-7 PEQE Roadway Segment Analysis Results

Roadway	To	From	Northside / Eastside		Southside / Westside	
			Score	Grade	Score	Grade
Washington Street	Western Hillcrest Boundary	Fourth Avenue	6	Medium	6	Medium
Washington Street	Fourth Avenue	Fifth Avenue	4	Medium	6	Medium
Washington Street	Fifth Avenue	Eighth Avenue	4	Medium	4	Medium
Washington Street	Eighth Avenue	Ninth Avenue	6	Medium	6	Medium
Washington Street	Ninth Avenue	SR-163 NB Off-Ramp	1	Low	1	Low
Washington Street	SR-163 NB Off-Ramp	Richmond Street	1	Low	1	Low
Washington Street	Richmond Street	Campus Avenue / Polk Avenue	4	Medium	4	Medium
University Avenue	Western Hillcrest Boundary	Fourth Avenue	7	High	7	High
University Avenue	Fourth Avenue	Fifth Avenue	6	Medium	8	High
University Avenue	Fifth Avenue	Sixth Avenue	8	High	8	High
University Avenue	Sixth Avenue	Tenth Avenue	7	High	7	High
University Avenue	Tenth Avenue	Richmond Street	8	High	8	High
University Avenue	Richmond Street	Normal Street	8	High	8	High
University Avenue	Normal Street	Park Boulevard	8	High	8	High
Robinson Avenue	Western Hillcrest Boundary	Fourth Avenue	7	High	7	High
Robinson Avenue	Fourth Avenue	Fifth Avenue	5	Medium	7	High
Robinson Avenue	Fifth Avenue	Sixth Avenue	5	Medium	5	Medium
Robinson Avenue	Sixth Avenue	SR-163 SB Ramps	7	High	7	High
Robinson Avenue	SR-163 SB Ramps	Tenth Avenue	2	Low	2	Low
Robinson Avenue	Tenth Avenue	Park Boulevard	7	High	7	High
Normal Street	El Cajon Blvd	Washington Avenue	7	High	6	Medium
Normal Street	Washington Avenue	University Avenue	7	High	7	High
Fourth Avenue	Northern Terminus	Washington Avenue	7	High	7	High
Fourth Avenue	Washington Avenue	University Avenue	8	High	8	High
Fourth Avenue	University Avenue	Robinson Avenue	8	High	8	High
Fourth Avenue	Robinson Avenue	Southern Hillcrest Boundary	7	High	7	High

Table 1-7 PEQE Roadway Segment Analysis Results

Roadway	To	From	Northside / Eastside		Southside / Westside	
			Score	Grade	Score	Grade
Fifth Avenue	Fourth Avenue	Washington Avenue	7	High	7	High
Fifth Avenue	Washington Avenue	University Avenue	6	Medium	6	Medium
Fifth Avenue	University Avenue	Robinson Avenue	8	High	8	High
Fifth Avenue	Robinson Avenue	Southern Hillcrest Boundary	7	High	7	High
Sixth Avenue	Washington Avenue	University Avenue	1	Low	1	Low
Sixth Avenue	University Avenue	Robinson Avenue	6	Medium	6	Medium
Sixth Avenue	Robinson Avenue	Pennsylvania Avenue	7	High	7	High
Sixth Avenue	Pennsylvania Avenue	Southern Hillcrest Boundary	5	Medium	5	Medium
Eighth Avenue	Washington Avenue	University Avenue	6	Medium	7	High
Eighth Avenue	University Avenue	Robinson Avenue	6	Medium	7	High
Tenth Avenue	University Avenue	Robinson Avenue	7	High	6	Medium
Richmond Street	Washington Avenue	University Avenue	6	Medium	8	High
Park Boulevard	El Cajon Boulevard	University Avenue	7	High	7	High
Park Boulevard	University Avenue	Robinson Avenue	7	High	7	High

Intersection PEQE analysis results are provided in **Table 1-8**. No crossings scored in the high category. Medium scoring crossings, where they occurred, were aided by physical or operational features at the intersection, such as high-visibility continental crosswalks, advanced stop bars, or pedestrian countdown signals. Hillcrest is also one of the few places in the City with lead pedestrian intervals at select traffic signals, which allow pedestrians crossing the street a brief head start prior to the signal turning green for motorists. Low scoring crossings occurred in locations with no upgraded physical or operational crossing features present, or non-ADA-compliant curb ramps.

Table 1-8 PEQE Intersection Analysis Results

#	Intersection	North Leg		South Leg		East Leg		West Leg	
		Score	Grade	Score	Grade	Score	Grade	Score	Grade
1	Fourth Avenue & Lewis Street	3	Low	3	Low	3	Low	3	Low
2	Fourth Avenue & Fifth Avenue	4	Medium	1	Low	4	Medium	N/A	N/A
3	Fifth Avenue & Scripps Mercy Hospital Entrance	N/A	N/A	4	Medium	N/A	N/A	4	Medium
4	Dove Street & Washington Street	6	Medium	6	Medium	6	Medium	5	Medium
5	Albatross Street & Washington Street	3	Low	3	Low	N/A	N/A	4	Medium
6	Front Street & Washington Street	6	Medium	6	Medium	6	Medium	6	Medium
7	First Avenue & Washington Street	6	Medium	6	Medium	6	Medium	6	Medium
8	Fourth Avenue & Washington Street	6	Medium	5	Medium	N/A	N/A	5	Medium

Table 1-8 PEQE Intersection Analysis Results

#	Intersection	North Leg		South Leg		East Leg		West Leg	
		Score	Grade	Score	Grade	Score	Grade	Score	Grade
9	Fifth Avenue & Washington Street	6	Medium	6	Medium	6	Medium	N/A	N/A
10	Eighth Avenue/SR- 163 Off-Ramp & Washington Street	5	Medium	4	Medium	N/A	N/A	4	Medium
11	Lincoln Avenue & Washington Street	5	Medium	4	Medium	4	Medium	N/A	N/A
12	Richmond Street/SR- 163 On-Ramp & Washington Street	N/A	N/A	2	Low	N/A	N/A	N/A	N/A
13	Cleveland Avenue & Washington Street	4	Medium	4	Medium	4	Medium	4	Medium
14	Campus Avenue/Polk Avenue & Washington Street/Normal Street	5	Medium	4	Medium	4	Medium	N/A	N/A
15	Park Boulevard & Normal Street/El Cajon Boulevard	5	Medium	N/A	N/A	5	Medium	N/A	N/A
16	Park Boulevard & Howard Avenue	6	Medium	6	Medium	6	Medium	N/A	N/A
17	Park Boulevard & Polk Avenue	6	Medium	N/A	N/A	5	Medium	6	Medium
18	Park Boulevard & Lincoln Avenue	6	Medium	6	Medium	6	Medium	6	Medium
19	Dove Street & University Avenue	5	Medium	5	Medium	5	Medium	5	Medium
20	Albatross Street & University Avenue	3	Low	3	Low	N/A	N/A	4	Medium
21	Front Street & University Avenue	N/A	N/A	4	Medium	N/A	N/A	4	Medium
22	First Avenue & University Avenue	6	Medium	6	Medium	6	Medium	6	Medium
23	Third Avenue & University Avenue	5	Medium	5	Medium	5	Medium	5	Medium
24	Fourth Avenue & University Avenue	6	Medium	6	Medium	6	Medium	6	Medium
25	Fifth Avenue & University Avenue	6	Medium	6	Medium	6	Medium	6	Medium
26	Sixth Avenue & University Avenue	6	Medium	6	Medium	6	Medium	6	Medium
27	Seventh Avenue & University Avenue	5	Medium	5	Medium	6	Medium	5	Medium
28	Eighth Avenue & University Avenue	5	Medium	5	Medium	6	Medium	6	Medium
29	Ninth Avenue & University Avenue	5	Medium	N/A	N/A	N/A	N/A	6	Medium
30	Tenth Avenue & University Avenue	5	Medium	6	Medium	6	Medium	5	Medium
31	Cleveland Avenue/Vermont Street & University Avenue	6	Medium	6	Medium	6	Medium	6	Medium
32	Richmond Street & University Avenue	6	Medium	6	Medium	6	Medium	6	Medium
33	Normal Street & University Avenue	6	Medium	N/A	N/A	6	Medium	6	Medium
34	Centre Street & University Avenue	0	Low	0	Low	0	Low	4	Medium
35	Park Boulevard & University Avenue	6	Medium	6	Medium	6	Medium	6	Medium
36	Tenth Ave & SR-163 NB On-Ramp	N/A	N/A	N/A	N/A	N/A	N/A	1	Low

Table 1-8 PEQE Intersection Analysis Results

#	Intersection	North Leg		South Leg		East Leg		West Leg	
		Score	Grade	Score	Grade	Score	Grade	Score	Grade
37	Park Boulevard & Essex Street	4	Medium	N/A	N/A	N/A	N/A	3	Low
38	First Avenue & Robinson Avenue	6	Medium	6	Medium	6	Medium	6	Medium
39	Fourth Avenue & Robinson Avenue	4	Medium	5	Medium	4	Medium	4	Medium
40	Fifth Avenue & Robinson Avenue	6	Medium	6	Medium	6	Medium	5	Medium
41	Sixth Avenue & Robinson Avenue	6	Medium	6	Medium	6	Medium	6	Medium
42	Seventh Avenue & Robinson Avenue	5	Medium	5	Medium	6	Medium	6	Medium
43	SR-163 SB On-Ramp & Robinson Avenue	3	Low	1	Low	1	Low	3	Low
44	SR-163 NB Off-Ramp & Robinson Avenue	4	Medium	4	Medium	4	Medium	4	Medium
45	Richmond Street & Robinson Avenue	6	Medium	6	Medium	6	Medium	6	Medium
46	Park Boulevard/Indiana Street & Robinson Avenue	5	Medium	5	Medium	5	Medium	6	Medium
47	Fourth Avenue & Pennsylvania Avenue	3	Low	3	Low	5	Medium	3	Low
48	Fifth Avenue & Pennsylvania Avenue	6	Medium	6	Medium	6	Medium	6	Medium
49	Sixth Avenue & Pennsylvania Avenue	6	Medium	6	Medium	6	Medium	6	Medium
50	Fourth Avenue & Walnut Avenue	2	Low	2	Low	2	Low	3	Low

Table 1-9 summarizes the PEQE scoring by mileage of roadway segment (including both sides of the roadway) within study area. Nearly 70% of the study area segment mileage scored in the high category, just over 22% scored medium and approximately 8% of the study area segment mileage scored low.

Table 1-9 PEQE Roadway Segment Analysis Results by Linear Foot

Grade	Linear Mileage	Percent
High	9.9	69.4%
Medium	3.2	22.2%
Low	1.2	8.4%
Total Mileage	14.2	100%

Table 1-10 summarizes the number of intersection approaches studied by their PEQE score. Most intersection approaches (85%) scored medium.

Table 1-10 PEQE Intersection Analysis Results by Approach

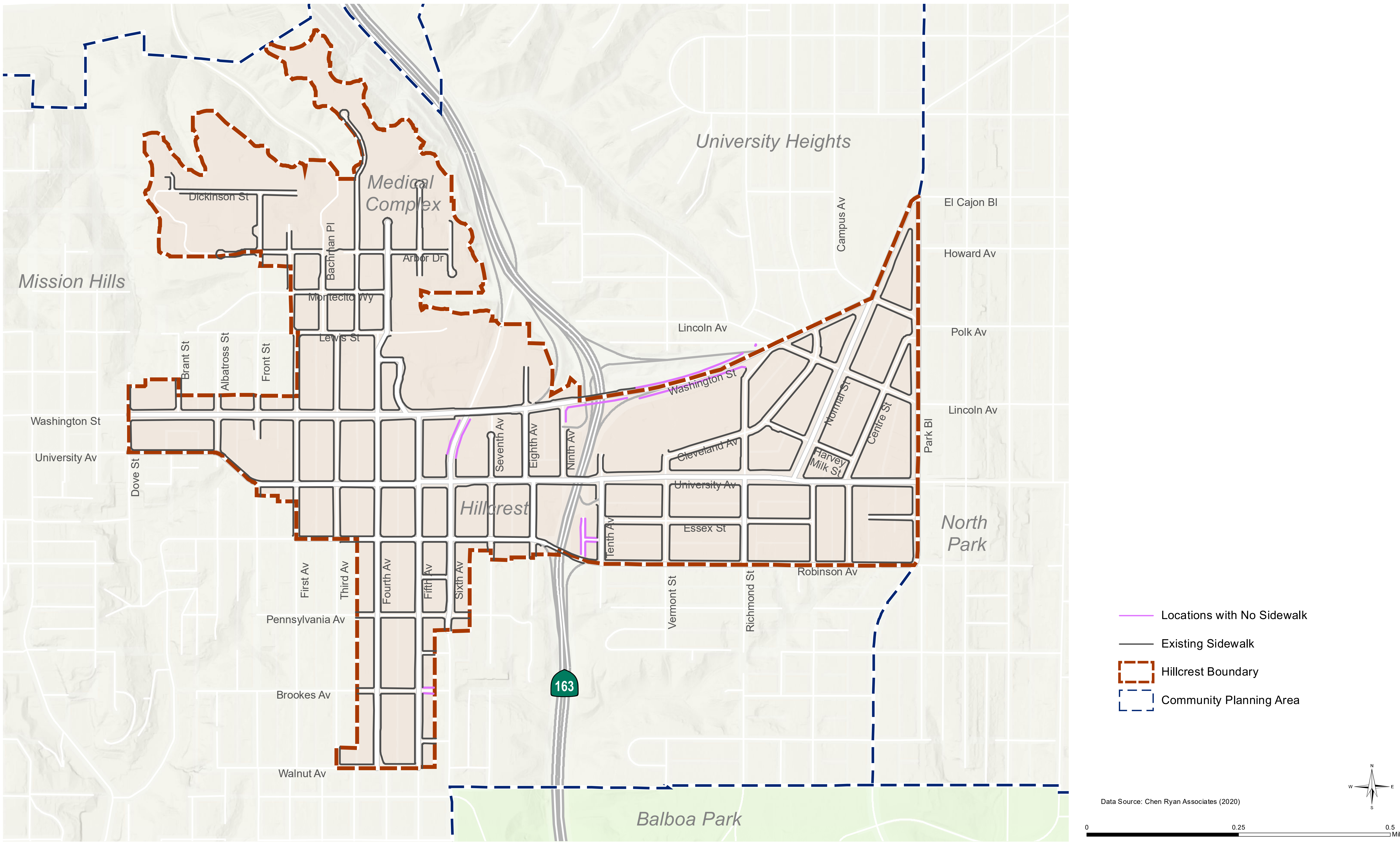
Grade	Number of Approaches	Percent
High	0	0.0%
Medium	147	85%
Low	26	15%
Total Approaches	173	100%

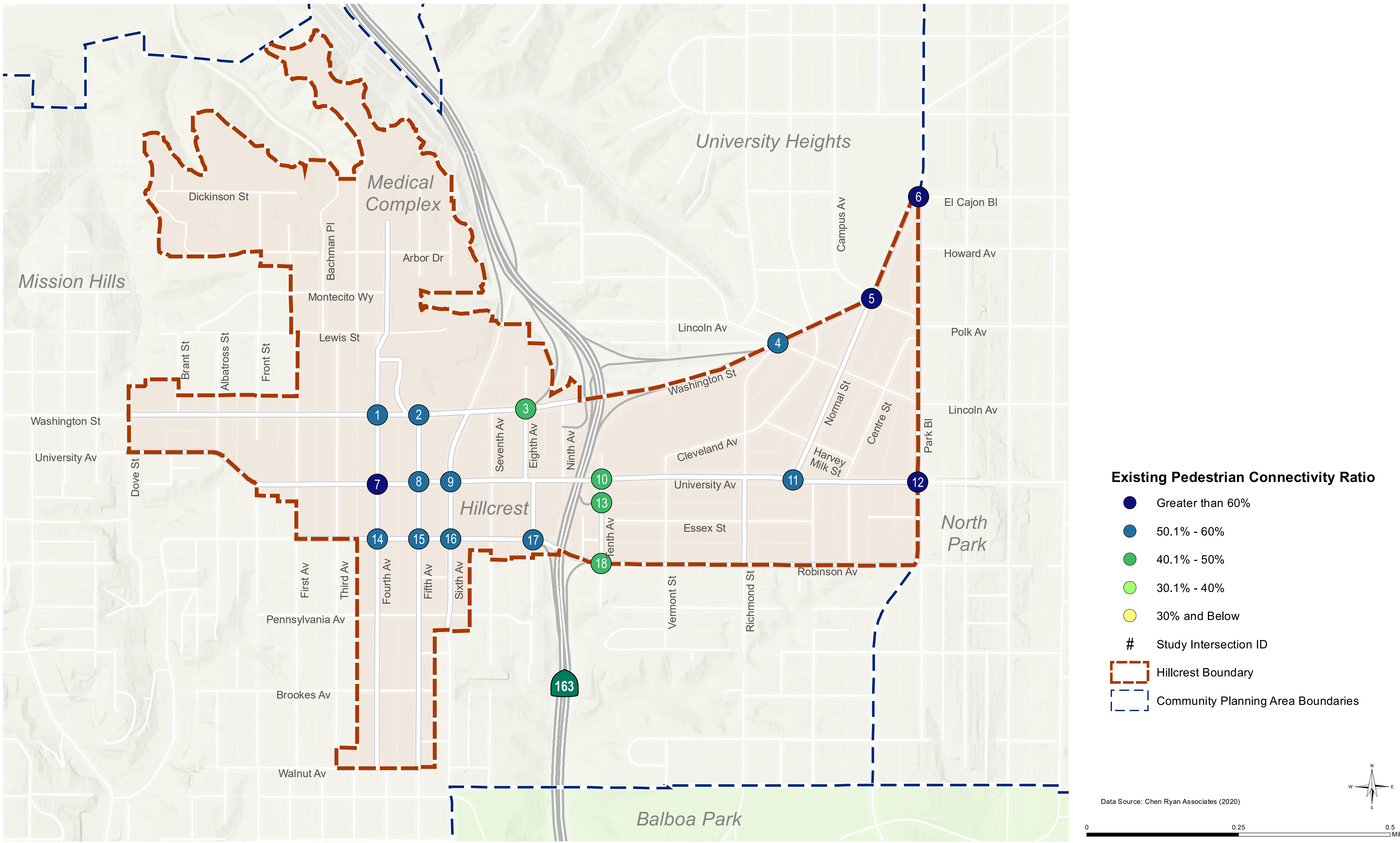
1.1.4 Pedestrian Connectivity

Figure 1-8 displays the locations within the study area where there are no sidewalks. As shown, there are no sidewalk connections along Washington Street between Ninth Avenue and Lincoln Avenue (across the SR-163). The south side of this segment is further complicated by two freeway off-ramps which provide a free-flow merge with eastbound Washington Street vehicular traffic. East to west pedestrian travel requires making a southern detour to University Avenue to safely get across the freeway. The other remaining locations with no sidewalk in the community occur at Sixth Avenue, north of University Avenue; and at cul-de-sac locations: Oneida Street and Place, west of Tenth Avenue; and Brookes Avenue east of Fifth Avenue.

Figure 1-9 shows the pedestrian connectivity ratio of each study intersection in Hillcrest. The pedestrian connectivity ratio is a measure of street network connectivity calculated by dividing the area of a half-mile walkshed from an origin by the area of a half-mile circle. The methodology is described in more detail in Appendix A. A higher ratio reflects better street connectivity. Ratios of 50% or better are typically reflective of grid street network conditions with short block lengths in all directions. Lower ratios are typically reflective of cul-de-sac street network patterns, superblocks, or physical barriers in the proximity to the origin such as a canyon, freeway, or Balboa Park.

Most of the study intersections within the community have high pedestrian connectivity ratios, indicating good network connectivity. The highest connectivity intersections occur at locations farthest away from Washington Street between Fifth Avenue and Lincoln Avenue, where to the north the street network is disrupted by topography and Washington Street's expansive SR-163 freeway ramps. The lowest connectivity ratios are found in the study intersections closest to the SR-163 freeway, where street patterns are disrupted.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Cleveland Av
Essex St
Lincoln Av
Campus Av
El Cajon Bl
Howard Av
Polk Av
Normal St
Centre St
Harvey Milk St
Park Bl
Robinson Av
Vermont St
Richmond St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
163
Locations with No Sidewalk
Existing Sidewalk
Hillcrest Boundary
Community Planning Area
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles



University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Lincoln Av
El Cajon Bl
Howard Av
Polk Av
Lincoln Av
Campus Av
Normal St
Centre St
Park Bl
Harvey Milk St
Cleveland Av
University Av
Essex St
Robinson Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Vermont St
Richmond St
Pennsylvania Av
Brookes Av
Walnut Av
163
Existing Pedestrian Connectivity Ratio
Greater than 60%
50.1% - 60%
40.1% - 50%
30.1% - 40%
30% and Below
Study Intersection ID
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

1.2 Bicycle Mobility

Stimulating mode shift toward bicycling is viewed as one potential solution to many of the issues facing urban environments, such as greenhouse gas emissions, concern for public health, transportation costs and creating alternatives to sitting in vehicular traffic congestion. The establishment of a safe and well-connected bicycle network can help bicycling to become a more viable transportation option.

2008 City of San Diego General Plan Mobility Element – Bicycling Goals:

- *A city where bicycling is a viable travel choice, particularly for trips of less than five miles.*
- *A safe and comprehensive local and regional bikeway network.*
- *Environmental quality, public health, recreation and mobility benefits through increased bicycling.*

The City of San Diego has increased its emphasis on the role of bicycle mobility in the future with the adoption of the Climate Action Plan (CAP) in December 2015. The CAP sets a target to "achieve 6% bicycle commuter mode share by 2020 and 18% mode share by 2035 in Transit Priority Areas." As previously stated, Hillcrest is entirely within the existing TPA coverage of the City.

Figure 1-10 shows existing and planned bicycle facilities within the Hillcrest community. The existing network is comprised of Class I multi-use paths, Class II bike lanes, and Class III bike routes. Planned facilities, identified in the recently adopted Uptown Community Plan (2019) include additional types of facilities not currently present in the community, including Class IV cycle tracks, bicycle boulevards (enhanced bike routes) and hybrid Class II/Class III facilities.

East-west bicycling connectivity is complicated by the SR-163 freeway, which acts as a network barrier. Of the limited east-west alignments which connect across the freeway, Washington Street has the most detrimental conditions for cyclists: mixed traffic conditions at high travel speeds with the heaviest vehicular traffic volumes in the community. University Avenue has bicycle lanes however cyclists must contend with obstacles including frequent bus traffic along the corridor, and the adjacency of high turnover-high demand on-street parking. Robinson Avenue is a parallel alternative with comparatively lower traffic volumes; however, cyclists must ride in mixed-traffic conditions and topography limits the utility of the corridor as an axis of travel beyond the Hillcrest community boundary.

There are adequate bicycling connections between Hillcrest and some of its adjacent neighborhoods, including University Heights, Balboa Park, North Park and Bankers Hill. Connectivity to Mission Valley is complicated because of limited street network connectivity and steep terrain. Connectivity to Mission Hills requires riding in mixed traffic conditions on roadways with high traffic volumes, on either four-lane Washington Street or two-lane University Avenue.

Table 1-11 describes the typical characteristics of each bicycle facility classification and summarizes their total mileage within the community. Class II bicycle lanes and Class III bicycle routes are the most common type of bicycle facility in Hillcrest. There is one Class I multi-use path within Hillcrest, a bridge overpass which connects the portions of Vermont Street separated by Washington Street and its SR-163 on-ramps.

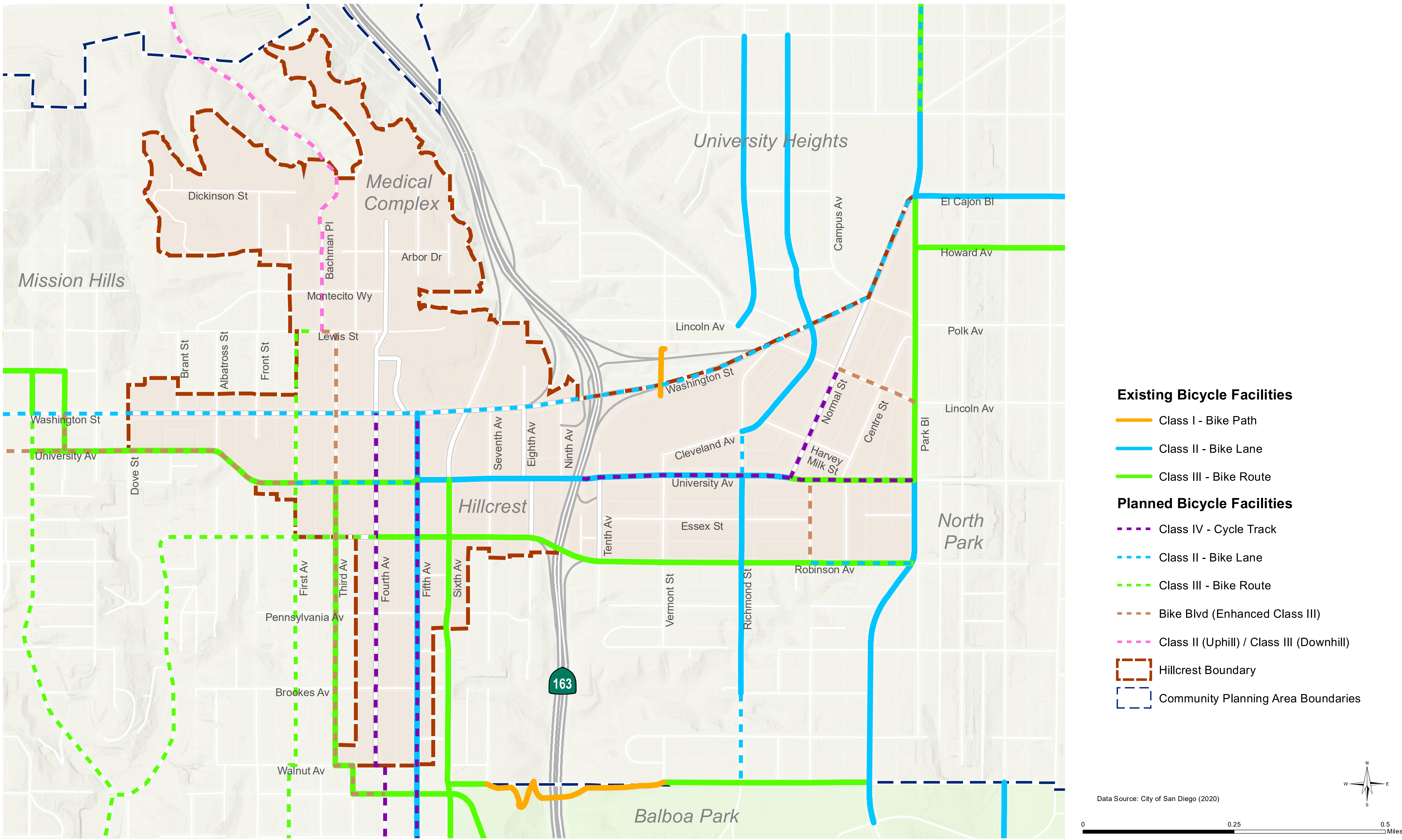
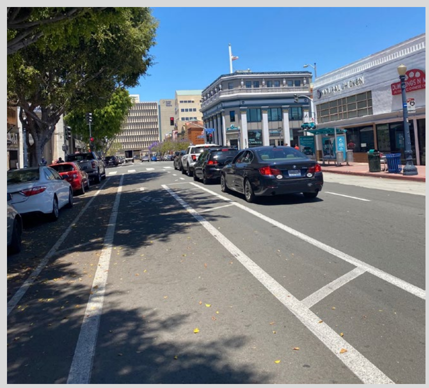
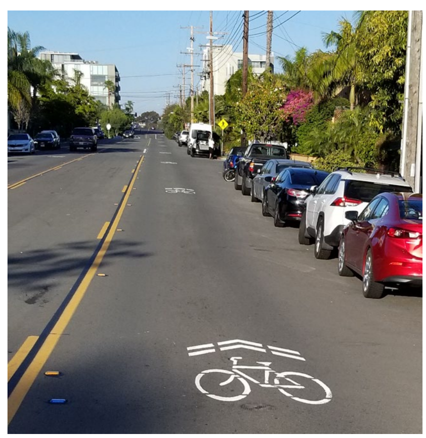

University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Harvey Milk St
Centre St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Existing Bicycle Facilities
Class I - Bike Path
Class II - Bike Lane
Class III - Bike Route
Planned Bicycle Facilities
Class IV - Cycle Track
Class II - Bike Lane
Class III - Bike Route
Bike Blvd (Enhanced Class III)
Class II (Uphill) / Class III (Downhill)
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: City of San Diego (2020)
0
0.25
0.5
Miles

Table 1-11 Bicycle Facility Classifications and Existing Network Mileage

Description of Facility	Example	Existing Mileage
Class I Multi-Use Path – Also referred to as a bike paths or shared-use paths, Class I facilities provide a completely separated right-of-way designed for the exclusive use of bicycles and pedestrians with crossflows by motorists minimized. Multi-use paths can provide connections where roadways are non-existent or unable to support bicycle travel. The minimum paved width for a two-way multi-use path is eight feet, with a two-foot wide graded area adjacent to the pavement.	 *Vermont Street bridge*	0.1 mile
Class II Bike Lane – Provides a striped lane designated for the exclusive or semi-exclusive use of bicycles with through travel by motor vehicles or pedestrians prohibited. Bike lanes are one-way facilities located on either side of a roadway. Pedestrian and motorist crossflows are permitted. Additional enhancements such as painted buffers and signage may be applied. The minimum bike lane width is five feet.	 *Fifth Avenue*	1.8 miles
Class III Bike Route – Provides shared use of traffic lanes with cyclists and motor vehicles, identified by signage and shared lane markings called "sharrows". Bike routes are best suited for low-speed, low-volume roadways with an outside lane of 14 feet or greater. Bike routes provide network continuity or designate preferred routes through corridors with high demand.	 *Robinson Avenue*	2.4 miles
	TOTAL MILEAGE	4.3 miles

The following sections of Class II bike lanes traverse Hillcrest (with their origin or destination area noted, if outside Hillcrest), including:

- University Avenue from Fifth Avenue to Normal Street
- Northbound Fifth Avenue from Elm Street (in South Bankers Hill) to Washington Street
- Cleveland Avenue from Madison Avenue (in University Heights) to Richmond Street
- Richmond Street from University Avenue to Brookes Terrace (near Balboa Park)
- Park Boulevard from University Avenue to Zoo Drive (in Balboa Park)

Sections of Class III bike routes within Hillcrest, include:

- University Avenue from Goldfinch Street (in Mission Hills) to Fifth Avenue
- University Avenue from Normal Street to Park Boulevard
- Robinson Avenue from Fourth Avenue to Park Boulevard
- Park Boulevard from El Cajon Boulevard to University Avenue
- Third Avenue from University Avenue to Walnut Avenue
- Sixth Avenue from Elm Street (in South Bankers Hill) to University Avenue

1.2.1 Bicycle Demand

A composite understanding of bicycling demand in the Hillcrest community was assembled for this study, informed by the City of San Diego Bicycle Priority Model, commute mode share data from the American Community Survey, and peak period bicycle counts.

Figure 1-11 shows the Bicycle Priority Model scores across the Hillcrest community. The model considers demand-based factors: inter-community demand, explained by the presence of or proximity and centrality to major activity centers such as smart growth areas and employment centers; and intra-community demand, based on concentrations of land uses and varieties of demographic populations. High detractors, based on collision history, traffic volumes, posted speeds, travel lanes, and slope, are combined with demand to determine priority. Nearly all of Hillcrest has high bicycle demand and priority characteristics based on the Bicycle Priority Model.

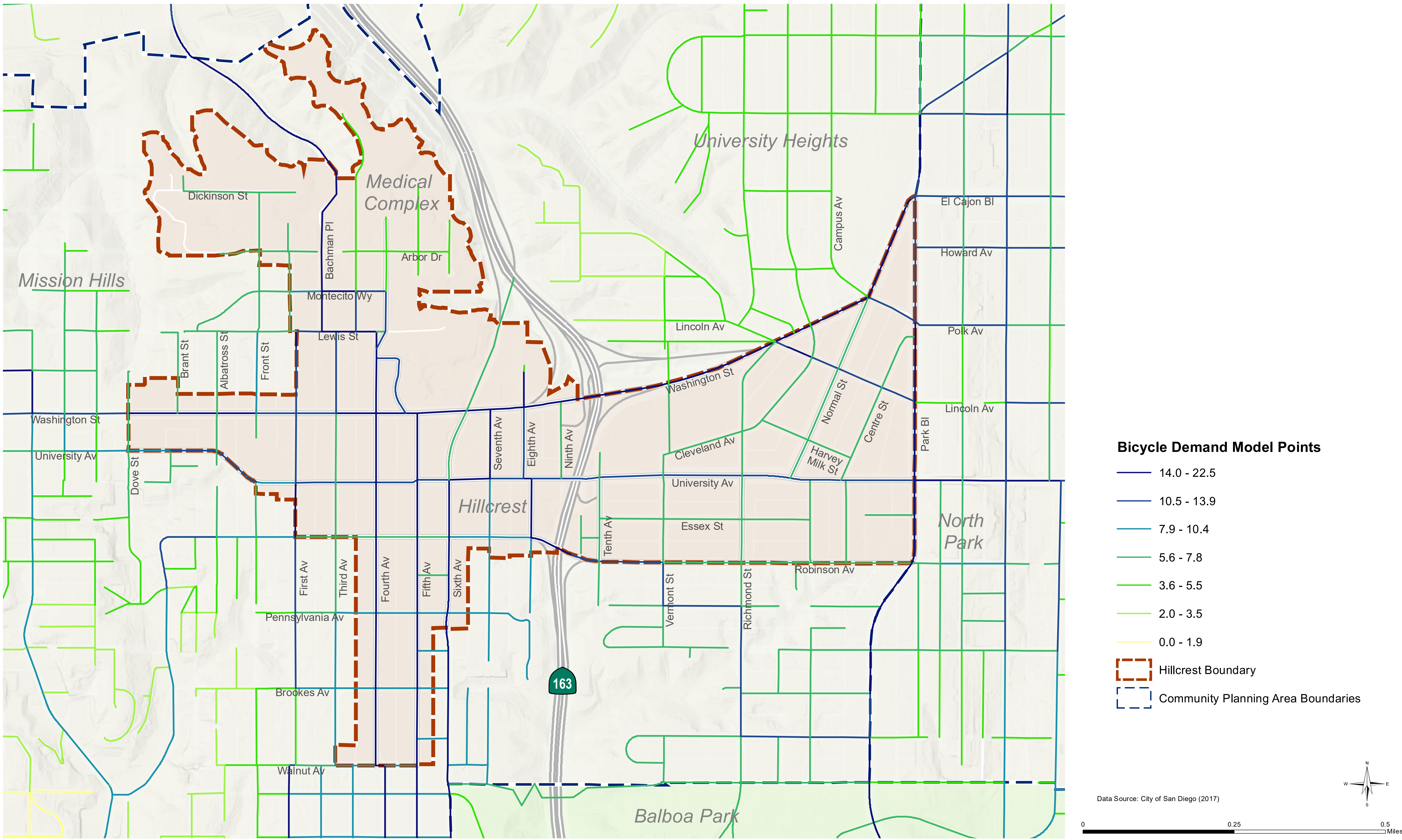
Table 1-12 compares the bicycling commute mode share of Hillcrest to the City and the San Diego County region. Notably, the Hillcrest community has a bicycle commute mode share (3.7%) which is four-times higher than the citywide bicycling mode share.

Table 1-12 Bicycle Commute Mode Share Comparison

	Hillcrest	City of San Diego	San Diego County
Total Bicycle Commuters	162	6,714	10,494
Total Workers	4,373	714,312	1,603,486
Bicycle Commute Mode Share	3.7%	0.9%	0.7%

Source: US Census, 2018 American Community Survey 5-Year Estimates

Figure 1-12 displays peak period bicycle movements observed at study intersections. Counts were conducted on typical weekdays in February 2020 from 7 AM to 9 AM, 11 AM to 1 PM, and 4 PM to 6 PM representing AM, midday, and PM peak periods, respectively. Data collection count sheets for each study intersection are provided in Appendix B.



Mission Hills
Medical Complex
University Heights
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Centre St
Harvey Milk St
Campus Av
El Cajon Bl
Howard Av
Polk Av
Park Bl
163
Bicycle Demand Model Points
14.0 - 22.5
10.5 - 13.9
7.9 - 10.4
5.6 - 7.8
3.6 - 5.5
2.0 - 3.5
0.0 - 1.9
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: City of San Diego (2017)
0
0.25
0.5
Miles

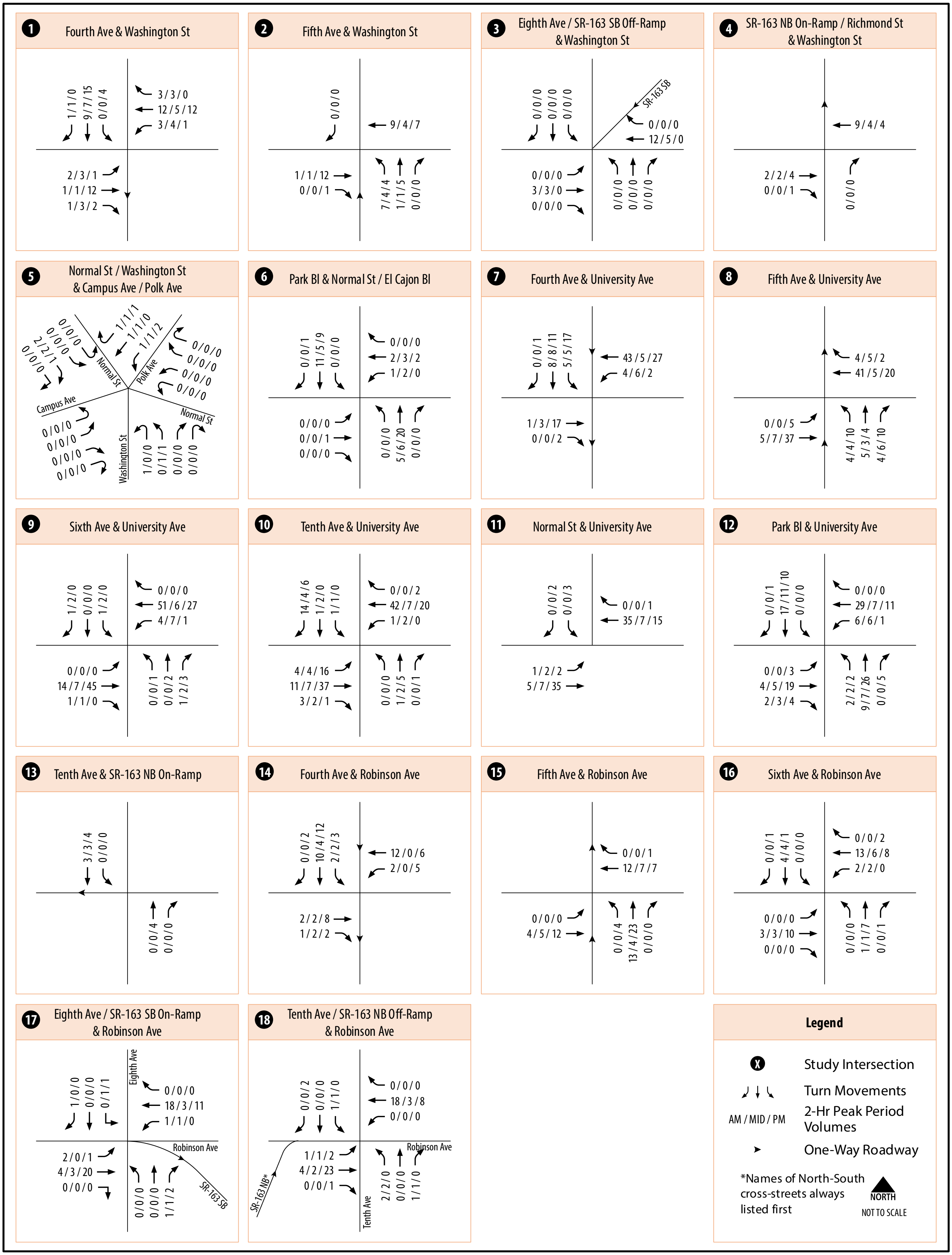

1 Fourth Ave & Washington St
1/1/0 9/7/15 0/0/4
3/3/0
12/5/12
3/4/1
2/3/1
1/1/12
1/3/2
2 Fifth Ave & Washington St
0/0/0
9/4/7
1/1/12
0/0/1
7/4/4 1/1/5 0/0/0
3 Eighth Ave / SR-163 SB Off-Ramp & Washington St
0/0/0 0/0/0 0/0/0
SR-163 SB
0/0/0
12/5/0
0/0/0
3/3/0
0/0/0
0/0/0 0/0/0 0/0/0
4 SR-163 NB On-Ramp / Richmond St & Washington St
9/4/4
2/2/4
0/0/1
0/0/0
5 Normal St / Washington St & Campus Ave / Polk Ave
0/0/0 0/0/0 2/2/1 0/0/0
1/1/1 1/1/0 1/1/2
0/0/0 0/0/0 0/0/0 0/0/0
Normal St
Polk Ave
Campus Ave
Normal St
0/0/0 0/0/0 0/0/0 0/0/0
Washington St
1/0/0 0/1/1 0/0/0 0/0/0
6 Park Bl & Normal St / El Cajon Bl
0/0/1 11/5/9 0/0/0
0/0/0
2/3/2
1/2/0
0/0/0
0/0/1
0/0/0
0/0/0 5/6/20 0/0/0
7 Fourth Ave & University Ave
0/0/1 8/8/11 5/5/17
43/5/27
4/6/2
1/3/17
0/0/2
8 Fifth Ave & University Ave
4/5/2
41/5/20
0/0/5
5/7/37
4/4/10 5/3/4 4/6/10
9 Sixth Ave & University Ave
1/2/0 0/0/0 1/2/0
0/0/0
51/6/27
4/7/1
0/0/0
14/7/45
1/1/0
0/0/1 0/0/2 1/2/3
10 Tenth Ave & University Ave
14/4/6 1/2/0 1/1/0
0/0/2
42/7/20
1/2/0
4/4/16
11/7/37
3/2/1
0/0/0 1/2/5 0/0/1
11 Normal St & University Ave
0/0/2 0/0/3
0/0/1
35/7/15
1/2/2
5/7/35
12 Park Bl & University Ave
0/0/1 17/11/10 0/0/0
0/0/0
29/7/11
6/6/1
0/0/3
4/5/19
2/3/4
2/2/2 9/7/26 0/0/5
13 Tenth Ave & SR-163 NB On-Ramp
3/3/4 0/0/0
0/0/4 0/0/0
14 Fourth Ave & Robinson Ave
0/0/2 10/4/12 2/2/3
12/0/6
2/0/5
2/2/8
1/2/2
15 Fifth Ave & Robinson Ave
0/0/1
12/7/7
0/0/0
4/5/12
0/0/4 13/4/23 0/0/0
16 Sixth Ave & Robinson Ave
0/0/1 4/4/1 0/0/0
0/0/2
13/6/8
2/2/0
0/0/0
3/3/10
0/0/0
0/0/0 1/1/7 0/0/1
17 Eighth Ave / SR-163 SB On-Ramp & Robinson Ave
1/0/0 0/0/0 0/1/1
Eighth Ave
0/0/0
18/3/11
1/1/0
Robinson Ave
2/0/1
4/3/20
0/0/0
0/0/0 0/0/0 1/1/2
SR-163 SB
18 Tenth Ave / SR-163 NB Off-Ramp & Robinson Ave
0/0/2 0/0/0 1/1/0
0/0/0
18/3/8
0/0/0
Robinson Ave
1/1/2
4/2/23
0/0/1
SR-163 NB*
Tenth Ave
2/2/0 0/0/0 1/1/0
Legend
X Study Intersection
Turn Movements
AM / MID / PM 2-Hr Peak Period Volumes
One-Way Roadway
*Names of North-South cross-streets always listed first
NORTH
NOT TO SCALE

Table 1-13 summarizes the bicycle volumes counted during the AM, midday and PM peak periods passing through the 18 study intersections within the community.

Table 1-13 Existing AM / Midday / PM Peak Period Bicycle Counts

Intersection	AM Peak	Midday	PM Peak	Combined Peak
1: Fourth Avenue & Washington Street	32	27	47	106
2: Fifth Avenue & Washington Street	18	10	29	57
3: Eighth Avenue / SR-163 SB Off-Ramp & Washington Street	15	8	0	23
4: SR-163 On-Ramp / Richmond Street & Washington Street	11	6	9	26
5: Normal Street / Washington Street & Campus Avenue / Polk Avenue	6	6	5	17
6: Park Boulevard & Normal Street / El Cajon Boulevard	19	16	33	68
7: Fourth Avenue & University Avenue	61	27	77	165
8: Fifth Avenue & University Avenue	63	30	88	181
9: Sixth Avenue & University Avenue	73	27	79	179
10: Tenth Avenue & University Avenue	78	31	88	197
11: Normal Street & University Avenue	41	16	58	115
12: Park Boulevard & University Avenue	69	41	82	192
13: Tenth Avenue & SR-163 NB On-Ramp	3	3	8	14
14: Fourth Avenue & Robinson Avenue	29	10	38	77
15: Fifth Avenue & Robinson Avenue	29	16	47	92
16: Sixth Avenue & Robinson Avenue	23	16	30	69
17: Eighth Avenue / SR-163 SB On-Ramp & Robinson Avenue	27	9	35	71
18: Tenth Avenue / SR-163 NB Off-Ramp & Robinson Avenue	27	10	36	73

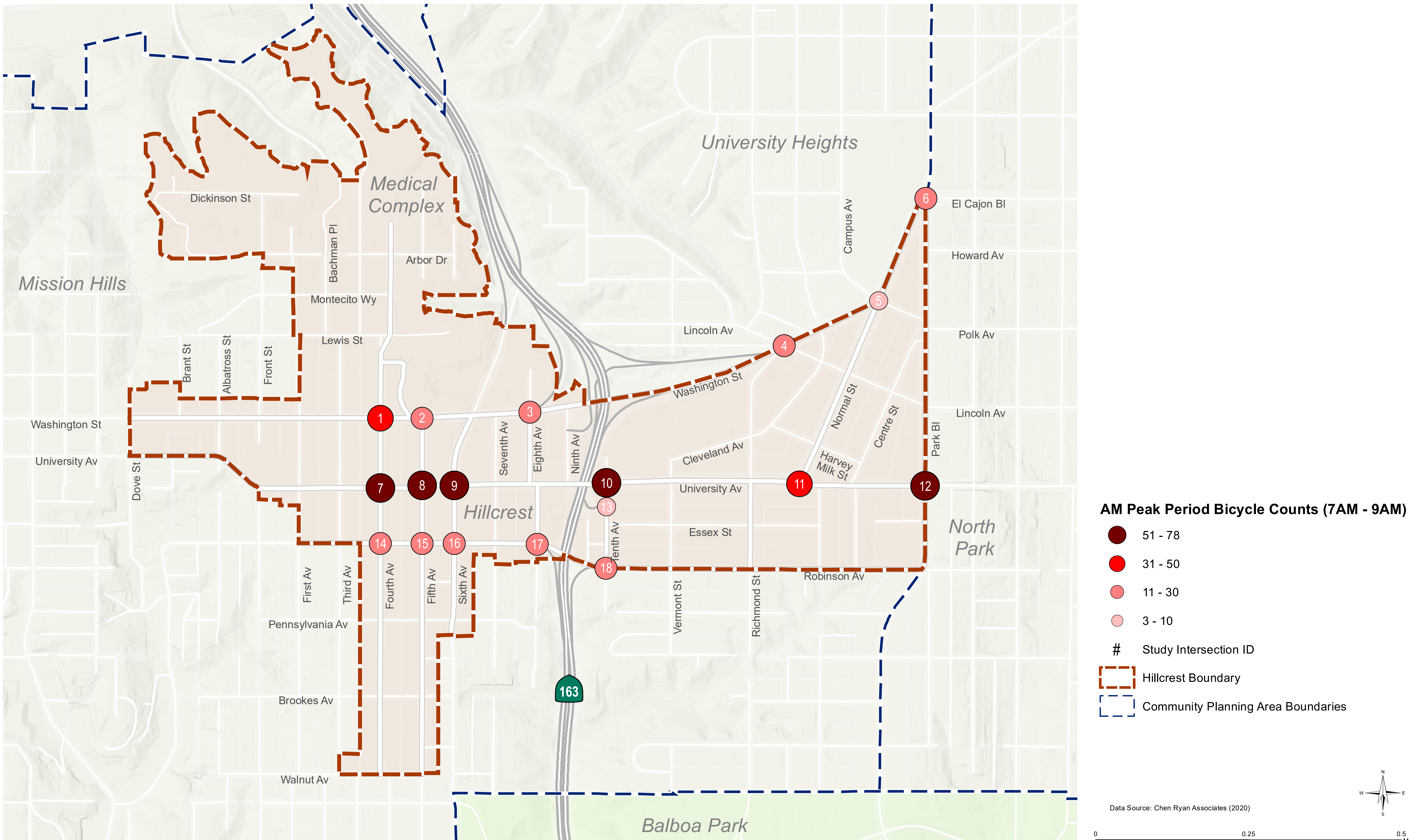
Source: Counts Unlimited Inc., February 2020

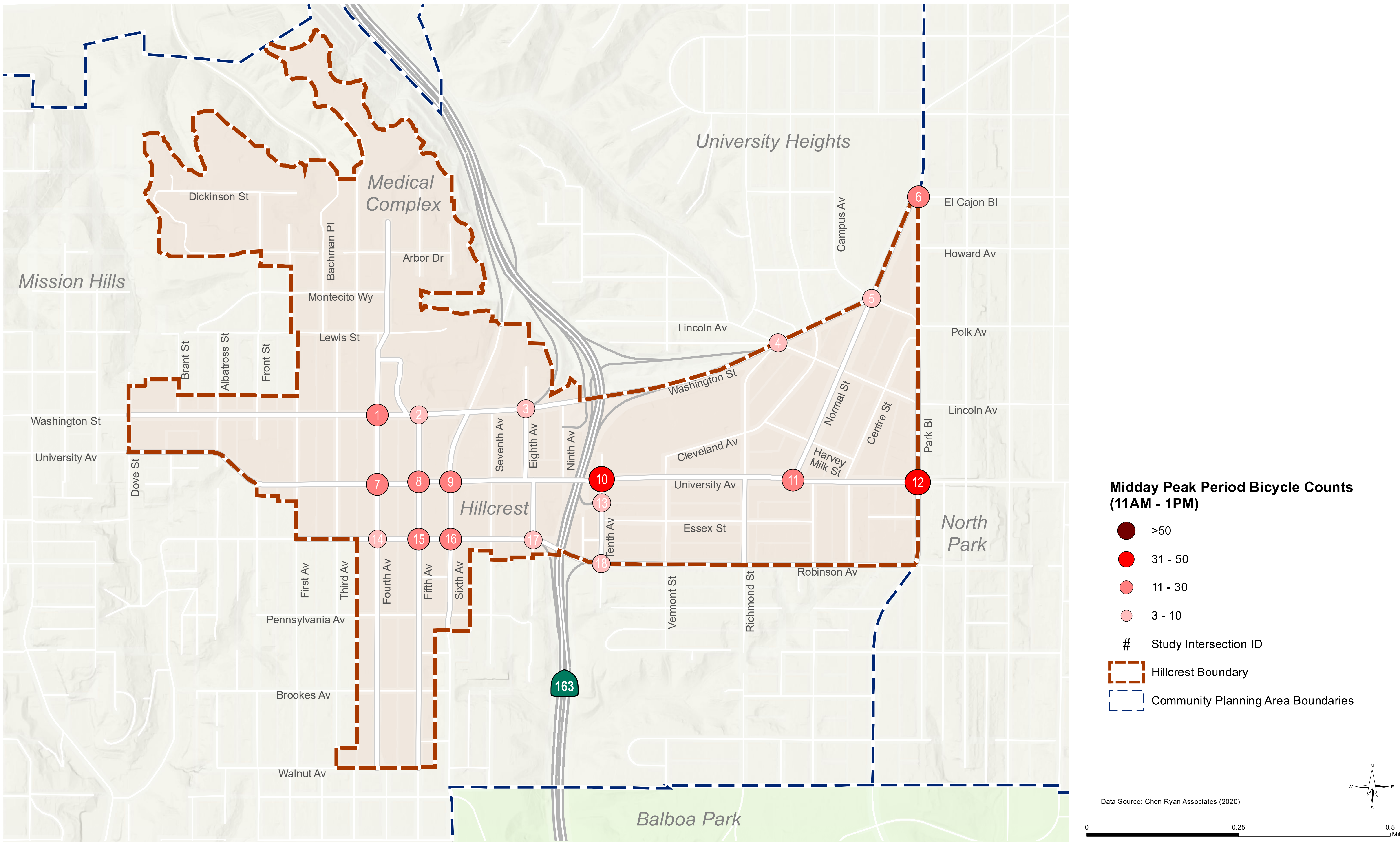
Each of the intersections with the highest combined bicycle volumes during the three peak periods combined are situated along University Avenue, they include:

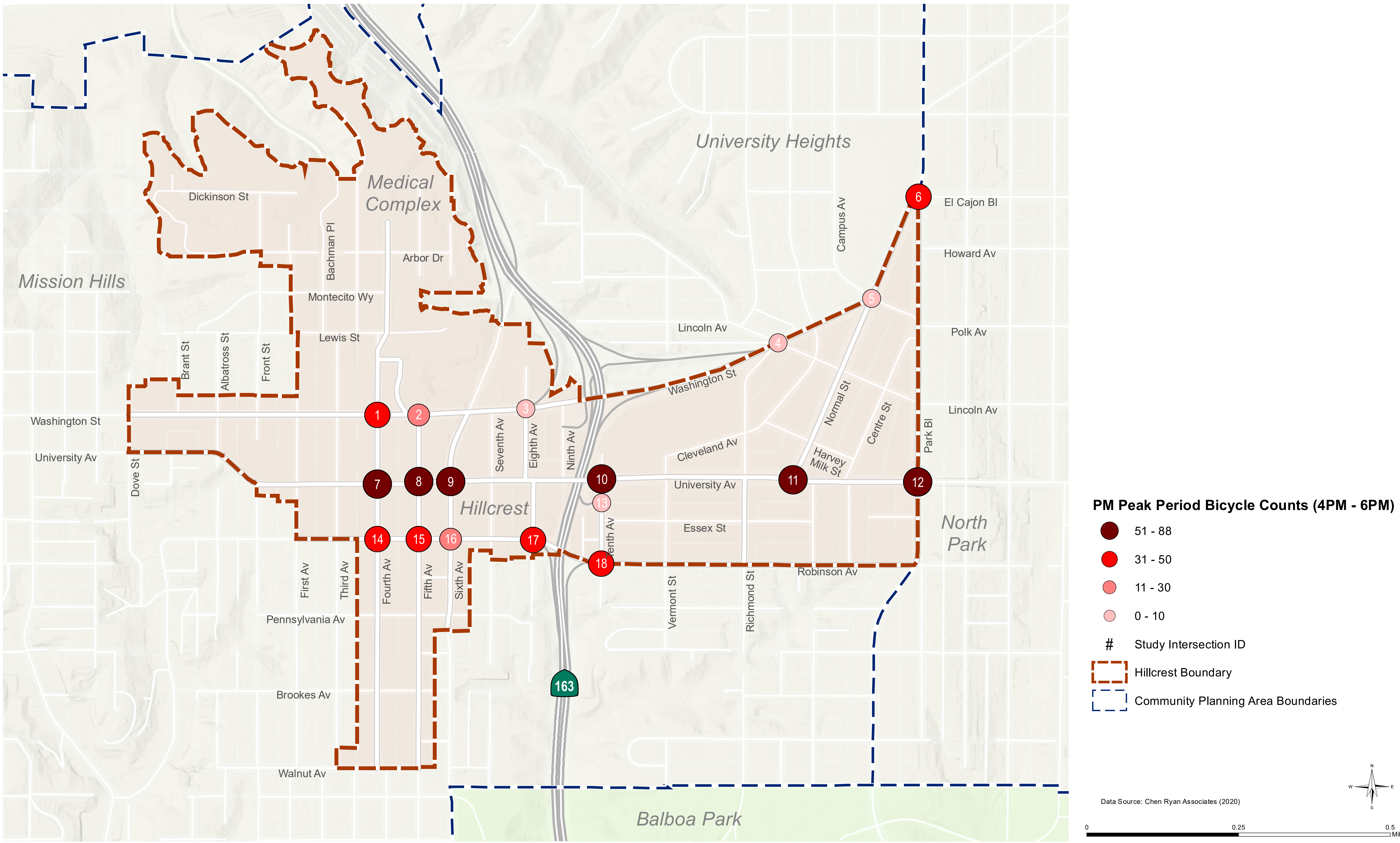
- #7: Fourth Avenue and University Avenue (165)
- #8: Fifth Avenue and University Avenue (181)
- #9: Sixth Avenue and University Avenue (179)
- #10: Tenth Avenue and University Avenue (197)
- #12: Park Boulevard and University Avenue (192)

The most activity occurs along University Avenue, where all six of the University corridor's study intersections ranked in the six highest locations for daily volumes from the combined peak periods. The busiest period for bicycling throughout the community occurs during the PM peak period. Midday peak bicycling volumes were lower than the AM peak period (about half compared to AM), which is the reverse of the observation of pedestrian activity.

Figure 1-13A, **1-13B,** and **1-13C** display the locations of the 18 study intersections and their levels of bicycling activity during the AM, midday, and PM peak periods. Data collection count sheets for each study intersection are provided in Appendix B.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Lincoln Av
Cleveland Av
Normal St
Centre St
Harvey Milk St
Park Bl
Campus Av
El Cajon Bl
Howard Av
Polk Av
Essex St
Robinson Av
Vermont St
Richmond St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
163
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
AM Peak Period Bicycle Counts (7AM - 9AM)
51 - 78
31 - 50
11 - 30
3 - 10
Study Intersection ID
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Normal St
Centre St
Harvey Milk St
Park Bl
Campus Av
El Cajon Bl
Howard Av
Polk Av
163
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Midday Peak Period Bicycle Counts (11AM - 1PM)
>50
31 - 50
11 - 30
3 - 10
Study Intersection ID
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles
N
W
E
S



PM Peak Period Bicycle Counts (4PM - 6PM)
51 - 88
31 - 50
11 - 30
0 - 10
Study Intersection ID
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles
University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
163
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

1.2.2 Bicycle Safety

Collision history within Hillcrest was examined to evaluate bicycle safety. A collision dataset was obtained from the Transportation Injury Mapping System (TIMS), an open data service provided by Safe Transportation Research and Education Center at University of California, Berkeley, for injury collisions between the years between 2014 and 2018.

A total of 50 bicycle-involved collisions resulting in injury were reported during this five-year period. **Figure 1-14** displays where the collision occurred and where the bicycling systemic safety hotspots are located. **Table 1-14** summarizes the location within the roadway where bicycle-involved collisions occurred. As shown, 70% occurred at intersection locations. **Table 1-15** lists the locations where more than one bicycle-involved collision occurred during the period.

Table 1-14 Bicycle Collision Locations within the Roadway: 2014 – 2018

Location within the Roadway	Frequency	Percent of Total
Intersection	35	70%
Midblock	15	30%
Total	**50**	**100%**

Source: Transportation Injury Mapping System (TIMS)

Table 1-15 Most Frequent Bicycle Collision Locations: 2014 – 2018

Rank	Intersection	Frequency
1	Centre Street & University Avenue	3
1	Park Boulevard & University Avenue	3
3	Fifth Avenue & Washington Street	2
3	Fifth Avenue & Robinson Avenue	2
3	Sixth Avenue & University Avenue	2
3	Seventh Avenue & Robinson Avenue	2
3	Eighth Avenue & University Avenue	2
3	Richmond Street & Robinson Avenue	2
3	Normal Street & University Avenue	2

Source: Transportation Injury Mapping System (TIMS)

Table 1-16 summarizes the party-at-fault for each of the 50 bicycle-involved collisions. As shown, the driver (or vehicles) were at fault for just over half of the collisions that occurred (52%). Two of the 50 bicyclist-involved collisions were between a cyclist and a pedestrian. In both instances, the cyclist was at fault.

Table 1-16 Bicycle Collision Party Fault: 2014 – 2018

Party-At-Fault	Frequency	Percent of Total
Driver	26	52%
Bicyclist	23	46%
Parked Vehicle	1	2%
Total	**50**	**100%**

Source: Transportation Injury Mapping System (TIMS)

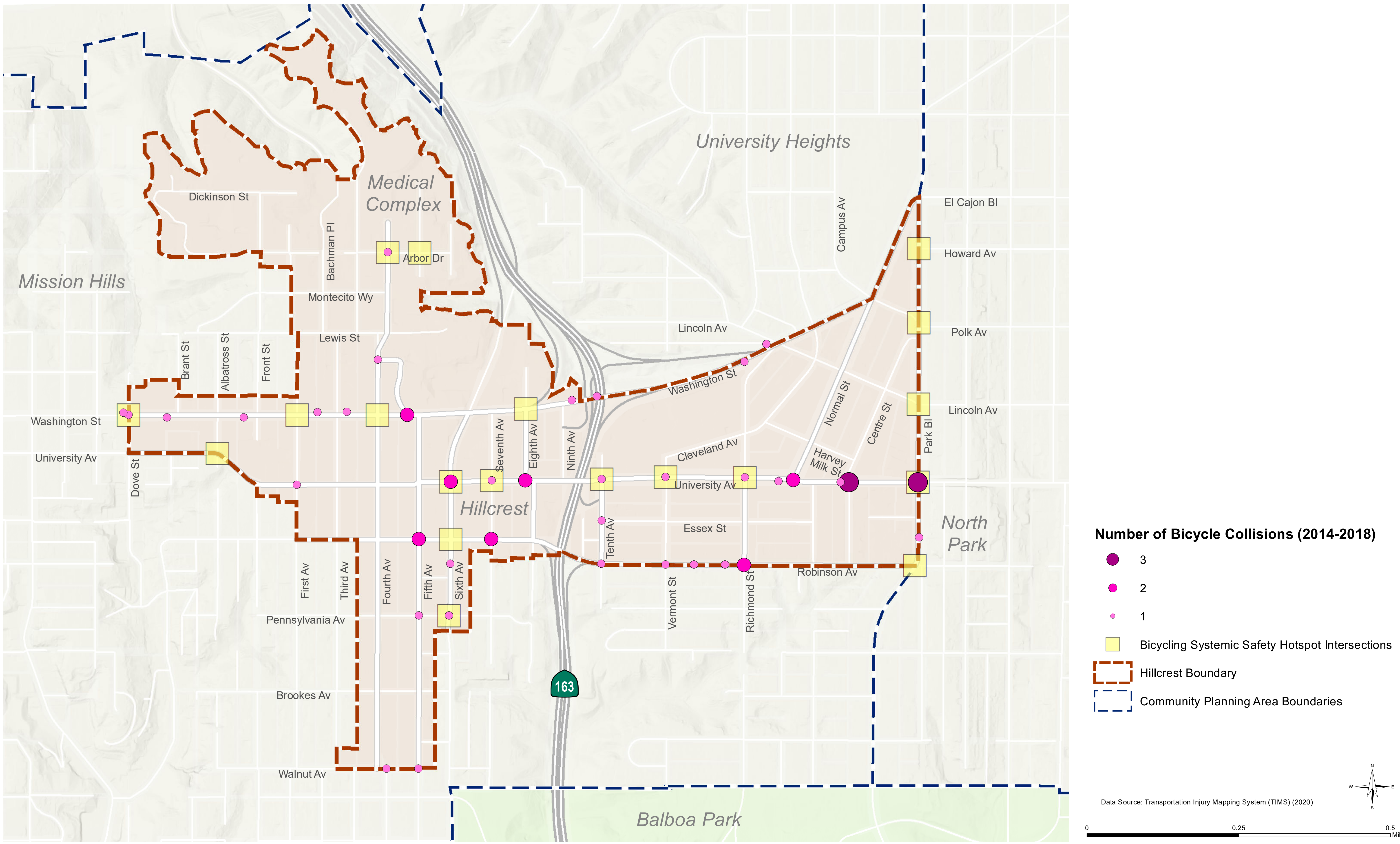

Mission Hills
Medical Complex
University Heights
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Centre St
Campus Av
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Number of Bicycle Collisions (2014-2018)
3
2
1
Bicycling Systemic Safety Hotspot Intersections
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Transportation Injury Mapping System (TIMS) (2020)
0
0.25
0.5
Miles

Table 1-17 lists the various primary collision causes for the 50 bicycle-involved collisions in Hillcrest. The most frequent primary cause was improper turning (32%), followed by violation of the automobile's right-of-way (20%).

Table 1-17 Bicycle Collision Primary Causes: 2014 – 2018

Collision Primary Cause	Frequency	Percent of Total
Improper Turning	16	32%
Automobile Right-of-Way	10	20%
Unknown	7	14%
Not Stated	4	8%
Unsafe Speed	4	8%
Traffic Signals or Signs	4	8%
Following Too Closely	2	4%
Wrong Side of Road	1	2%
Pedestrian Right of Way	1	2%
Other Hazardous Violation	1	2%
Total	**50**	**100%**

Source: Transportation Injury Mapping System (TIMS)

Table 1-18 categorizes the 50 collisions by their worst injury outcome. As shown, there were no collisions resulting in severe injury or fatal collisions occurred during the five-year period.

Table 1-18 Bicycle Collision Injury Severity by Outcome: 2014 – 2018

Severity of Collision	Frequency	Percent of Total
Other Visible Injury	33	66%
Complaint of Pain	17	34%
Total	**50**	**100%**

Source: Transportation Injury Mapping System (TIMS)

1.2.3 Bicycle Facility Quality

Bicycle Level of Traffic Stress (LTS) classifies the street network according to the estimated level of stress it causes cyclists. The measure takes into consideration a cyclist's physical separation from vehicular traffic, posted speed limits and number of travel lanes along a roadway, in addition to factors which may be present at intersection approaches such as right-turn only lanes and uncontrolled crossings. LTS scores range from 1 (lowest stress) to 4 (highest stress) and correspond to roadway conditions that different cycling demographics would find suitable for riding based on stress tolerance. LTS 2 or lower is considered suitable for most user groups.

Table 1-19 identifies the four LTS categories and describes the traffic stress experienced by the cyclist and the environmental characteristics consistent with the category.

Table 1-19 Level of Traffic Stress Classifications and Descriptions

LTS Category	LTS Description	Description of Environment	Acceptability to Populations
LTS 1	Presenting little traffic stress and demanding little attention from cyclists; suitable for almost all cyclists, including children trained to safely cross intersections.	• Facility that is physically separated from traffic or an exclusive cycling zone next to a slow traffic stream with no more than one lane per direction • A shared roadway where cyclists only interact with the occasional motor vehicle with a low speed differential • Ample space for cyclist when alongside a parking lane • Intersections are easy to approach and cross	Interested but Concerned – Vulnerable Populations
LTS 2	Presenting little traffic stress but demanding more attention that might be expected from children.	• Facility that is physically separated from traffic or an exclusive cycling zone next to a well-confined traffic stream with adequate clearance from parking lanes • A shared roadway where cyclists only interact with the occasional motor vehicle (as opposed to a stream of traffic) with a low speed differential • Unambiguous priority to the cyclist where cars must cross bike lanes (e.g. at dedicated right-turn lanes); design speed for right-turn lanes comparable to bicycling speeds • Crossings not difficult for most adults	Interested but Concerned – Mainstream Adult Populations
LTS 3	Presenting enough traffic stress to deter the Interested but Concerned demographic	• An exclusive cyclin zone (lane) next to moderate-speed vehicular traffic • A shared roadway that is not multilane and has moderately low automobile travel speeds • Crossings may be longer or across higher-speed roadways than allowed by LTS 2, but are still considered acceptably safe to most adult pedestrians	Enthused & Confident
LTS 4	Presenting enough traffic stress to deter all but the Strong & Fearless demographic	• An exclusive cycling zone (lane) next to high-speed and multilane vehicular traffic • A shared roadway with multiple lanes per direction with high traffic speeds • Cyclist must maneuver through dedicated right-turn lanes containing no dedicated bicycling space and designed for turning speeds faster than bicycling speeds	Strong & Fearless

Source: Mekuria, et al. (2012)

Figure 1-15 shows the LTS for all bikeable roadway links within the community. **Appendix D** includes all LTS scoring criteria look-up tables. Several major corridors are LTS 4 in their entirety through Hillcrest, including Washington Street, Park Boulevard and Sixth Avenue. University Avenue is LTS 2 west of Fifth Avenue where it is two lanes wide and LTS 3 east of Fifth Avenue where it is four lanes wide (and LTS 4 across SR-163, where its bike lanes temporarily drop). The Fourth and Fifth Avenue one-way couplet are LTS 3. Robinson Avenue is LTS 2 west of Tenth Avenue and LTS 3 to the east, due to the change in posted speed limit.

1.2.4 Bicycle Network Connectivity

Bicycle connectivity was evaluated using two metrics: existing bicycle connectivity ratio – a measurement of travelshed connectivity for bicycling from each study intersection; and Low-Stress Bicycle Connectivity, which measures the connectivity between sets of origins and destinations within the community using only low-stress bicycling network links. The methodologies used for both analyses are described in Appendix A.

Bicycle Connectivity Ratio

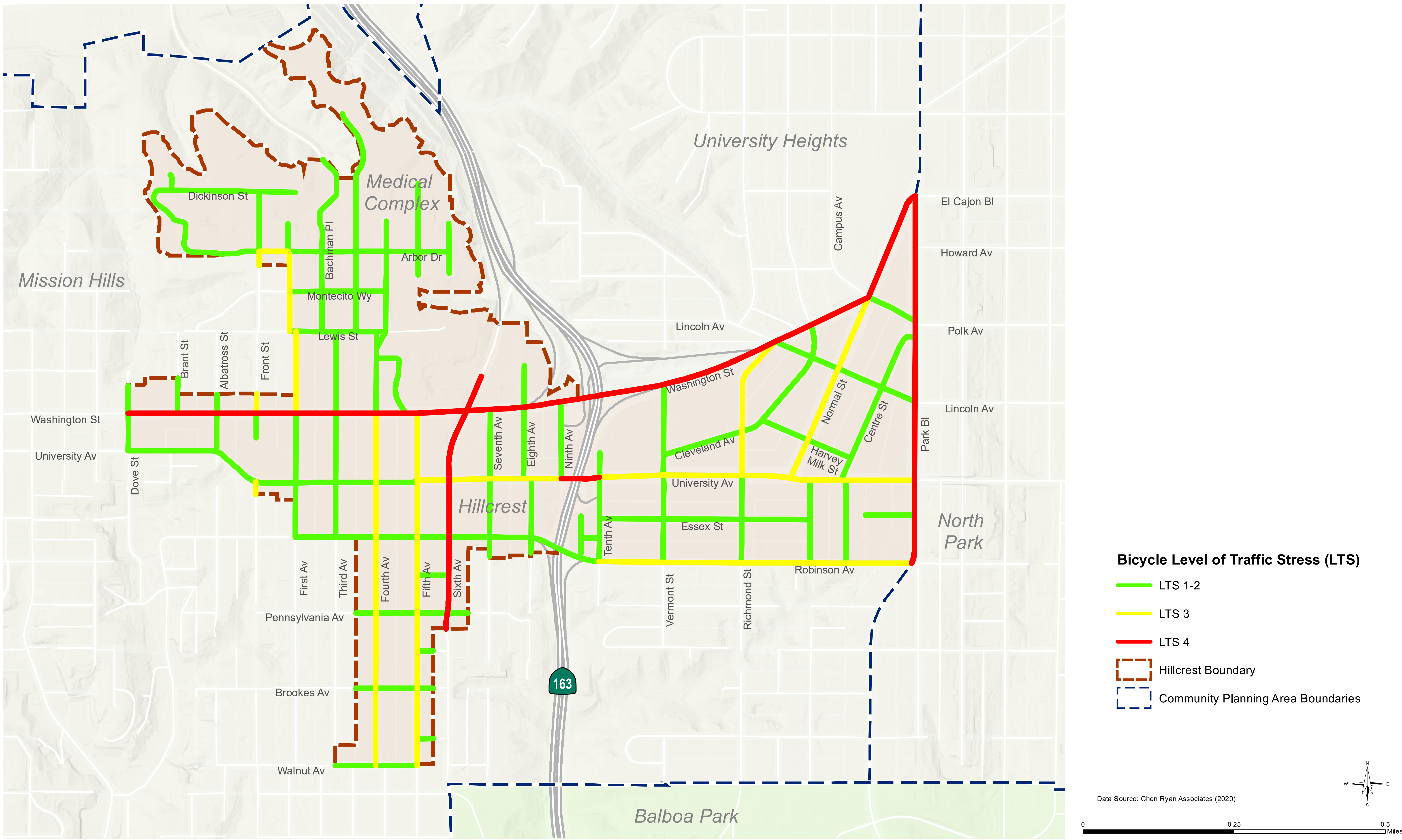
Figure 1-16 shows the bicycle connectivity ratio of each study intersection in Hillcrest. The ratio is an indicator of street network connectivity calculated by dividing the area of a one-mile bicycle travelshed from an origin by the area of a one-mile circle. A higher ratio reflects better street connectivity. Ratios of 40% or better are typically reflective of grid street network conditions with short block lengths in all directions. In comparison to pedestrian connectivity ratio scores, bicycle connectivity ratio scores are less sensitive to barriers because of the larger one-mile distance used for the analysis. Scores will typically have a lower range and be distributed closer to the mean. Ratios below 40% are typically reflective of major physical barriers with few network alternatives in proximity to the origin.

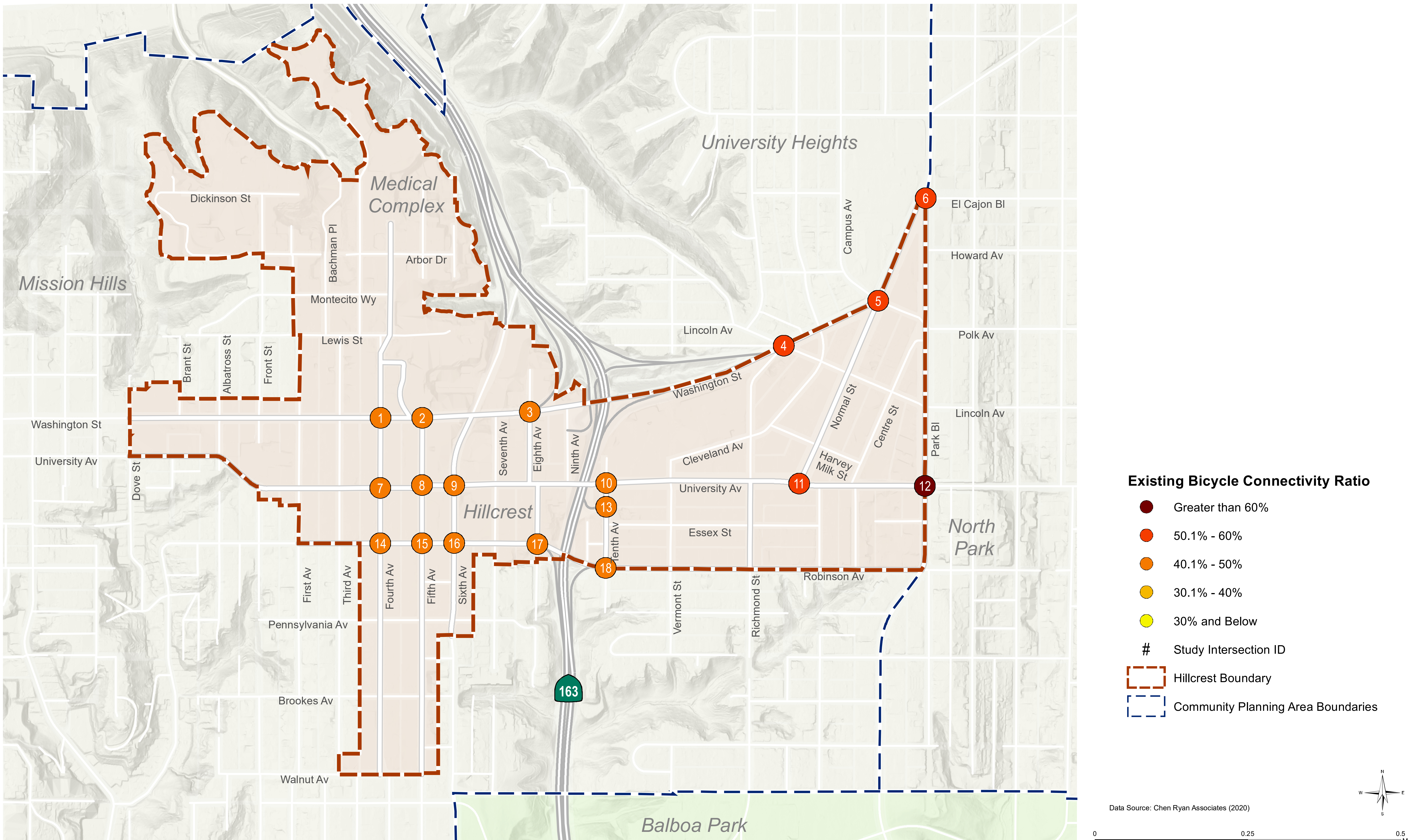
Most of the study intersections within the community have high bicycle connectivity ratios, indicating good network connectivity. The intersections to the east of Richmond Street have higher connectivity ratios because they are farthest removed from the topographical and freeway barriers within the study area. In addition to being closer to the freeway and topographical barriers, the intersections west of SR-163 also have slightly worse connectivity ratios due to the presence of one-way couplets, which require minor detours for navigating in some directions.

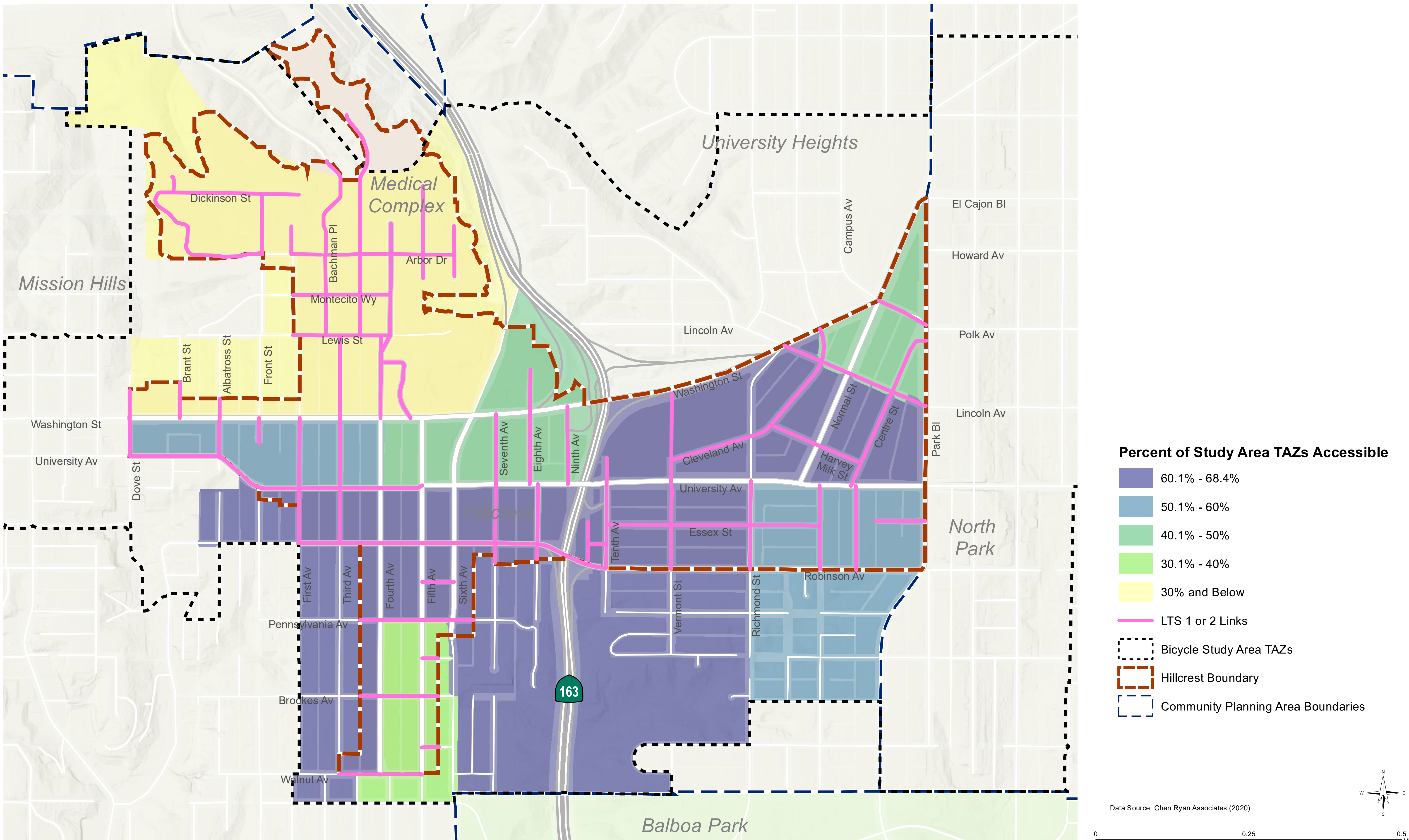
Low-Stress Bicycle Connectivity

Low-Stress Bicycle Connectivity is an analysis which measures the percentage of destinations within the community and surrounding area that are accessible from a set of origins within the community without significant detour by only using low-stress (LTS 1 or 2) network links. Traffic Analysis Zones (TAZs) centroid points were utilized as origins and destinations. Within Hillcrest there are 28 TAZs and an additional 12 TAZs surrounding the community were supplemented to the set of destinations analyzed.

Figure 1-17 presents the results of this analysis. As shown, much of the community between Washington Street and Robinson Avenue has adequate connectivity to neighboring destinations using only low-stress links. The most isolated area within the community for low-stress connectivity is the Medical Complex subarea, which is detached from the remainder of Hillcrest by Washington Street (LTS 4) with Third Avenue providing the only connection between the subarea and the rest of the community.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Normal St
Centre St
Harvey Milk St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Bicycle Level of Traffic Stress (LTS)
LTS 1-2
LTS 3
LTS 4
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
163
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Existing Bicycle Connectivity Ratio
Greater than 60%
50.1% - 60%
40.1% - 50%
30.1% - 40%
30% and Below
Study Intersection ID
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles
N
S
E
W


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Normal St
Centre St
Harvey Milk St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Percent of Study Area TAZs Accessible
60.1% - 68.4%
50.1% - 60%
40.1% - 50%
30.1% - 40%
30% and Below
LTS 1 or 2 Links
Bicycle Study Area TAZs
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

1.3 Public Transportation Mobility

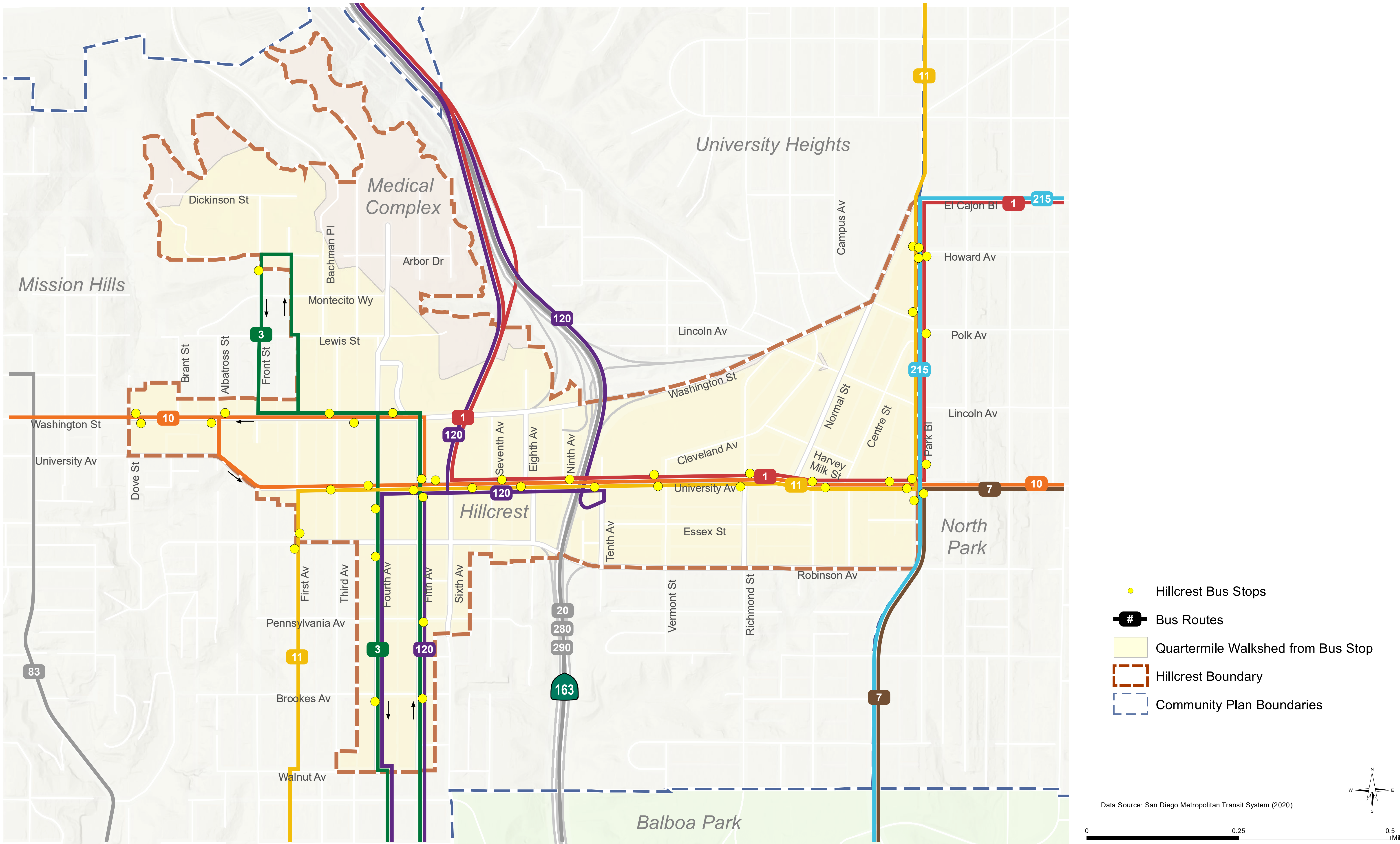
A prosperous public transportation system has many virtues for society. When public transportation works effectively it can provide a population with a viable lower cost mobility alternative to driving. Spatially, it is the most efficient way of moving large numbers of people around a city. It is also one of the least environmentally harmful modes of transportation. For public transportation to work most effectively, it requires increased service frequencies, reliable service patterns, protection from vehicular traffic congestion, and supportive surrounding population and employment density. Public transportation infrastructure is planned, designed, and built by SANDAG due to its regional significance. Transit service is planned and operated by the Metropolitan Transit System (MTS). Within Hillcrest, public transportation consists entirely of bus services.

2008 City of San Diego General Plan Mobility Element – Transit Goals:

- *An attractive and convenient transit system that is the first choice of travel for many of the trips made in the City.*
- *Increased transit ridership.*

The City of San Diego increased emphasis on the role of transit in the future with the adoption of the Climate Action Plan (CAP) in December 2015. The CAP sets a target to "achieve mass transit commute mode share of 12% by 2020 and 25% by 2035 in Transit Priority Areas." As previously stated, Transit Priority Areas (TPAs) include areas within one-half mile of existing or planned rail stations or bus stops served by two or more high frequency bus routes, each having a frequency of service of 15 minutes or less during the morning and afternoon peak commute periods. Hillcrest is entirely within the existing TPA coverage of the City.

Figure 1-18 displays the existing public transportation routes within Hillcrest and the surrounding communities. Within Hillcrest there are seven MTS bus routes which provide service, including one *Rapid* bus route (215) and two limited stop routes (Routes 10 and 120). Each route serving Hillcrest operates at all day high frequency (headways of fifteen minutes or better). Several other bus routes pass through Hillcrest along SR-163 without stopping in the community, including Routes 20, 280 and 290. One additional low frequency bus route (Route 83) bypasses Hillcrest to the west, stopping at Goldfinch Street and Washington Street. As shown, all of the Hillcrest community but for the northern reaches of the Medical Complex subarea are within a quarter-mile of a bus stop.



University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
1
3
7
10
11
83
120
163
215
20
280
290
Hillcrest Bus Stops
Bus Routes
Quartermile Walkshed from Bus Stop
Hillcrest Boundary
Community Plan Boundaries
Data Source: San Diego Metropolitan Transit System (2020)
0
0.25
0.5
Miles

Park Boulevard between El Cajon Boulevard and University Avenue features center-running transit only lanes which are used by the *Rapid* 215.
There are no distinct transit hubs in Hillcrest, however there are areas within the community that are ideal for making transfers between two routes. They include:

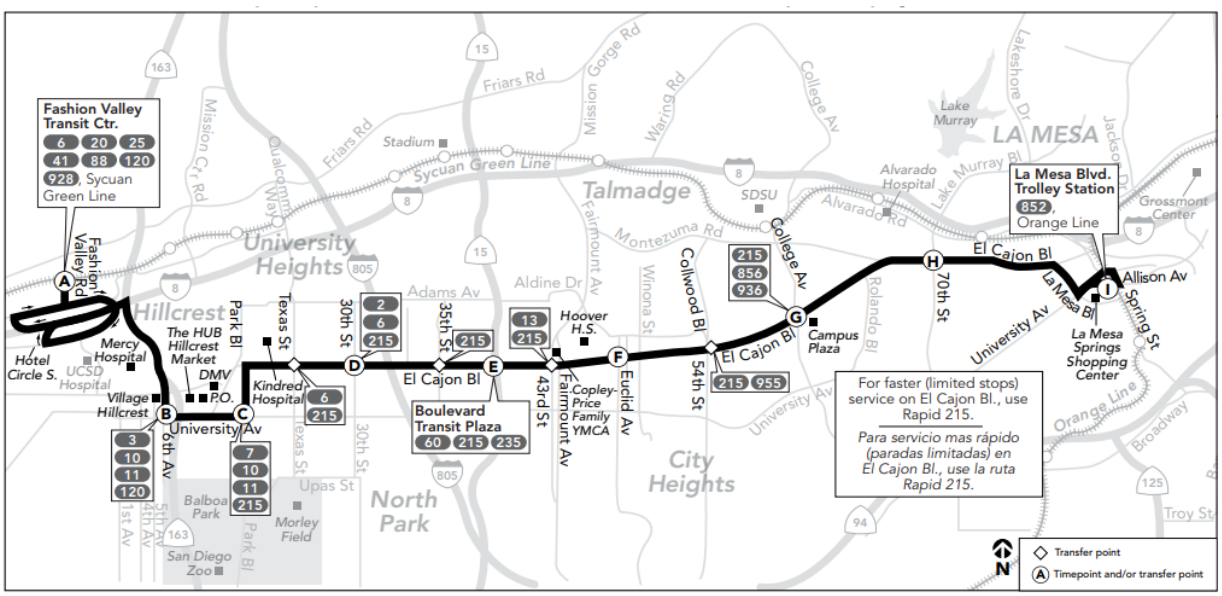
- Park Boulevard and University Avenue, where five bus routes converge at the intersection (Routes 1, 7, 10, 11 and *Rapid* 215); and
- University Avenue, between Third Avenue and Tenth Avenue, where this stretch of roadway functions as a trunk system for five separate bus routes (Routes 1, 3, 10, 11 and 120).

1.3.1 Bus Routes

Each of the bus routes serving Hillcrest are described in the following section, including the areas and destinations they serve, their general alignments, service patterns, frequency, and span. Local bus services (Routes 1, 3, 7, and 11) have stop spacing about 1/8 mile apart. Limited Stop (Routes 10 and 120) and Rapid Routes (Route 215) have stop spacing that is typically between ¼ and ½ mile apart. The latter services with wider stop spacing are intended to facilitate faster and longer distance service than local routes.

Route 1 – Operates as a local bus service between Fashion Valley shopping center in Mission Valley and Downtown La Mesa. The western end of the route uses SR-163 (via University Avenue) for its alignment between Hillcrest and Mission Valley. To the east, this route utilizes University Avenue, Park Boulevard and El Cajon Boulevard to reach La Mesa, passing North Park and the Mid-City communities of San Diego in between. Side-running bus only lanes along El Cajon Boulevard between Park Boulevard and 43rd Street are used by this route through North Park and Mid-City.

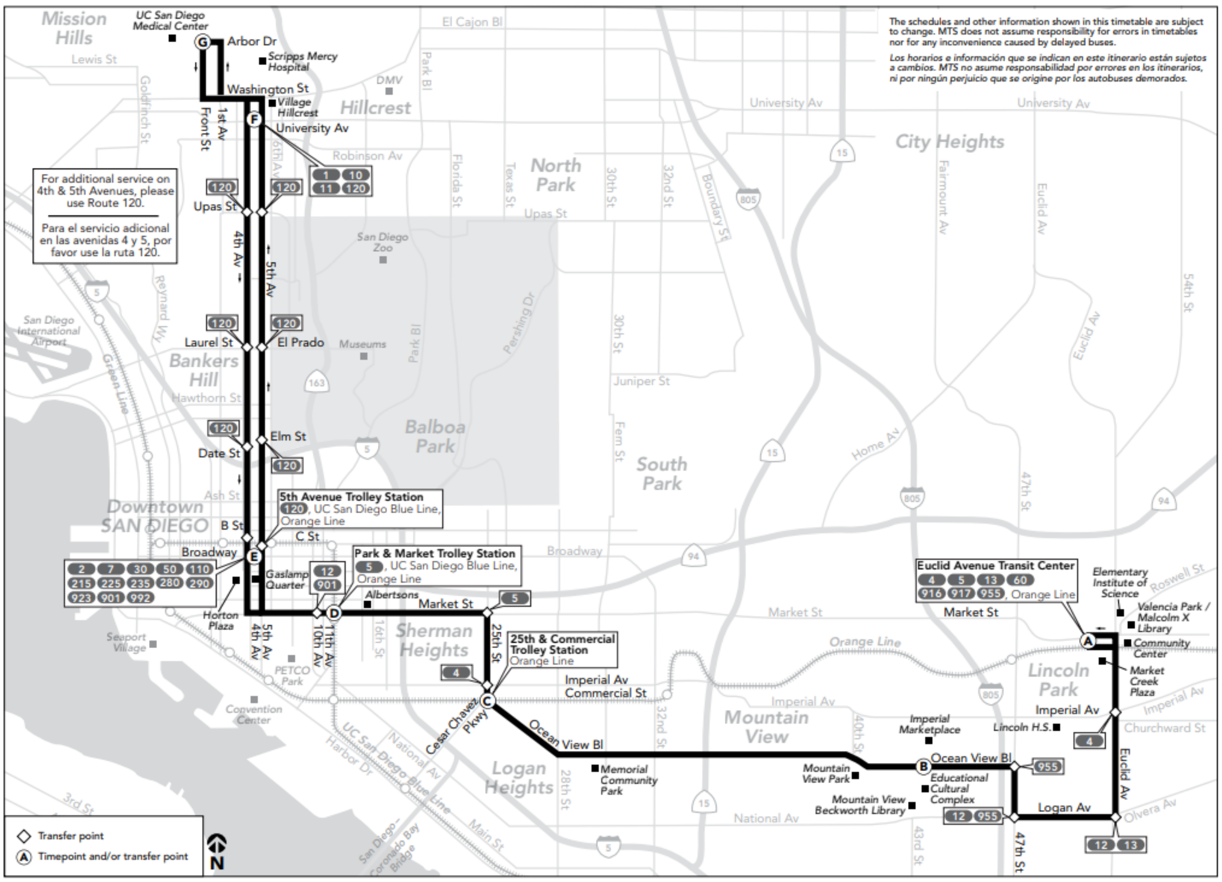
Subject to change, the headways are 15 minutes throughout the day during weekdays. Weekend and holiday headways are 30 minutes throughout the day. Service span is approximately 19 hours on weekdays and Saturdays (5 AM to 12 AM), with a shorter 15-hour service span (6 AM to 9 PM) in effect on Sundays and holidays.



Source: MTS (2020)

Route 3 - Operates as a local bus service between UCSD Medical Center in Hillcrest and Euclid Avenue transit center in the Encanto community. The route uses the Fourth and Fifth Avenue one-way couplet through Hillcrest, before jogging via Washington Street to its terminus at UCSD Medical Center off Front Street and Arbor Drive. South of Hillcrest, the route serves Bankers Hill, Downtown San Diego, Southeastern San Diego and Encanto, traveling on the Fourth and Fifth Avenue couplet, Market Street, 25th Street, Logan Avenue, and Ocean View Boulevard, before eventually reaching Euclid Avenue transit center.

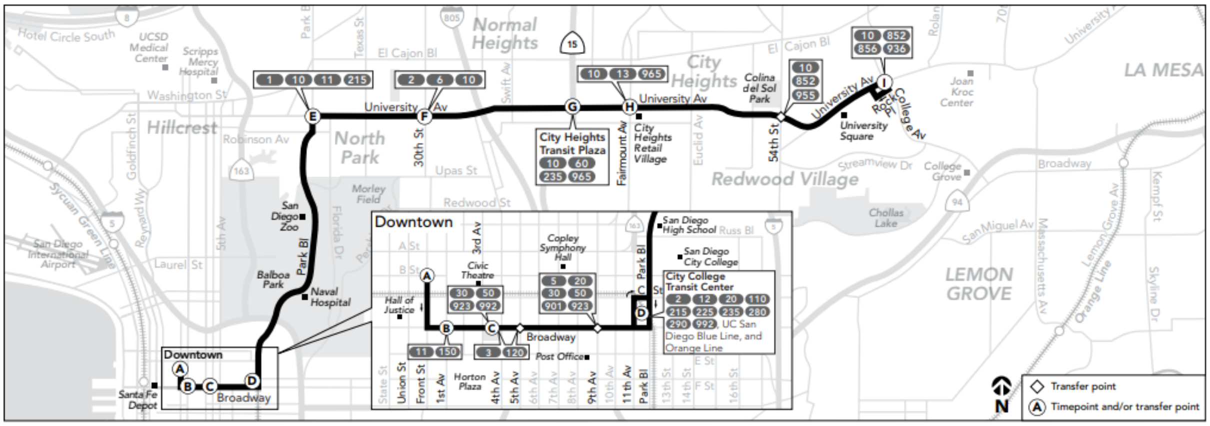
Subject to change, headways are 12 minutes throughout the day during weekdays, 20 minutes on Saturdays, and 30 minutes on Sundays and holidays. Service span is approximately 19-hours on weekdays and Saturdays (5 AM to 12 AM). Sunday and holiday service span is approximately 15-hours (6 AM to 9 PM).



Source: MTS (2020)

Route 7 – Operates as a local bus service between Downtown San Diego and East San Diego at College Avenue and University Avenue. The route passes the boundary of Hillcrest along Park Boulevard at University Avenue. To the south, this route takes Park Boulevard and Broadway to reach Downtown San Diego. To the east, this route uses University Avenue to reach its terminus in East San Diego, passing through North Park and City Heights along the way.

Subject to change, the headways are 10 minutes throughout the day during weekdays and Saturdays, with an approximately 21-hour span (5 AM to 2 AM). Weekend and holiday headways are 12 to 15 minutes throughout the day. Service span on weekdays and Saturdays is approximately 21 hours (5 AM to 2 AM), and approximately 19-hours on Sunday (5 AM to 12 AM).

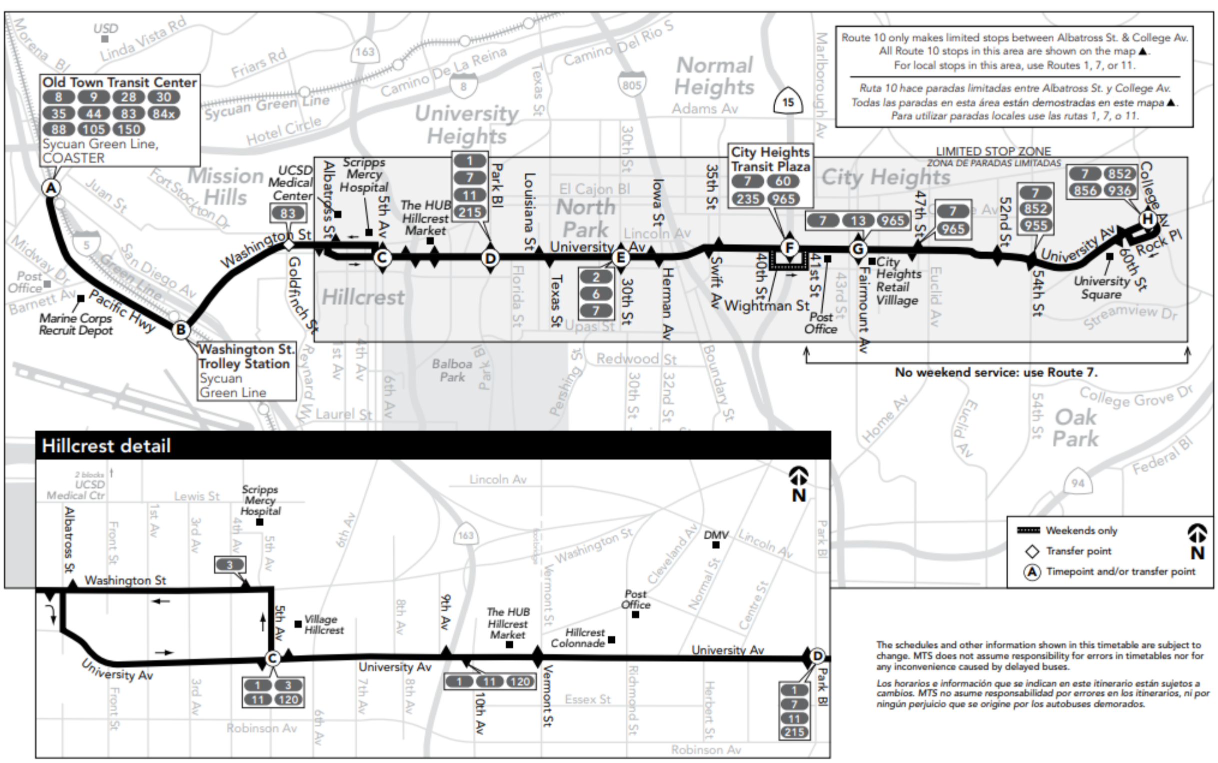


Source: MTS (2020)

Route 10 – Operates between Old Town transit center and East San Diego at College Avenue and University Avenue, primarily as a limited stop service (between Old Town and Hillcrest the route assumes a local service pattern, with closer stop spacing).

Route 10 traverses Hillcrest along Washington Street and University Avenue. Between Albatross Street and Fifth Avenue, it is aligned as a one-way couplet with eastbound buses along University Avenue and westbound buses along Washington Street. East of Fifth Avenue the route uses University Avenue for the remainder of its alignment, passing through North Park and City Heights along the way. On Sundays and holidays, the route terminates at City Heights transit plaza to the east.

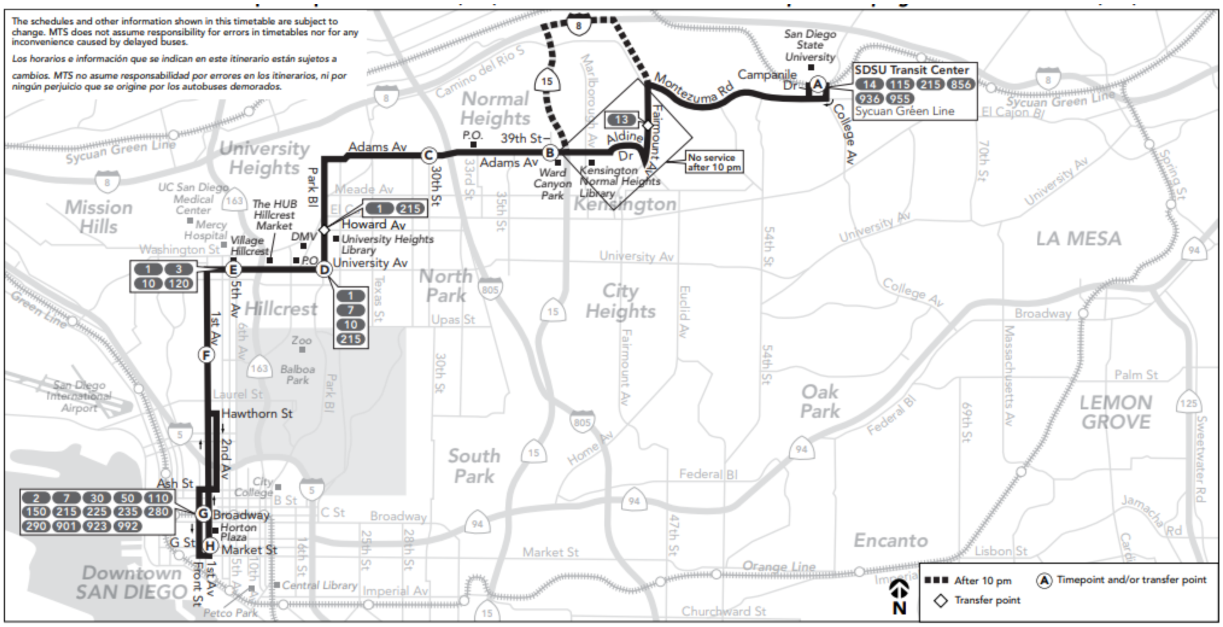
Subject to change, the headways are 15 minutes throughout the day during weekdays, 20 minutes on Saturdays, and 30 minutes on Sundays. Service span on weekdays and Saturdays is approximately 19-hours (5 AM to 12 AM), while on Sundays and holidays this route operates during a 17-hour span (5 AM to 10 PM).



Source: MTS (2020)

Route 11 – Operates as a local bus service between Downtown San Diego and San Diego State University. The route passes through Hillcrest on First Avenue (to and from Downtown), University Avenue and Park Boulevard. To the east of Hillcrest, Route 11 traverses Adams Avenue, Fairmount Avenue and Montezuma Road to reach its San Diego State University terminus, passing University Heights, North Park, Normal Heights, Kensington and the College Area along the way.

Subject to change, the headways are 15 minutes throughout the day during weekdays and 30 minutes on weekends and holidays. Weekday and Saturday service span is 18 hours (5 AM to 11 PM), while Sunday and holiday service span lasts approximately 14 hours (6:30 AM to 8:30 PM).

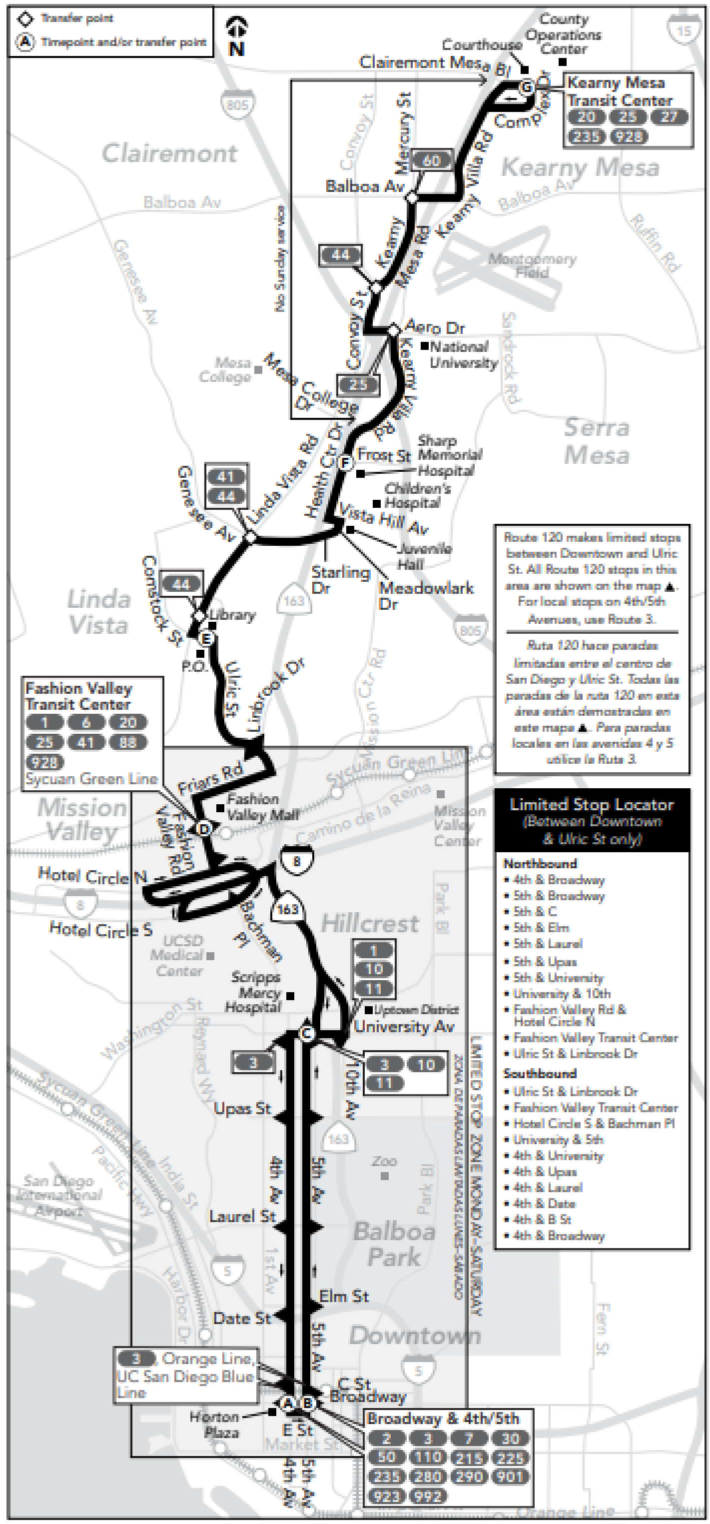


Source: MTS (2020)

Route 120 – Operates between Kearny Mesa transit center and Downtown San Diego, via Fashion Valley shopping center. Between Downtown and Fashion Valley, the route has a limited stop service pattern, and to points north of Fashion Valley utilizes a local service pattern. Between Fashion Valley and Kearny Mesa, the route also serves Linda Vista, the Sharp Health Center complex, and Serra Mesa.

Route 120 uses the Fourth and Fifth Avenue one-way couplet for its alignment between Hillcrest and Downtown San Diego. Through Hillcrest, the north-south alignment jogs briefly along University Avenue between the couplet and SR-163, which it uses to go to and from Fashion Valley. North of Fashion Valley, the route traverses Ulric Street, Linda Vista Road, Kearny Villa Road, Convoy Street, and Kearny Mesa Road – zigzagging across SR-163 several times. On Sundays and holidays, the route terminates at Sharp Hospital to the north.

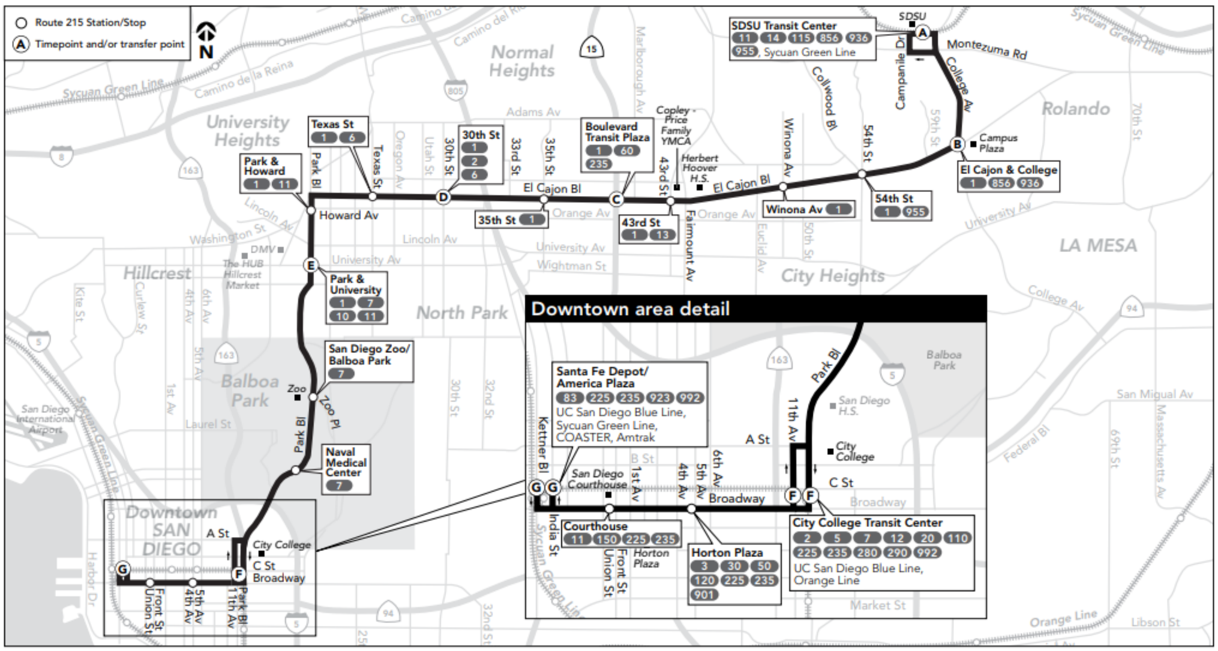
Subject to change, the headways are 15 minutes throughout the day between Downtown and Fashion Valley during weekdays, 30 minutes on weekends. Service span is approximately 19 hours (5AM to 12 AM) on weekdays, 17 hours on Saturdays (5:30 AM to 10:30 PM), and 16 hours on Sundays and holidays (6 AM to 10 PM).



Source: MTS (2020)

***Rapid* Route 215** – Route 215 is an MTS *Rapid* branded service. *Rapid* buses operate with a limited stop service pattern typical of mass transit lines. The route travels between Downtown San Diego and San Diego State University, serving North Park and Mid-City in between. This route features transit priority infrastructure for approximately one-third of its alignment. Within Hillcrest, it operates within center-running bus lanes separated by a median along Park Boulevard between University Avenue and El Cajon Boulevard, and along El Cajon Boulevard between Park Boulevard and 43rd Street through North Park and Mid-City, it operates in side-running bus lanes (shared with cyclists and motorists needing to make right-turns or access parking or driveways).

Subject to change, headways are 10 minutes throughout the day during weekdays and 15 minutes on weekends and holidays. Service on weekdays runs for about 21-hours (4:30 AM to 1:30 AM) on weekdays, and 20 hours (5 AM to 1 AM) on weekends and holidays.



Source: MTS (2020)

1.3.2 Transit Demand

Hillcrest transit demand was approximated by analysis of boardings and alightings for every bus stop within the community by route and through comparison of transit commute mode share to the City and region.

Table 1-20 presents the average daily boardings and alightings in 2019 by route and direction for each bus stop in Hillcrest. **Figure 1-19** shows combined average boardings and alightings for each bus stop in 2019. As shown, Park Boulevard and University Avenue has the highest transit passenger activity with a combined 2,100 average daily boardings and alightings occurring between the six separate bus stops at the intersection. The second busiest location is Fifth Avenue and University Avenue, where a combined 1,600 average daily boardings and alightings occur between the intersection’s four bus stops. The busiest standalone bus stop is the Route 3 terminus at Front Street and Arbor Drive next to UCSD Hospital, which averaged 659 combined daily boardings and alightings.

Table 1-20 Average Daily Boardings and Alightings by Route (2019)

Stop ID	Location	Direction	Boardings	Alightings	Total
Route 1					
10478	Seventh Avenue & University Avenue	EB	57	34	91
13391	Eighth Avenue & University Avenue	EB	30	12	42
10106	Tenth Avenue & University Avenue	EB	35	15	50
10111	Vermont Street & University Avenue	EB	60	14	74
10114	Richmond Street & University Avenue	EB	18	10	28
10494	Herbert Street & University Avenue	EB	12	12	24
12804	Park Boulevard & University Avenue	EB	107	79	186
12453	Park Boulevard & Polk Avenue	EB	3	8	11
12454	Park Boulevard & Howard Avenue	EB	32	25	57
11671	Park Boulevard & Howard Avenue	WB	25	35	60
11670	Park Boulevard & Polk Avenue	WB	5	5	10
11675	Park Boulevard & University Avenue	WB	82	81	163
10865	Normal Street & University Avenue	WB	10	14	24
10862	Richmond Street & University Avenue	WB	15	21	36
11254	Vermont Street & University Avenue	WB	20	57	77
10852	Ninth Avenue & University Avenue	WB	8	15	23
10847	Seventh Avenue & University Avenue	WB	22	87	109
Route 3					
12432	Fifth Avenue & Pennsylvania Avenue	NB	3	33	36
12429	Fifth Avenue & Brookes Avenue	NB	2	14	16
11243	Washington Street & Fifth Avenue	NB	13	126	139
11236	Washington Street & Third Avenue	NB	7	65	72
12009	Front Street & Arbor Drive	Terminus	260	399	659
10468	Washington Street & Fourth Avenue	SB	166	18	184
12027	Fourth Avenue & University Avenue	SB	216	43	259
12025	Fourth Avenue & Robinson Avenue	SB	51	3	54
12028	Fourth Avenue & Brookes Avenue	SB	21	6	27
Route 7					
12456	Park Boulevard & University Avenue	EB	137	249	386
12066	Park Boulevard & University Avenue	WB	215	162	377
Route 10					
10456	Washington Street & Dove Street	EB	54	38	92
10088	Washington Street & Albatross Street	EB	35	41	76
10098	Fifth Avenue & University Avenue	EB	248	177	425

Table 1-20 Average Daily Boardings and Alightings by Route (2019)

Stop ID	Location	Direction	Boardings	Alightings	Total
10106	Tenth Avenue & University Avenue	EB	48	63	111
10111	Vermont Street & University Avenue	EB	83	65	148
13354	Park Boulevard & University Avenue	EB	79	205	284
13355	Park Boulevard & University Avenue	WB	204	76	280
11254	Vermont Street & University Avenue	WB	95	85	180
10852	Ninth Avenue & University Avenue	WB	28	26	54
11245	Sixth Avenue & University Avenue	WB	102	145	247
11243	Washington Street & Fifth Avenue	WB	66	97	163
10838	Washington Street & Albatross Street	WB	55	61	116
10834	Washington Street & Dove Street	WB	41	39	80
Route 11					
12418	First Avenue & Robinson Avenue	EB	8	28	36
10092	Third Avenue & University Avenue	EB	26	41	67
10098	Fifth Avenue & University Avenue	EB	151	51	202
13391	Eighth Avenue & University Avenue	EB	31	25	56
10106	Tenth Avenue & University Avenue	EB	23	25	48
10111	Vermont Street & University Avenue	EB	55	42	97
10114	Richmond Street & University Avenue	EB	18	27	45
10494	Herbert Street & University Avenue	EB	9	20	29
12804	Park Boulevard & University Avenue	EB	107	119	226
12453	Park Boulevard & Polk Avenue	EB	5	10	15
12454	Park Boulevard & Howard Avenue	EB	42	43	85
11671	Park Boulevard & Howard Avenue	WB	34	41	75
11670	Park Boulevard & Polk Avenue	WB	6	3	9
11675	Park Boulevard & University Avenue	WB	127	84	211
10865	Normal Street & University Avenue	WB	20	8	28
10862	Richmond Street & University Avenue	WB	28	17	45
11254	Vermont Street & University Avenue	WB	78	58	136
10852	Ninth Avenue & University Avenue	WB	14	15	29
10847	Seventh Avenue & University Avenue	WB	17	16	33
11245	Sixth Avenue & University Avenue	WB	43	74	117
11240	University Avenue & Fourth Avenue	WB	41	77	118
12018	First Avenue & Robinson Avenue	WB	28	11	39
Route 120					
12431	Fifth Avenue & University Avenue	NB	90	141	231

Table 1-20 Average Daily Boardings and Alightings by Route (2019)

Stop ID	Location	Direction	Boardings	Alightings	Total
10106	Tenth Avenue & University Avenue	NB	50	54	104
11245	Sixth Avenue & University Avenue	SB	53	98	151
12027	Fourth Avenue & University Avenue	SB	92	34	126
Route 215					
13550	Park Boulevard & University Avenue	NB	180	232	412
13552	Park Boulevard & Howard Avenue	NB	62	160	222
13553	Park Boulevard & Howard Avenue	SB	154	85	239
13551	Park Boulevard & University Avenue	SB	217	186	403

Source: MTS (2020)


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
Average Daily Boardings and Alightings
401 - 659
201 - 400
101 - 200
51 - 100
26 - 50
16 - 25
Bus Routes
Quartermile Walkshed from Bus Stop
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: San Diego Metropolitan Transit System (2020)
0
0.25
0.5
Miles

Table 1-21 compares public transportation commute mode share between Hillcrest, the City and the San Diego County region. As shown, Hillcrest has a public transportation commute mode share of 7.1%, which is nearly twice as high as the citywide mode share or more than double the regional transit mode share.

Table 1-21 Public Transportation Commute Mode Share Comparison

	Hillcrest	City of San Diego	San Diego County
Total Public Transportation Commuters	310	27,446	46,506
Total Workers	4,373	714,312	1,603,486
Public Transportation Commute Mode Share	7.1%	3.8%	2.9%

Source: US Census, 2018 American Community Survey 5-Year Estimates

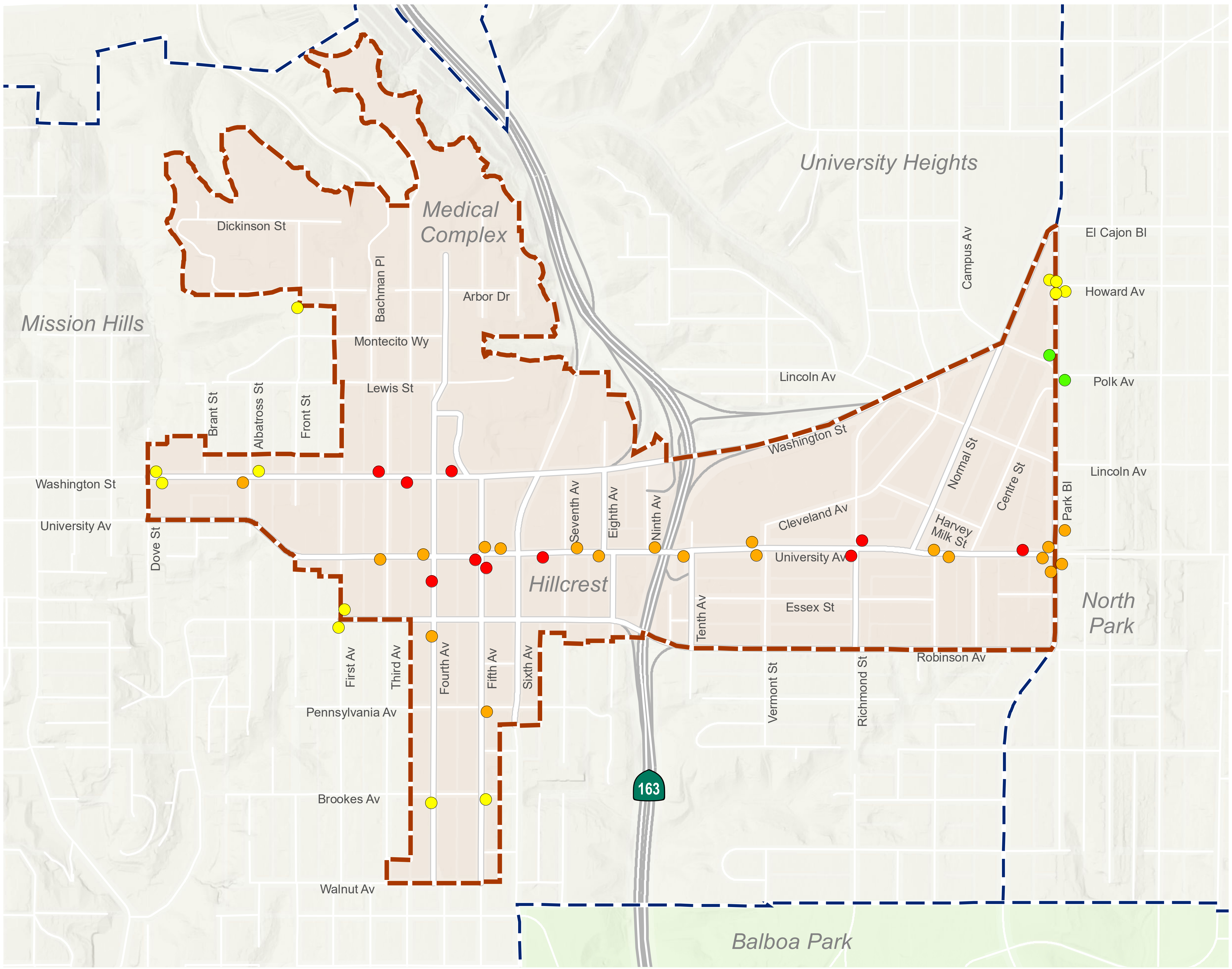
1.3.3 Pedestrian and Cyclist Safety Near Bus Stops

Pedestrian and bicycle-involved collisions between 2014 and 2018 were spatially summarized to within 500 feet of each bus stop in the community. There was a total of 138 collisions reported during this five-year period, including 88 pedestrian-vehicular collisions, 48 bicyclist-vehicular collisions and two pedestrian-cyclist collisions. Of those 138 collisions, 109 were within 500 feet of a bus stop.

Figure 1-20 displays the location of bus stops within Hillcrest and the number of pedestrian and bicycle-involved occurring within 500 feet of those stops. The highest number of pedestrian and bicycle-involved collisions near a bus stop was 16, which occurred at three bus stops:

- Washington Street and Fourth Avenue
- Washington Street and Fifth Avenue
- Fourth Avenue and University Avenue

As many bus stops are close together, this spatial summary will typically assign collisions to multiple bus stop locations.



Pedestrian and Bicycle Collisions Within 500 feet of a Transit Stop (2014-2018)

- 11 - 16
- 6 - 10
- 1 - 5
- 0
- Hillcrest Boundary
- Community Planning Area

Data Source: Transportation Injury Mapping System (TIMS) (2020)

0 0.25 0.5 Miles

1.3.4 Transit Station Quality

Table 1-22 identifies the amenities provided and the 2019 average daily boardings and alightings at each stop. The MTS Design for Transit Manual (2018) was referenced to identify required amenities based on the number of average daily boardings, and to determine any amenity-related deficiencies. As shown, every bus stop in Hillcrest has the minimum basic amenities, which consist of ADA accessibility and route signage. About one third of the bus stops have shelter structures and all but three bus stops in the community have seating. Bus stops along the University Avenue trunk (between Fifth Avenue and Tenth Avenue) and the stops at the corner of Park Boulevard and University Avenue, where transfers are expected to occur, have additional amenities to assist travelers, including route maps and schedule information.

1.3.5 Transit Service Quality – Bus Route On-Time Performance

On-time bus performance can be directly affected by variety of factors, including vehicular traffic congestion along roadways serving bus routes where transit does not have priority. In 2018 and 2019 five of the seven bus routes which traverse Hillcrest did not met the on-time performance goals set for urban frequent bus routes of 85%. The bus routes which did not meet on-time reliability 85% of the time included Routes 3, 7, 10, 11 and 120. Of the bus routes serving Hillcrest, Route 3 has the lowest on-time performance (78%), while the other routes are on-time between 79% and 84% of the time.

Routes 1 and Rapid 215 met on-time reliability benchmarks, with 85% and 87% on-time performance, respectively.

1.3.6 Quality Connectivity from Major Transit Stops

Quality pedestrian and bicycle connectivity was analyzed from major transit stops. The assessments measure the ratio of quality travelshed (0.25 miles for walking and 0.75 miles for bicycling) based on PEQE and Bicycle LTS assessment to the area of a crow flies buffer of the same distance. Those threshold distances to transit, based on SANDAG Regional Transit Oriented Development Strategy[1], represent a five-minute travel time for pedestrians and cyclists, respectively. Major transit stop locations included in this analysis are those which are served by two or more high frequency bus routes.

Figure 1-21 displays the results of the Quality Walkshed Ratio from major transit stops. As shown, most transit stops in the community, including those along University Avenue have adequate quality walkshed. No transit stops within Hillcrest scored in the lowest category.

Figure 1-22 displays the results of the Quality Bikeshed Ratio from major transit stops. As shown, major transit stops along Washington Street west of Fifth Avenue, and bus stops near University Avenue and Park Boulevard are in the lowest category, due to their locations along high stress roadways with limited connections from low-stress side streets.

[1] San Diego Forward: The Regional Plan, Appendix U4

Table 1-22 Transit Stop Amenities

Stop ID	Intersection	Routes	Direction of Travel	Boardings	Alightings	Boardings and Alightings	Far Side / Near Side	Sign and Pole	Built-in Sign	Expanded Sidewalk	Accessible	Seating	Passenger Shelter	Route Designations	Schedule Display	Route Map	System Map	Trash Receptacle	Real Time Display	Bus Pads	Red Curbs	ADA Compliant
12009	Front Street & Arbor Drive	3	S	260	399	659	F	✓		✓	✓	✓	✓	✓				✓			✓	✓
12454	Park Boulevard & Howard Avenue	1 & 11	N	74	68	142	N	✓		✓	✓	✓		✓				✓			✓	✓
13552	Park Boulevard & Howard Avenue	215	N	62	160	222	F	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13553	Park Boulevard & Howard Avenue	215	S	154	85	239	F	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11671	Park Boulevard & Howard Avenue	1 & 11	S	59	77	136	F	✓		✓	✓	✓		✓				✓			✓	✓
12453	Park Boulevard & Polk Avenue	1 & 11	N	8	18	26	N	✓		✓	✓	✓		✓							✓	✓
11670	Park Boulevard & Polk Avenue	1 & 11	S	11	8	19	N	✓		✓	✓	✓		✓				✓			✓	✓
10456	Washington Street & Dove Street	10	E	54	38	92	F	✓		✓	✓	✓		✓							✓	✓
10834	Washington Street & Dove Street	10	W	41	39	80	N	✓		✓	✓	✓	✓	✓				✓			✓	✓
10088	Washington Street & Albatross Street	10	E	35	41	76	N	✓		✓	✓	✓		✓							✓	✓
10838	Washington Street & Albatross Street	10	W	55	61	116	N	✓		✓	✓	✓		✓							✓	✓
11236	Washington Street & Third Avenue	3	W	7	65	72	F	✓		✓	✓	✓		✓							✓	✓

Table 1-22 Transit Stop Amenities

Stop ID	Intersection	Routes	Direction of Travel	Boardings	Alightings	Boardings and Alightings	Far Side / Near Side	Sign and Pole	Built-in Sign	Expanded Sidewalk	Accessible	Seating	Passenger Shelter	Route Designations	Schedule Display	Route Map	System Map	Trash Receptacle	Real Time Display	Bus Pads	Red Curbs	ADA Compliant
10468	Washington Street & Fourth Avenue	3	E	166	18	184	N	✓		✓	✓	✓		✓							✓	✓
11243	Washington Street & Fifth Avenue	3 & 10	W	79	223	302	F	✓		✓	✓	✓		✓							✓	✓
10092	Third Avenue & University Avenue	11	E	26	41	67	N	✓		✓	✓	✓		✓				✓			✓	✓
11240	University Avenue & Fourth Avenue	11	W	41	77	118	F	✓		✓	✓	✓		✓							✓	✓
10098	Fifth Avenue & University Avenue	10 & 11	E	399	227	626	N	✓		✓	✓	✓		✓	✓			✓			✓	✓
12430	Fifth Avenue & University Avenue	3	N	38	204	242	F	✓		✓	✓	✓		✓							✓	✓
11245	Sixth Avenue & University Avenue	10, 11, & 120	W	198	316	514	N	✓		✓	✓	✓		✓	✓			✓			✓	✓
12431	Fifth Avenue & University Avenue	120	N	90	141	231	N	✓		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓
10478	Seventh Avenue & University Avenue	1	E	57	34	91	N	✓		✓	✓	✓		✓				✓			✓	✓
10847	Seventh Avenue & University Avenue	1 & 11	W	39	103	142	N	✓		✓	✓	✓		✓				✓			✓	✓
13391	Eighth Avenue & University Avenue	1 & 11	E	61	37	98	N	✓		✓	✓	✓		✓							✓	✓
10852	Ninth Avenue & University Avenue	1, 10, & 11	W	50	56	106	N	✓		✓	✓	✓		✓				✓			✓	✓

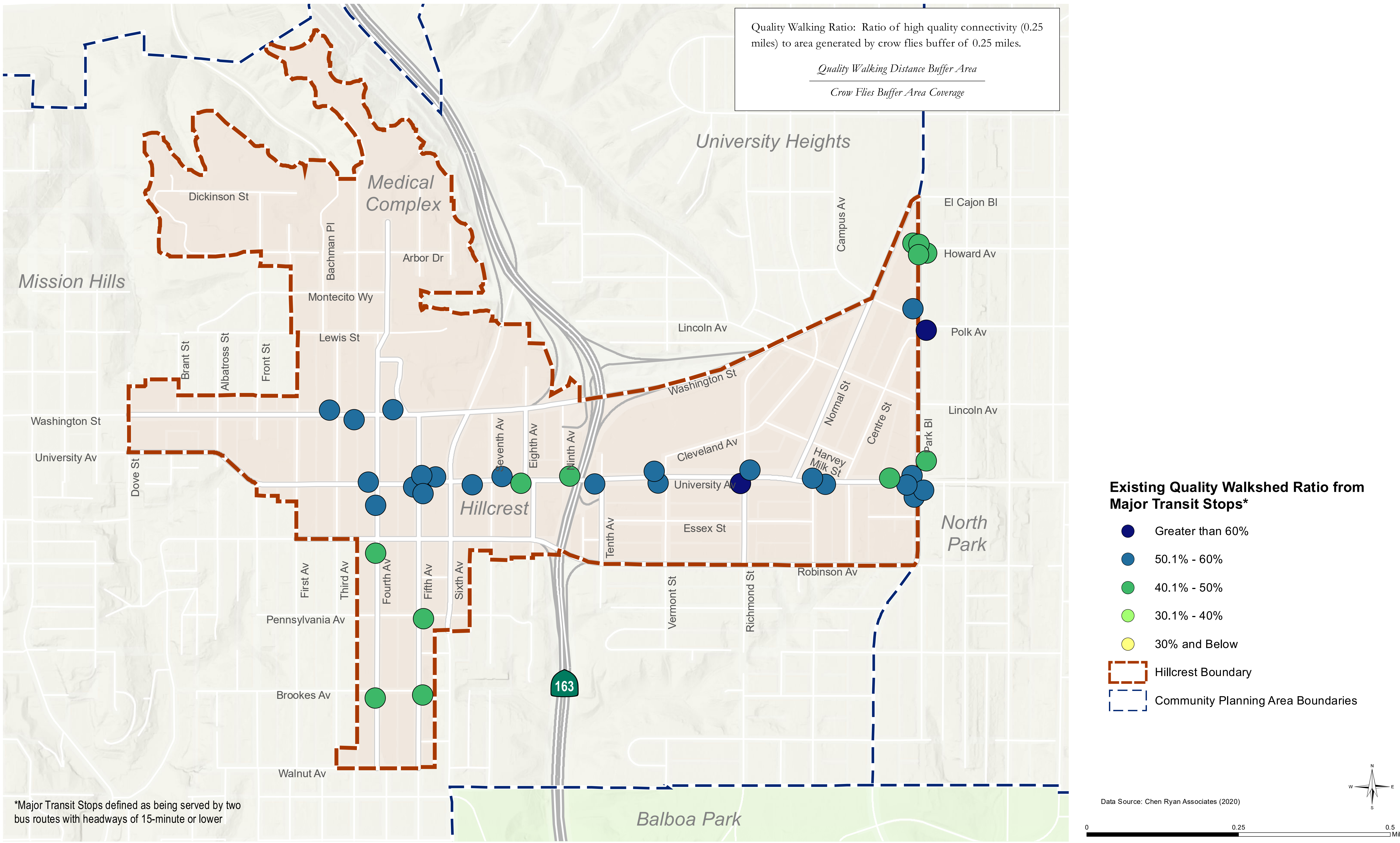
Table 1-22 Transit Stop Amenities

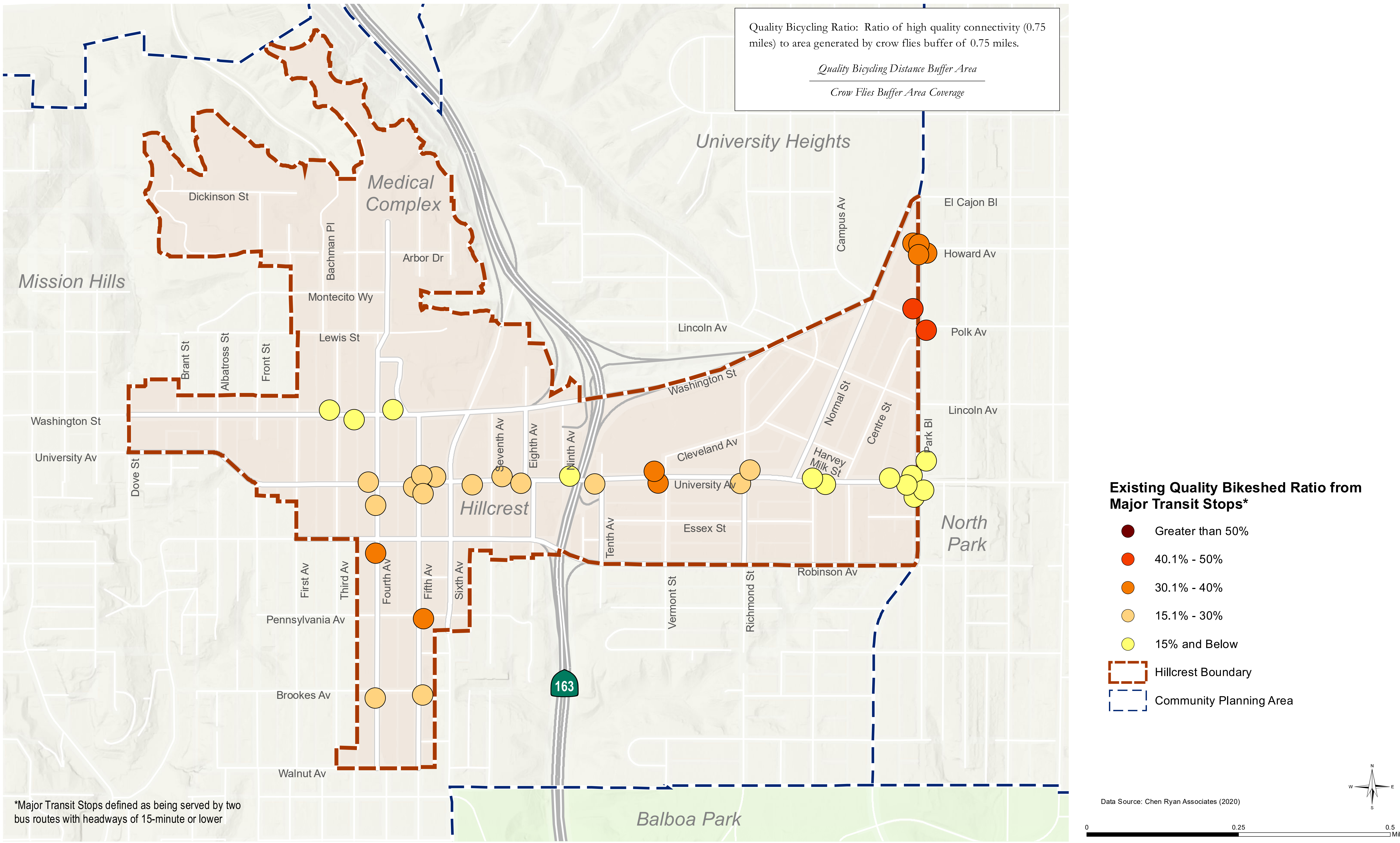
Stop ID	Intersection	Routes	Direction of Travel	Boardings	Alightings	Boardings and Alightings	Far Side / Near Side	Sign and Pole	Built-in Sign	Expanded Sidewalk	Accessible	Seating	Passenger Shelter	Route Designations	Schedule Display	Route Map	System Map	Trash Receptacle	Real Time Display	Bus Pads	Red Curbs	ADA Compliant
10106	Tenth Avenue & University Avenue	1, 10, 11, & 120	E	155	157	312	N	✓		✓	✓	✓	✓	✓	✓			✓			✓	✓
11254	Vermont Street & University Avenue	1, 10, & 11	W	192	200	392	F	✓		✓	✓	✓		✓				✓			✓	✓
10111	Vermont Street & University Avenue	1, 10, & 11	E	198	122	320	N	✓		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓
10114	Richmond Street & University Avenue	1 & 11	E	35	36	71	N	✓		✓	✓	✓		✓							✓	✓
10862	Richmond Street & University Avenue	1 & 11	W	43	38	81	N	✓		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓
10865	Normal Street & University Avenue	1 & 11	W	30	23	53	N	✓		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓
10494	Herbert Street & University Avenue	1 & 11	E	22	31	53	F	✓		✓	✓	✓		✓				✓			✓	✓
13355	Park Boulevard & University Avenue	10	W	204	76	280	F	✓		✓	✓	✓		✓	✓						✓	✓
13354	Park Boulevard & University Avenue	10	E	79	205	284	N	✓		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓
11675	Park Boulevard & University Avenue	1 & 11	S	209	165	374	N	✓		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓
12066	Park Boulevard & University Avenue	7	S	215	162	377	F	✓		✓	✓	✓		✓				✓			✓	✓
12456	Park Boulevard & University Avenue	7	N	137	249	386	N	✓		✓	✓	✓		✓	✓			✓			✓	✓

Table 1-22 Transit Stop Amenities

Stop ID	Intersection	Routes	Direction of Travel	Boardings	Alightings	Boardings and Alightings	Far Side / Near Side	Sign and Pole	Built-in Sign	Expanded Sidewalk	Accessible	Seating	Passenger Shelter	Route Designations	Schedule Display	Route Map	System Map	Trash Receptacle	Real Time Display	Bus Pads	Red Curbs	ADA Compliant
12804	Park Boulevard & University Avenue	1 & 11	N	214	199	413	F	✓		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓
12418	First Avenue & Robinson Avenue	11	N	8	28	36	F	✓			✓	✓		✓							✓	✓
12018	First Avenue & Robinson Avenue	11	S	28	11	39	F	✓			✓	✓		✓							✓	✓
12027	Fourth Avenue & University Avenue	3 & 120	S	309	77	386	F	✓		✓	✓	✓		✓				✓			✓	✓
12025	Fourth Avenue & Robinson Avenue	3	S	51	3	54	F	✓			✓	✓	✓	✓	✓	✓		✓			✓	✓
12028	Fourth Avenue & Brookes Avenue	3	S	21	6	27	F	✓			✓			✓				✓			✓	✓
12432	Fifth Avenue & Pennsylvania Avenue	3	N	3	33	36	N	✓		✓	✓			✓							✓	✓
12429	Fifth Avenue & Brookes Avenue	3	N	2	14	16	N	✓		✓	✓			✓							✓	✓
13551	Park Boulevard & University Avenue	215	S	217	186	403	N	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13550	Park Boulevard & University Avenue	215	N	180	232	412	F	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: MTS (2020)


Quality Walking Ratio: Ratio of high quality connectivity (0.25 miles) to area generated by crow flies buffer of 0.25 miles.
Quality Walking Distance Buffer Area
Crow Flies Buffer Area Coverage
University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Lincoln Av
Washington St
Cleveland Av
University Av
Essex St
Robinson Av
Campus Av
El Cajon Bl
Howard Av
Polk Av
Lincoln Av
Normal St
Centre St
Park Bl
Harvey Milk St
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Vermont St
Richmond St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
163
Existing Quality Walkshed Ratio from Major Transit Stops*
Greater than 60%
50.1% - 60%
40.1% - 50%
30.1% - 40%
30% and Below
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles
*Major Transit Stops defined as being served by two bus routes with headways of 15-minute or lower


Quality Bicycling Ratio: Ratio of high quality connectivity (0.75 miles) to area generated by crow flies buffer of 0.75 miles.
Quality Bicycling Distance Buffer Area
Crow Flies Buffer Area Coverage
University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Centre St
Harvey Milk St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Existing Quality Bikeshed Ratio from Major Transit Stops*
Greater than 50%
40.1% - 50%
30.1% - 40%
15.1% - 30%
15% and Below
Hillcrest Boundary
Community Planning Area
*Major Transit Stops defined as being served by two bus routes with headways of 15-minute or lower
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

1.4 Vehicular Mobility

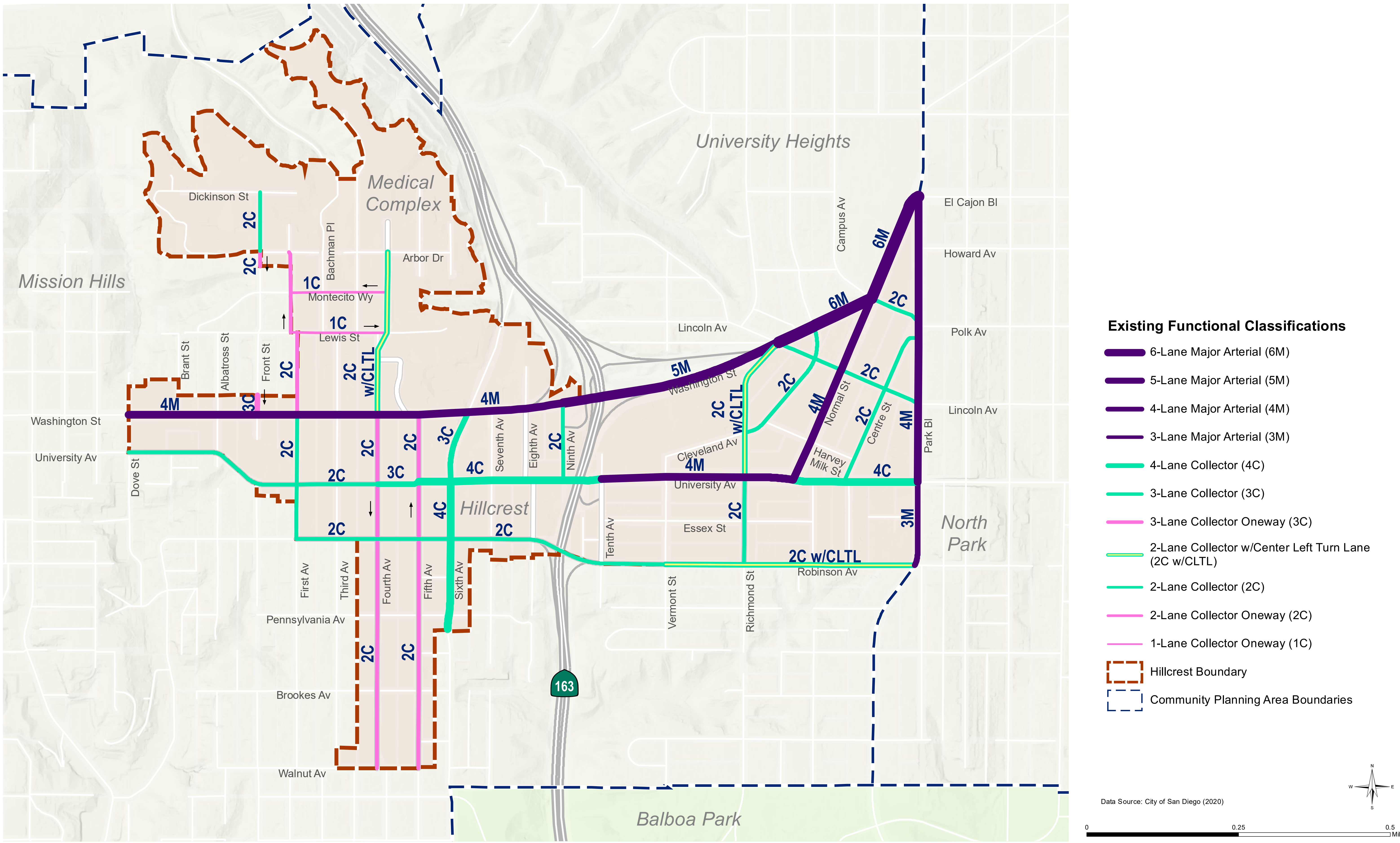
Maintaining efficient vehicular operations is vital to the economy, and helps reduce energy consumption, air pollution, and GHG emissions. Local roadways and the regional freeway system provide an interconnected network used to move people and goods throughout the region.

2008 City of San Diego General Plan Mobility Element – Street & Freeway System Goals:

- *A street and freeway system that balances the needs of multiple users of the public right-of-way.*
- *An interconnected street system that provides multiple linkages within and between communities.*
- *Vehicle congestion relief.*
- *Safe and efficient street design that minimizes environmental and neighborhood impacts.*
- *Well maintained streets.*

Figure 1-23 shows the existing functional classifications of the roadways within Hillcrest. **Table 1-23** provides descriptions of the characteristics for each of these roadways, which also include the roadway lane geometry, posted speed limit, and specifies the presence of median, on-street parking, sidewalks, and bicycle facilities.

The existing lane geometries of the 18 study area intersections are presented in **Figure 1-24**.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Existing Functional Classifications
6-Lane Major Arterial (6M)
5-Lane Major Arterial (5M)
4-Lane Major Arterial (4M)
3-Lane Major Arterial (3M)
4-Lane Collector (4C)
3-Lane Collector (3C)
3-Lane Collector Oneway (3C)
2-Lane Collector w/Center Left Turn Lane (2C w/CLTL)
2-Lane Collector (2C)
2-Lane Collector Oneway (2C)
1-Lane Collector Oneway (1C)
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: City of San Diego (2020)
0
0.25
0.5
Miles

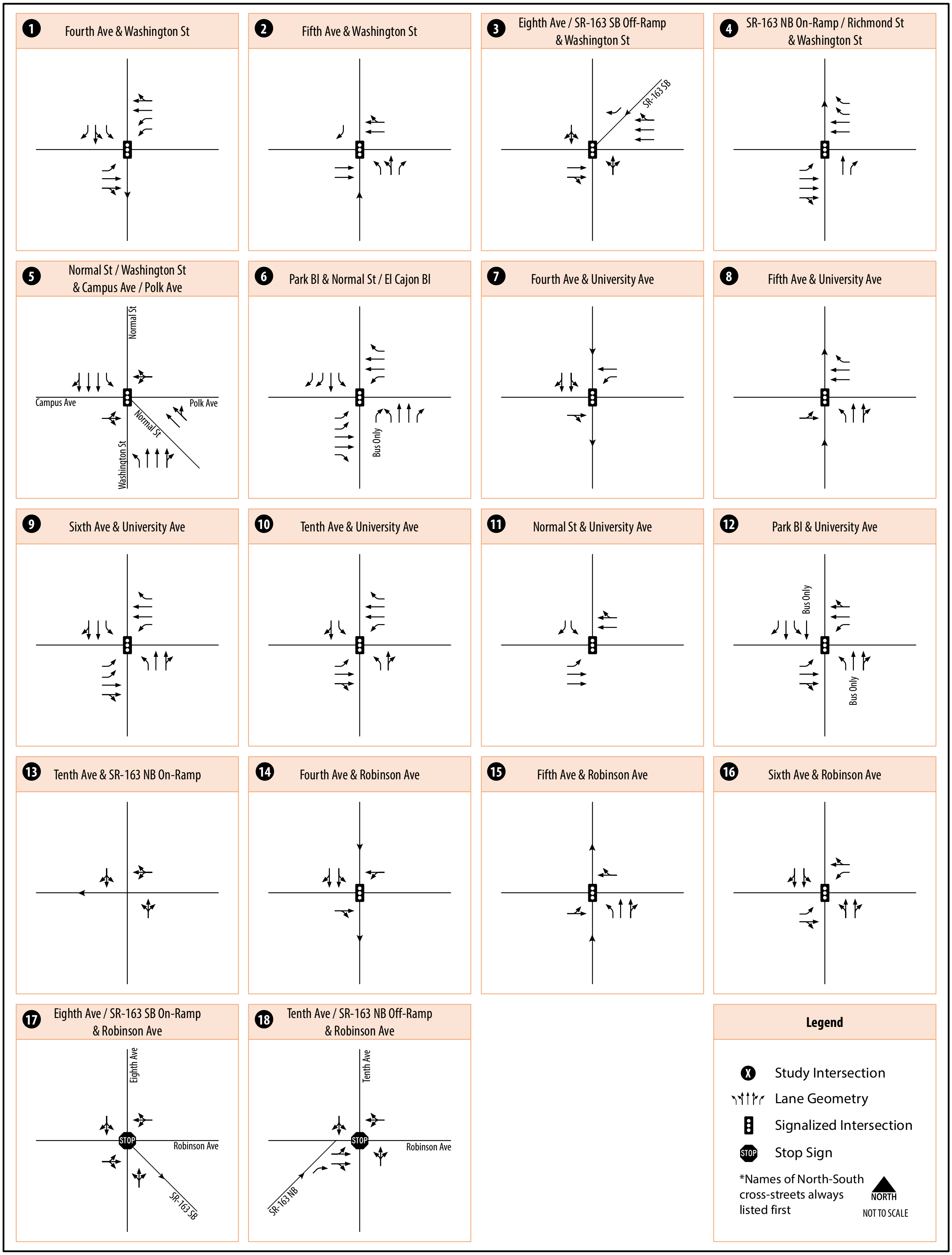


Figure 4-21
Existing Intersection Geometrics

Table 1-23 Existing Roadway Characteristics

Roadway	From	To	Functional Classification	Lane Directions	Presence of Median	Posted Speed (mph)	Presence of On-Street Parking	On-Street Parking is Metered	Presence of Sidewalk	Presence of Bicycle Facility
East/West Roadway										
Montecito Way	Front Street	Fourth Avenue	1-Ln Collector (One-Way)	1 WB	-	-	Parallel	-	Contiguous	-
Polk Avenue	Normal Street	Park Boulevard	2-Ln Collector	1 EB / 1 WB	-	-	EB: Parallel WB: Angled	-	Contiguous	-
Lewis Street	Front Street	Fourth Avenue	1-Ln Collector (One-Way)	1 EB	-	-	Parallel	-	Contiguous	-
Washington Street	Dove Street	Fourth Avenue	4-Ln Major Arterial	2 EB / 2 WB	Raised	35	Parallel	x	Continuous	-
Washington Street	Fourth Avenue	Fifth Avenue	4-Ln Major Arterial	2 EB / 2 WB	Raised	35	Parallel	x	Continuous	-
Washington Street	Fifth Avenue	Eighth Avenue	4-Ln Major Arterial	2 EB / 2 WB	Raised	35	None	-	Continuous	-
Washington Street	Eighth Avenue	Ninth Avenue	4-Ln Major Arterial	2 EB / 2 WB	Raised	40	Parallel	x	Noncontiguous	-
Washington Street	Ninth Avenue	Lincoln Avenue	5-Ln Major Arterial	3 EB / 2 WB	Raised	40	Parallel	x	Noncontiguous	-
Washington Street	Lincoln Avenue	Normal Street	6-Ln Major Arterial	3 EB / 3 WB	Raised	40	None	-	Contiguous	-
Lincoln Avenue	Washington Street	Normal Street	2-Ln Collector	1 EB / 1 WB	-	25	Parallel	-	Contiguous	-
Lincoln Avenue	Normal Street	Park Boulevard	2-Ln Collector	1 EB / 1 WB	-	25	EB: Parallel WB: Angled	-	Contiguous	-
University Avenue	Dove Street	First Avenue	2-Ln Collector	1 EB / 1 WB	-	25	Parallel (Intermittently)	x	Contiguous	Class III
University Avenue	First Avenue	Fourth Avenue	2-Ln Collector	1 EB / 1 WB	-	25	Parallel	x	Contiguous	Class III

Table 1-23 Existing Roadway Characteristics

Roadway	From	To	Functional Classification	Lane Directions	Presence of Median	Posted Speed (mph)	Presence of On-Street Parking	On-Street Parking is Metered	Presence of Sidewalk	Presence of Bicycle Facility
University Avenue	Fourth Avenue	Fifth Avenue	2-Ln Collector	1 EB / 2 WB	-	25	EB: Parallel (Intermittently) WB: Prohibited	x	Contiguous	Class III
University Avenue	Fifth Avenue	Sixth Avenue	4-Ln Collector	2 EB / 2 WB	-	25	Parallel	x	Contiguous	Class II
University Avenue	Sixth Avenue	Tenth Avenue	4-Ln Collector	2 EB / 2 WB	-	25	None	-	Contiguous	Class II
University Avenue	Tenth Avenue	Richmond Street	4-Ln Major Arterial	2 EB / 2 WB	Raised	25 EB / 30 WB	Parallel / Angled	x	Contiguous	Class II
University Avenue	Richmond Street	Normal Street	4-Ln Major Arterial	2 EB / 2 WB	Raised	25	Angled	x	Contiguous	Class II
University Avenue	Normal Street	Park Boulevard	4-Ln Collector	2 EB / 2 WB	-	25	Parallel	x	Contiguous	Class III
Robinson Avenue	First Avenue	Fourth Avenue	2-Ln Collector	1 EB / 1 WB	-	25	Parallel	x	Contiguous	-
Robinson Avenue	Fourth Avenue	Fifth Avenue	2-Ln Collector	1 EB / 1 WB	-	25	EB: Parallel WB: Prohibited	x	Contiguous	Class III
Robinson Avenue	Fifth Avenue	Sixth Avenue	2-Ln Collector	1 EB / 1 WB	-	25	None	-	Contiguous	Class III
Robinson Avenue	Sixth Avenue	Eighth Avenue	2-Ln Collector	1 EB / 1 WB	-	25	Parallel (Intermittently)	x	Contiguous	Class III
Robinson Avenue	Eighth Avenue	Tenth Avenue	2-Ln Collector	1 EB / 1 WB	-	25	None	-	Contiguous	Class III
Robinson Avenue	Tenth Avenue	Vermont Street	2-Ln Collector	1 EB / 1 WB	-	30	Parallel	-	Contiguous	Class III
Robinson Avenue	Vermont Street	Richmond Street	2-Ln Collector (w/CLTL)	1 EB / 1 WB	CLTL	30	Parallel	-	Contiguous	Class III

Table 1-23 Existing Roadway Characteristics

Roadway	From	To	Functional Classification	Lane Directions	Presence of Median	Posted Speed (mph)	Presence of On-Street Parking	On-Street Parking is Metered	Presence of Sidewalk	Presence of Bicycle Facility
Robinson Avenue	Richmond Street	Park Boulevard	2-Ln Collector (w/CLTL)	1 EB / 1 WB	CLTL	30	Parallel	-	Contiguous	Class III
North/South Roadway										
Front Street	Dickinson Street	Arbor Drive	2-Ln Collector	1 NB / 1 SB	-	25	Parallel (Intermittently)	-	Contiguous	-
Front Street	Arbor Drive	Lewis Street	2-Ln Collector (One-Way)	2 SB	-	25	Parallel	-	Contiguous	-
Front Street	Lewis Street	Washington Street	3-Ln Collector (One-Way)	3 SB	-	25	Parallel	-	Contiguous	-
First Avenue	North of Arbor Drive	Arbor Drive	Local Road	1 NB / 1 SB	-	-	Parallel	-	Contiguous	-
First Avenue	Arbor Drive	Washington Street	2-Ln Collector (One-Way)	2 NB	-	-	Parallel	-	Contiguous	-
First Avenue	Washington Street	University Avenue	2-Ln Collector	1 NB / 1 SB	-	25	Parallel	-	Contiguous	-
First Avenue	University Avenue	Robinson Avenue	2-Ln Collector	1 NB / 1 SB	-	25	Parallel	-	Contiguous	-
Fourth Avenue	North of Arbor Drive	Arbor Drive	Local Road	1 NB / 1 SB	-	-	Parallel	-	Contiguous	-
Fourth Avenue	Arbor Drive	Washington Street	2-Ln Collector (w/CLTL)	1 NB / 1 SB	CLTL	-	Parallel	x	Contiguous	-
Fourth Avenue	Washington Street	University Avenue	2-Ln Collector (One-Way)	2 SB	-	25	Parallel	x	Contiguous	-
Fourth Avenue	University Avenue	Robinson Avenue	2-Ln Collector (One-Way)	2 SB	-	25	Parallel	x	Contiguous	-
Fourth Avenue	Robinson Avenue	Walnut Avenue	2-Ln Collector (One-Way)	2 SB	-	25	Parallel	x	Contiguous	-

Table 1-23 Existing Roadway Characteristics

Roadway	From	To	Functional Classification	Lane Directions	Presence of Median	Posted Speed (mph)	Presence of On-Street Parking	On-Street Parking is Metered	Presence of Sidewalk	Presence of Bicycle Facility
Fifth Avenue	North of Washington Street	Washington Street	Local Road	1 NB / 1 SB	-	25	Parallel	x	Contiguous	-
Fifth Avenue	Washington Street	University Avenue	2-Ln Collector (One-Way)	3 NB	-	25	Parallel	x	Contiguous	Class II
Fifth Avenue	University Avenue	Robinson Avenue	2-Ln Collector (One-Way)	3 NB	-	30	Parallel	x	Contiguous	Class II
Fifth Avenue	Robinson Avenue	Walnut Avenue	2-Ln Collector (One-Way)	3 NB	-	30	Parallel	x	Contiguous	Class II
Sixth Avenue	600' North of University Avenue	University Avenue	3-Lane Collector	1 NB / 2 SB	-	None	None	-	None	-
Sixth Avenue	University Avenue	Robinson Avenue	4-Ln Collector	2 NB / 2 SB	-	30	Parallel (Intermittently)	x	Contiguous	-
Sixth Avenue	Robinson Avenue	Pennsylvania Avenue	4-Ln Collector	2 NB / 2 SB	-	30	Parallel	x	Contiguous	-
Eighth Avenue	Washington Street	University Avenue	Local Road	1 NB / 1 SB	-	-	NB: Parallel SB: Angled	-	Contiguous	-
Eighth Avenue	University Avenue	Robinson Avenue	Local Road	1 NB / 1 SB	-	-	Parallel	-	Contiguous	-
Ninth Avenue	Washington Street	University Avenue	2-Ln Collector	1 NB / 1 SB	-	-	Parallel	-	Contiguous	-
Tenth Avenue	University Avenue	SR-163 NB On-Ramp	Local Road	1 NB / 1 SB	-	25	Angled	x	Contiguous	-
Tenth Avenue	SR-163 NB On-Ramp	Robinson Avenue	Local Road	1 NB / 1 SB	-	25	Parallel	-	Contiguous	-
Richmond Street	Washington Street	Cleveland Avenue	2-Ln Collector (w/CLTL)	1 NB / 1 SB	CLTL	30	Parallel	-	Contiguous	-

Table 1-23 Existing Roadway Characteristics

Roadway	From	To	Functional Classification	Lane Directions	Presence of Median	Posted Speed (mph)	Presence of On-Street Parking	On-Street Parking is Metered	Presence of Sidewalk	Presence of Bicycle Facility
Richmond Street	Cleveland Avenue	University Avenue	2-Ln Collector (w/CLTL)	1 NB / 1 SB	CLTL	30	Parallel	-	Contiguous	-
Richmond Street	University Avenue	Robinson Avenue	2-Ln Collector	1 NB / 1 SB	-	25	Parallel	x	Contiguous	Class II
Cleveland Avenue	Washington Street	Lincoln Avenue	2-Ln Collector	1 NB / 1 SB	-	25	Parallel	-	Contiguous	Class II
Cleveland Avenue	Lincoln Avenue	Richmond Street	2-Ln Collector	1 NB / 1 SB	-	25	Parallel	-	Contiguous	Class II
Normal Street	El Cajon Boulevard	Washington Street	6-Ln Major Arterial	3 NB / 3 SB	Raised	35	Parallel	x	Contiguous	-
Normal Street	Washington Street	University Avenue	4-Ln Major Arterial	2 NB / 2 SB	Raised	25	Parallel / Angled	x	Contiguous	-
Centre Street	Park Boulevard	Lincoln Avenue	2-Ln Collector	1 NB / 1 SB	-	25	NB: Parallel / Angled SB: Angled	-	Contiguous	-
Centre Street	Lincoln Avenue	University Avenue	2-Ln Collector	1 NB / 1 SB	-	25	NB: Perpendicular SB: Parallel	-	Contiguous	-
Park Boulevard	El Cajon Boulevard	University Avenue	4-Ln Major Arterial	2 NB / 2 SB	Raised	35 SB / 25 NB	Parallel / Angled	x	Contiguous	Class III
Park Boulevard	University Avenue	Robinson Avenue	3-Ln Major Arterial	2 NB / 1 SB	Striped	30	Parallel	x	Contiguous	Class III

Note:
CLTL = Center Left-Turn Lane.

1.4.1 Vehicular Demand

Commute mode share data, daily traffic volumes, and AM, PM and midday peak hour intersection volume counts were analyzed to assess demand for vehicular travel within Hillcrest.

Table 1-24 shows the vehicular commute mode share within the community, citywide and countywide. As shown, Hillcrest's vehicular mode share for commuting is 10% lower than the City and region.

Table 1-24 Vehicular Commute Mode Share Comparison

	Hillcrest	City of San Diego	San Diego County
Total Vehicular Commuters	3,212	596,295	1,361,907
Total Workers	4,373	714,312	1,603,486
Vehicular Commute Mode Share	73.4%	83.5%	84.9%

Source: US Census, 2018 American Community Survey 5-Year Estimates (2020)

Figures 1-25 and **1-26** display both daily traffic volumes and peak hour vehicular turning movements within the study area. Peak hour counts were conducted on weekdays of representative conditions in February of 2020, from 7 AM to 9 AM, 11 AM to 1 PM, and 4 PM to 6 PM for AM, midday and PM peak periods. Data collection count sheets for each study intersection are provided in Appendix B.

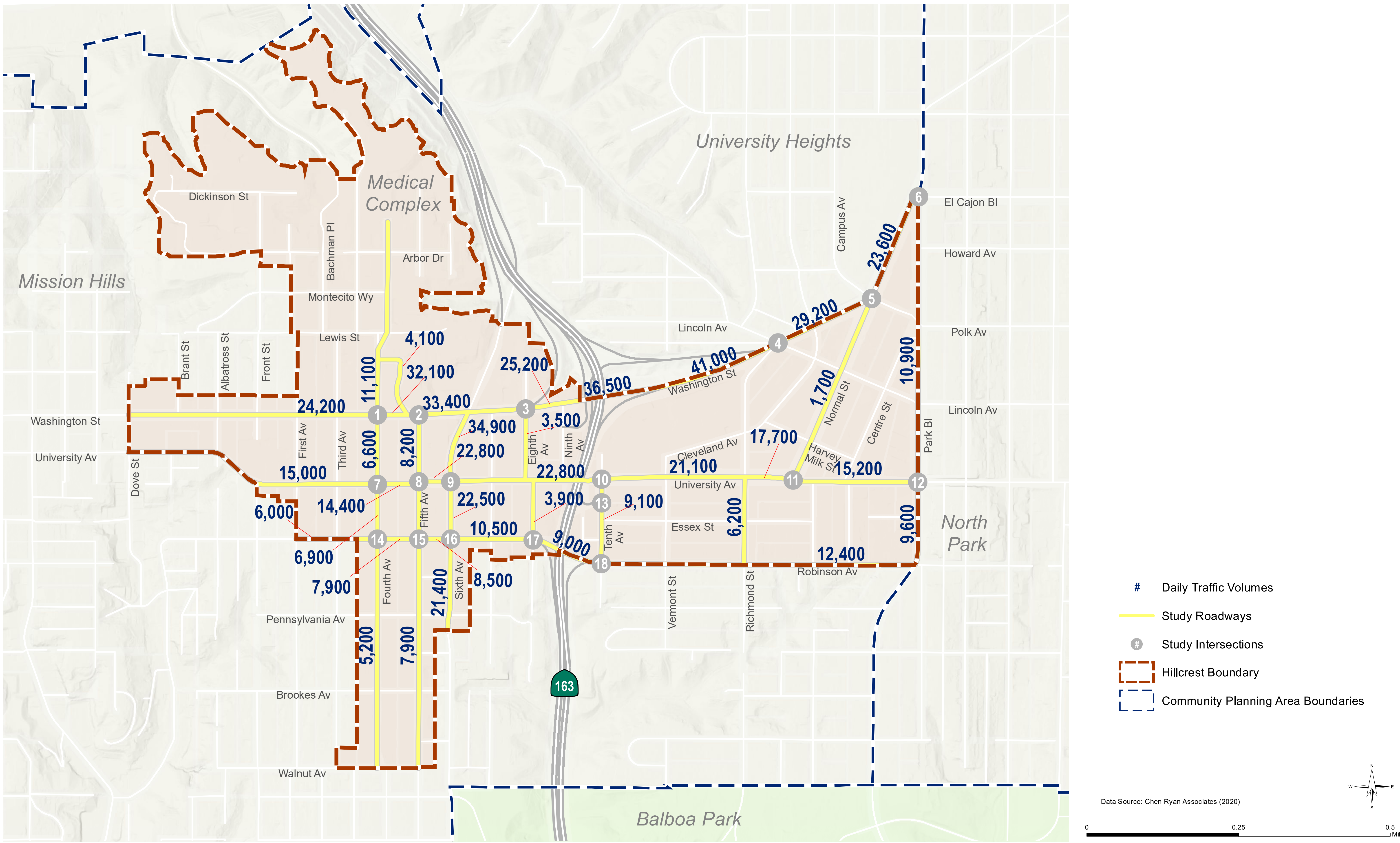
1.4.2 Vehicular Safety

Motorist injury collision history was examined to evaluate safety conditions within Hillcrest. Collision datasets were obtained from the Transportation Injury Mapping System (TIMS), an open data service provided by Safe Transportation Research and Education Center at University of California, Berkeley, for injury collisions between the years between 2014 and 2018. A total of 263 traffic collisions occurred resulting in injury were reported during this five-year period. **Figure 1-27** displays the where the collision locations occurred and where the vehicular systemic safety hotspots are located. **Table 1-25** identifies the leading collision locations within the community. As shown, many of the most frequent collision locations occurred along the Washington Street/Normal Street corridor.

Table 1-25 Most Frequent Automobile Collision Locations: 2014 – 2018

Rank	Intersection	Frequency
1	Fourth Avenue & Washington Street	13
2	First Avenue & Washington Street	12
3	Cleveland Avenue & Washington Street	10
3	Normal Street/Park Boulevard & El Cajon Boulevard	10
5	Tenth Avenue & University Avenue	9
6	Lincoln Avenue & Washington Street	8

Source: Transportation Injury Mapping System (TIMS)


University Heights
Medical Complex
Mission Hills
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
4,100
32,100
11,100
24,200
33,400
25,200
36,500
41,000
29,200
23,600
10,900
1,700
34,900
22,800
3,500
6,600
8,200
15,000
22,800
21,100
17,700
15,200
14,400
6,000
22,500
3,900
9,100
6,200
9,600
10,500
9,000
12,400
6,900
7,900
8,500
21,400
5,200
7,900
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Daily Traffic Volumes
Study Roadways
Study Intersections
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

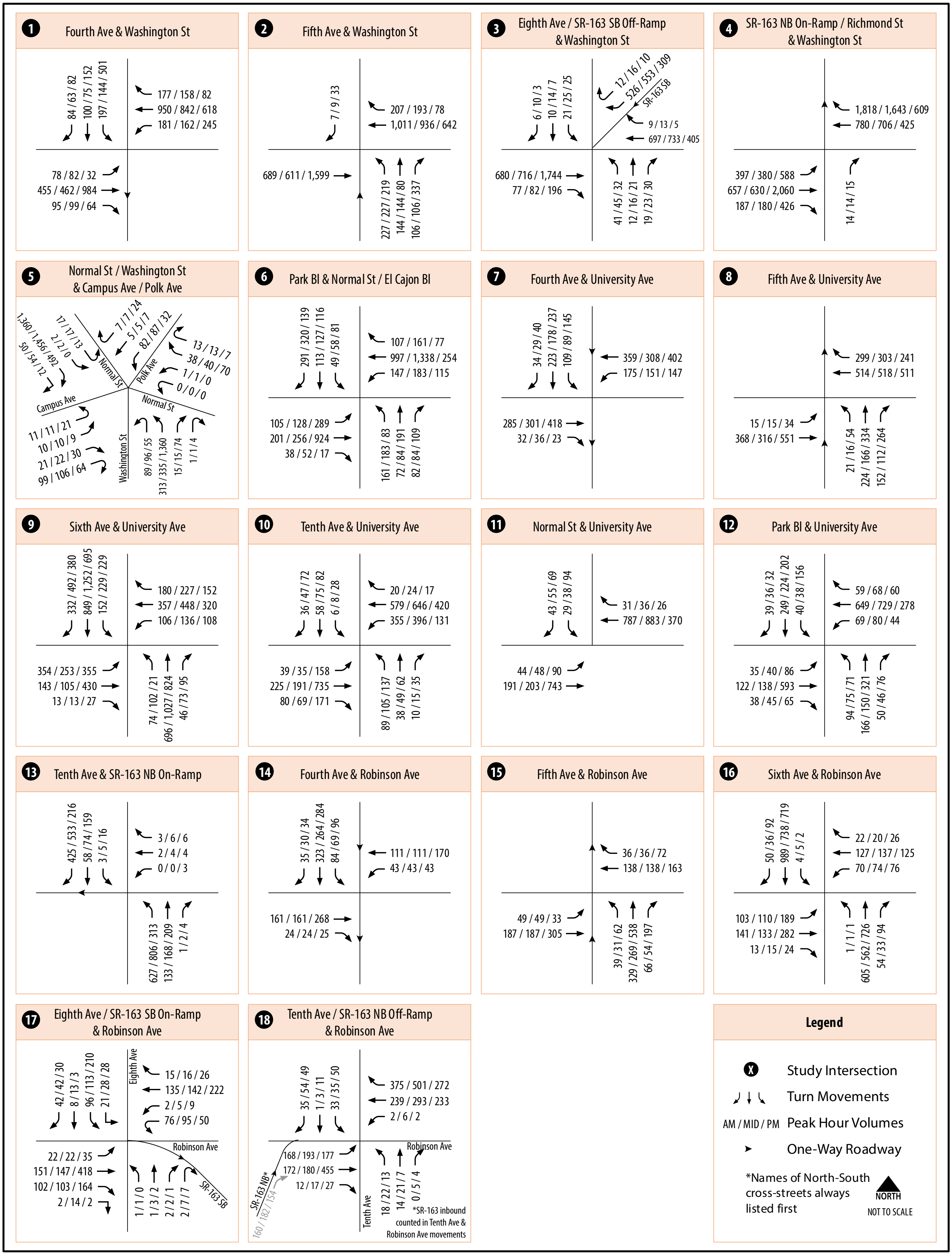


Figure 1-25

Existing Peak Hour Traffic Volumes

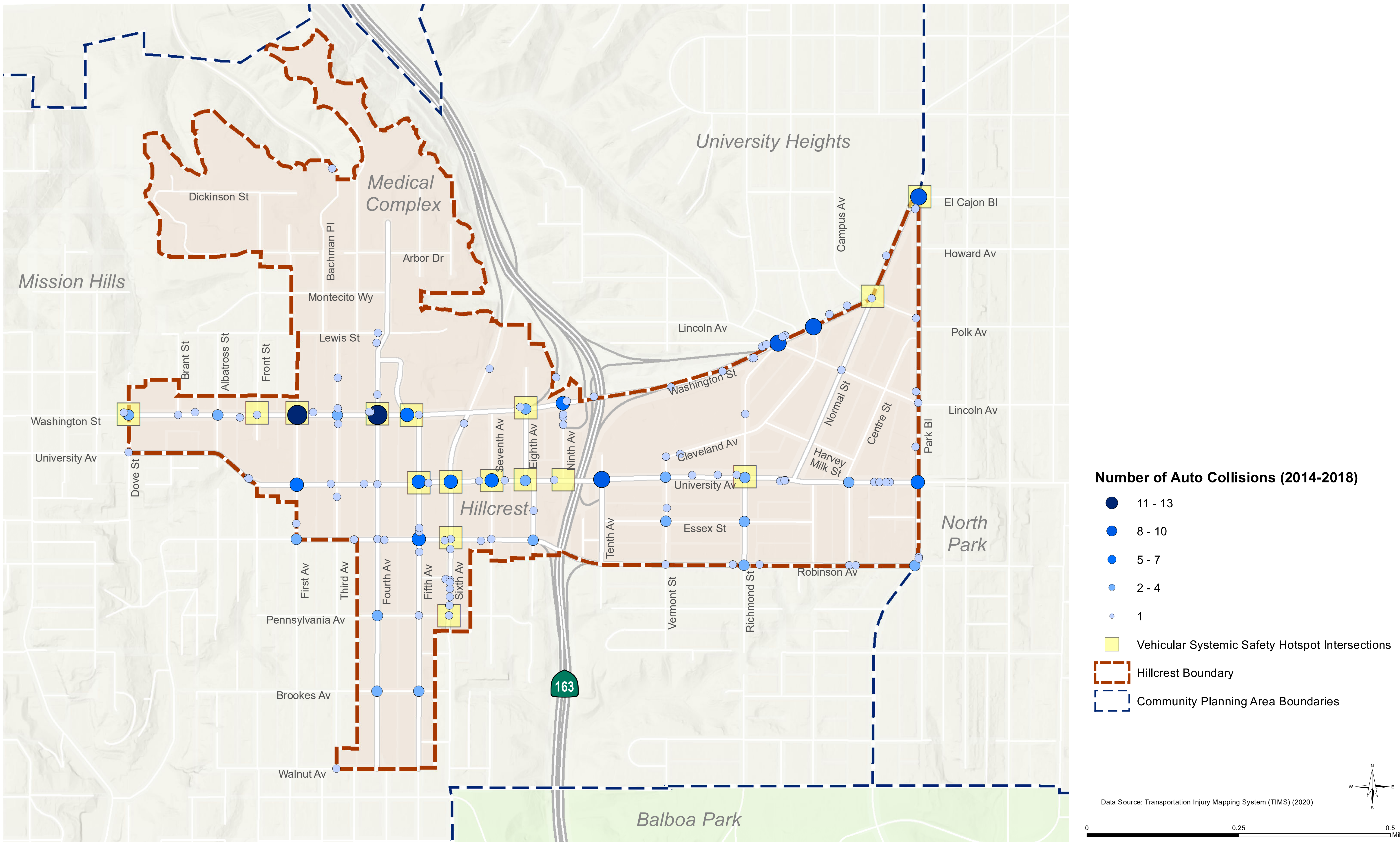

University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Centre St
Harvey Milk St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Number of Auto Collisions (2014-2018)
11 - 13
8 - 10
5 - 7
2 - 4
1
Vehicular Systemic Safety Hotspot Intersections
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Transportation Injury Mapping System (TIMS) (2020)
0
0.25
0.5
Miles

Table 1-26 summarizes the frequency of motorist injury collisions by the type of impact. Rear end collisions were the most common occurrence, comprising almost 40% of all records. Broadsides, were the second most common type, occurring in over one in four instances.

Table 1-26 Automobile Collision Type: 2014 – 2018

Collision Location	Frequency	Percent
Rear End	102	38.8%
Broadside	72	27.4%
Sideswipe	38	14.4%
Head-On	26	9.9%
Other	11	4.2%
Overturned	6	2.3%
Not Stated	4	1.5%
Hit Object	3	1.1%
Vehicle/Pedestrian	1	0.4%
Total	**263**	**100%**

Source: Transportation Injury Mapping System (TIMS)

Table 1-27 summarizes the primary collision causes for the 263 motorist injury collisions in Hillcrest. The leading primary causes were improper turning and unsafe travel speeds, each cause separately resulting in nearly 20% cases. The motorist's right of way was violated in 18.6% instances, while a violation of traffic control was attributed as the primary cause in 14% of motorist injury collisions.

Table 1-27 Automobile Collision Primary Causes: 2014 – 2018

Primary Collision Cause	Frequency	Percent
Improper Turning	52	19.8%
Unsafe Speed	51	19.4%
Automobile Right of Way	49	18.6%
Traffic Signals and Signs	38	14.4%
Following Too Closely	33	12.5%
Unsafe Starting or Backing	11	4.2%
Unknown	10	3.8%
Improper Passing	5	1.9%
Not Stated	3	1.1%
Unsafe Lane Change	3	1.1%
Wrong Side of Road	2	0.8%
Other Hazardous Violation	2	0.8%
Other Improper Driving	2	0.8%
Driving or Bicycling Under the Influence of Alcohol or Drug	1	0.4%
Brakes	1	0.4%
Total	**263**	**100.0%**

Source: Transportation Injury Mapping System (TIMS)

Table 1-28 categorizes the 263 collisions by their worst injury outcome. As shown, a 65% majority of injury collisions were minor (complaint of pain). Severe injury collisions were fewer than 5% of cases. One traffic collision resulting in a fatality occurred at the Campus Avenue and Washington Street/Normal Street intersection.

Table 1-28 Motorist Injury Collision Severity Worst Outcome: 2014 – 2018

Severity of Collision	Collisions	Percent of Total
Complaint of Pain	172	65.4%
Other Visible Injury	79	30.0%
Severe Injury	11	4.2%
Fatal	1	0.4%
Total	**263**	**100.0%**

Source: Transportation Injury Mapping System (TIMS)

1.4.3 Vehicular Quality – Roadway Segment Average Travel Speed

Traffic flow during the AM, midday and PM peak periods (7 AM to 9 AM, 11 AM to 1 PM, and 4 PM to 6PM, respectively) was represented by a ratio of average travel speed to posted speed limit. Average travel speeds were collected by direction along study area roadways providing inter-community connections using floating car data captured by a Global Positioning System (GPS) device. The data was collected on three consecutive weekdays (Tuesday, Wednesday, and Thursday). The following segments were analyzed with this method:

- Washington Street/Normal Street, between Dove Street and Park Boulevard
- University Avenue, between Dove Street and Park Boulevard
- Robinson Avenue, between First Avenue and Park Boulevard
- Pennsylvania Avenue, between Third Avenue and Seventh Avenue
- First Avenue, between Washington Street and Robinson Avenue
- Fourth Avenue, (SB) between Washington Street and Walnut Avenue
- Fifth Avenue, (NB) between Walnut Avenue and Washington Street
- Sixth Avenue, between SR-163 ramps and Pennsylvania Avenue
- Richmond Street, between Washington Street and Robinson Avenue
- Park Boulevard, between El Cajon Boulevard and Robinson Avenue

Table 1-29 displays the ratio of average travel speed by direction to posted speed limit for each segment analyzed. **Figures 1-28A, 1-28B,** and **1-28C** display those ratios within the study area for the AM, midday, and PM peak periods, respectively. As shown, ratios are the lowest throughout the study area during the midday peak period. Segments with ratios below 50% have average travel speed conditions that are at least half as slow the posted speed limit. These segments were most concentrated in the Hilcrest village area, where short block lengths, sources of friction, and heavy traffic volumes each contribute to congestion. Robinson Avenue along both approaches to Tenth Avenue displayed these conditions during all three peak periods. Tenth Avenue and Robinson Avenue is an all-way stop controlled intersection near freeway entrance and exit ramps.

Table 1-29 Ratio of Average Travel Speeds

Roadway	From	To	Direction	Posted Speed (mph)	AM Average Speed (mph)	AM Average Speed/Posted Speed Ratio	Midday Average Speed (mph)	Midday Average Speed/Posted Speed Ratio	PM Average Speed (mph)	PM Average Speed/Posted Speed Ratio
East/West Roadway										
Washington Street	Dove Street	Fourth Avenue	EB	35	29	0.82	17	0.47	9	0.27
			WB	35	18	0.52	20	0.56	28	0.80
Washington Street	Fourth Avenue	Fifth Avenue	EB	35	30	0.87	16	0.45	14	0.39
			WB	35	24	0.68	12	0.34	17	0.48
Washington Street	Fifth Avenue	Eighth Avenue	EB	35	34	0.97	16	0.46	23	0.67
			WB	35	20	0.58	17	0.49	20	0.57
Washington Street	Eighth Avenue	Ninth Avenue	EB	40	31	0.78	24	0.60	30	0.76
			WB	40	14	0.35	14	0.36	26	0.64
Washington Street	Ninth Avenue	Lincoln Avenue	EB	40	38	0.94	30	0.74	30	0.75
			WB	40	40	1.00	35	0.87	40	1.00
Washington Street	Lincoln Avenue	Normal Street	EB	40	24	0.59	20	0.51	18	0.44
			WB	40	22	0.55	27	0.69	26	0.64
Lincoln Avenue	Washington Street	Normal Street	EB	35	21	0.60	18	0.51	10	0.28
			WB	35	25	0.72	24	0.68	25	0.71
Lincoln Avenue	Normal Street	Park Boulevard	EB	40	34	0.84	18	0.45	22	0.56
			WB	40	29	0.73	21	0.52	22	0.54
University Avenue	Dove Street	First Avenue	EB	25	23	0.92	17	0.70	15	0.59
			WB	25	21	0.82	22	0.87	23	0.91
University Avenue	First Avenue	Fourth Avenue	EB	25	18	0.70	13	0.51	9	0.37
			WB	25	16	0.63	15	0.60	15	0.60
University Avenue	Fourth Avenue	Fifth Avenue	EB	25	11	0.44	11	0.45	13	0.51
			WB	25	12	0.48	11	0.43	11	0.46
University Avenue	Fifth Avenue	Sixth Avenue	EB	25	13	0.53	10	0.41	11	0.44
			WB	25	17	0.69	16	0.64	16	0.65

Table 1-29 Ratio of Average Travel Speeds

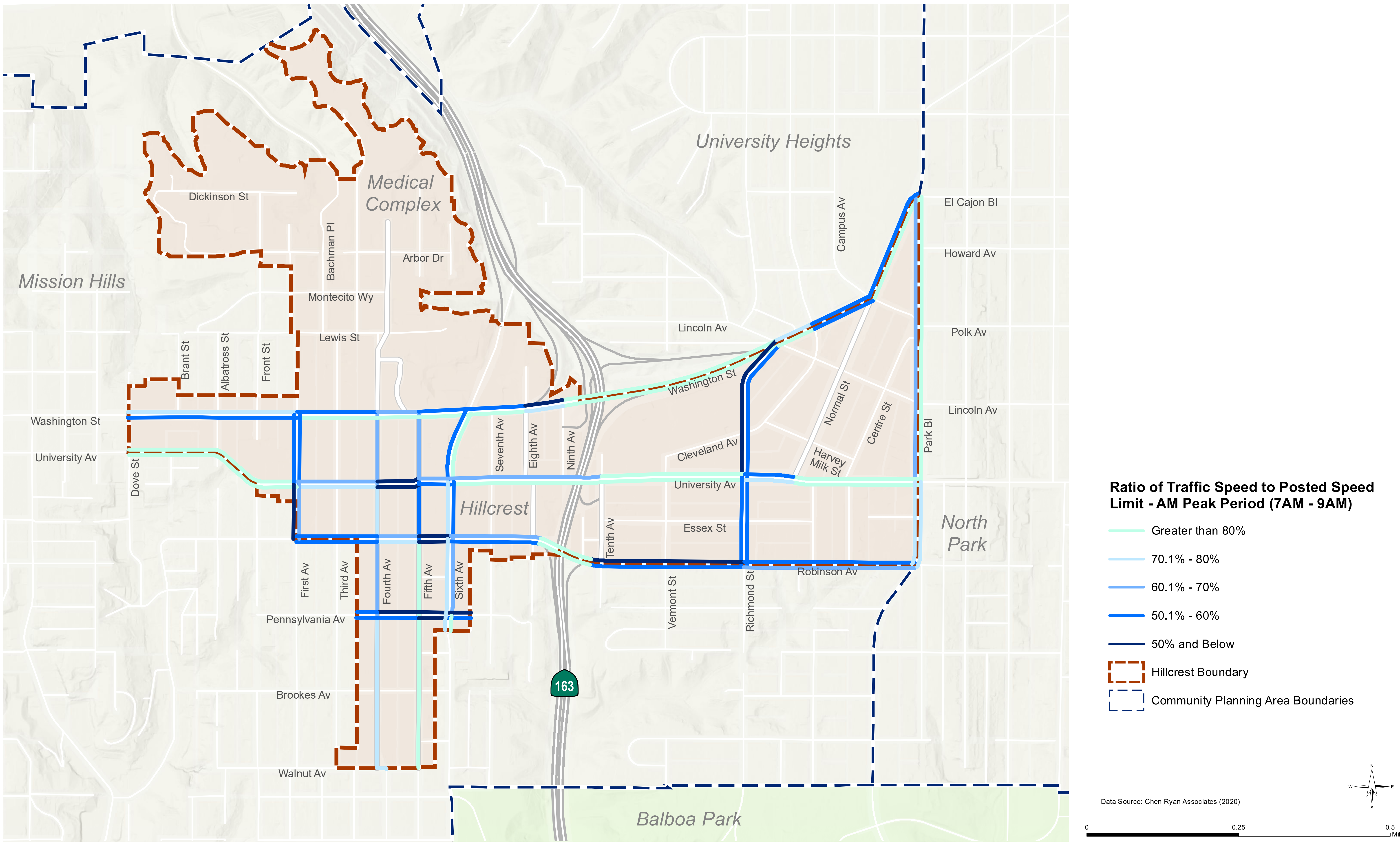
Roadway	From	To	Direction	Posted Speed (mph)	AM Average Speed (mph)	AM Average Speed/Posted Speed Ratio	Midday Average Speed (mph)	Midday Average Speed/Posted Speed Ratio	PM Average Speed (mph)	PM Average Speed/Posted Speed Ratio
University Avenue	Sixth Avenue	Tenth Avenue	EB	25	24	0.96	18	0.71	19	0.75
			WB	30	21	0.69	14	0.48	19	0.64
University Avenue	Tenth Avenue	Richmond Street	EB	25	20	0.80	24	0.97	24	0.97
			WB	30	26	0.88	28	0.93	26	0.88
University Avenue	Richmond Street	Normal Street	EB	25	19	0.77	14	0.55	14	0.56
			WB	25	14	0.57	22	0.89	20	0.81
University Avenue	Normal Street	Park Boulevard	EB	25	22	0.88	17	0.69	16	0.66
			WB	25	21	0.86	25	1.00	24	0.96
Robinson Avenue	First Avenue	Fourth Avenue	EB	25	13	0.52	12	0.49	14	0.56
			WB	25	13	0.53	13	0.52	15	0.61
Robinson Avenue	Fourth Avenue	Fifth Avenue	EB	25	20	0.78	12	0.48	13	0.51
			WB	25	17	0.69	19	0.77	18	0.70
Robinson Avenue	Fifth Avenue	Sixth Avenue	EB	25	9	0.37	10	0.38	10	0.39
			WB	25	9	0.38	14	0.57	12	0.47
Robinson Avenue	Sixth Avenue	Eighth Avenue	EB	25	13	0.53	12	0.47	13	0.51
			WB	25	15	0.61	12	0.49	13	0.52
Robinson Avenue	Eighth Avenue	Tenth Avenue	EB	30	17	0.58	15	0.50	15	0.51
			WB	30	11	0.35	15	0.49	12	0.41
Robinson Avenue	Tenth Avenue	Vermont Street	EB	30	17	0.58	15	0.50	15	0.51
			WB	30	11	0.35	15	0.49	12	0.41
Robinson Avenue	Vermont Street	Richmond Street	EB	30	17	0.58	15	0.50	15	0.51
			WB	30	11	0.35	15	0.49	12	0.41
Robinson Avenue	Richmond Street	Park Boulevard	EB	30	19	0.62	18	0.60	20	0.68
			WB	30	18	0.59	19	0.63	17	0.58
Pennsylvania Avenue	1st Avenue	4th Avenue	EB	25	13	0.53	13	0.54	13	0.50
			WB	25	14	0.58	17	0.66	15	0.62

Table 1-29 Ratio of Average Travel Speeds

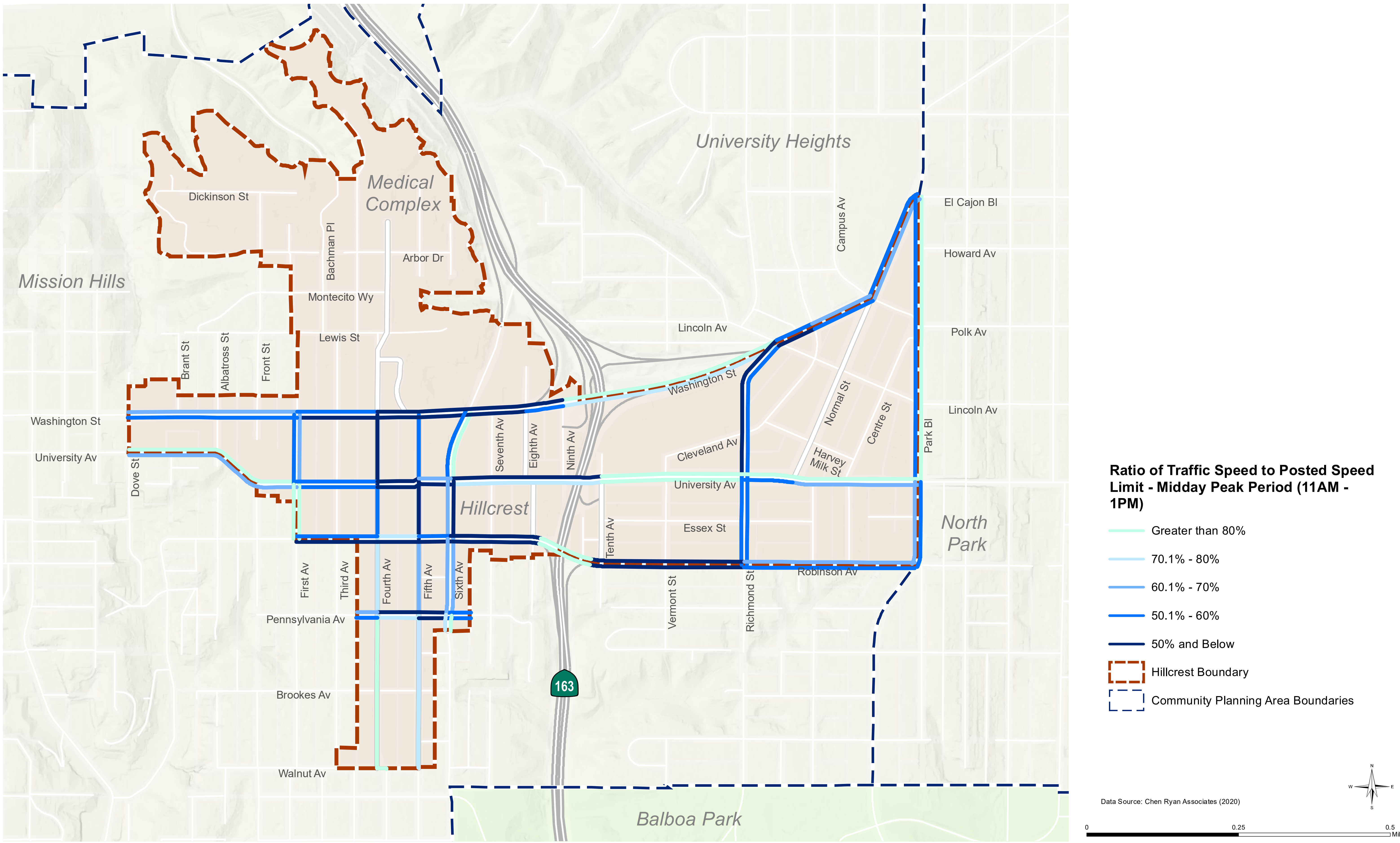
Roadway	From	To	Direction	Posted Speed (mph)	AM Average Speed (mph)	AM Average Speed/Posted Speed Ratio	Midday Average Speed (mph)	Midday Average Speed/Posted Speed Ratio	PM Average Speed (mph)	PM Average Speed/Posted Speed Ratio
Pennsylvania Avenue	4th Avenue	5th Avenue	EB	25	13	0.52	18	0.70	13	0.50
			WB	25	12	0.48	12	0.49	14	0.57
Pennsylvania Avenue	5th Avenue	6th Avenue	EB	25	10	0.40	10	0.41	9	0.36
			WB	25	10	0.39	8	0.31	13	0.50
Pennsylvania Avenue	6th Avenue	7th Avenue	EB	25	14	0.56	14	0.55	11	0.43
			WB	25	12	0.48	14	0.56	15	0.61
North/South Roadway										
First Avenue	Washington Street	University Avenue	NB	25	15	0.59	16	0.64	17	0.68
			SB	25	13	0.50	14	0.54	15	0.62
First Avenue	University Avenue	Robinson Avenue	NB	25	17	0.70	20	0.80	16	0.65
			SB	25	12	0.47	22	0.87	15	0.62
Fourth Avenue	Washington Street	University Avenue	SB	25	17	0.70	10	0.39	21	0.83
Fourth Avenue	University Avenue	Robinson Avenue	SB	25	18	0.74	13	0.52	18	0.70
Fourth Avenue	Robinson Avenue	Walnut Avenue	SB	25	17	0.68	18	0.73	19	0.75
Fifth Avenue	Washington Street	University Avenue	NB	25	16	0.65	13	0.51	16	0.65
Fifth Avenue	University Avenue	Robinson Avenue	NB	30	17	0.55	10	0.33	16	0.52
Fifth Avenue	Robinson Avenue	Walnut Avenue	NB	30	25	0.84	18	0.61	18	0.60
Sixth Avenue	600' North of University Avenue	University Avenue	NB	30	30	1.00	28	0.93	22	0.73
			SB	30	18	0.59	16	0.52	19	0.65
Sixth Avenue	University Avenue	Robinson Avenue	NB	30	18	0.60	12	0.41	12	0.40
			SB	30	23	0.76	19	0.63	18	0.59
Sixth Avenue	Robinson Avenue	Pennsylvania Avenue	NB	30	20	0.66	21	0.70	16	0.53
			SB	30	23	0.75	19	0.65	14	0.47
Richmond Street	Washington Street	Cleveland Avenue	NB	30	16	0.52	15	0.51	19	0.62
			SB	30	14	0.46	13	0.42	14	0.46

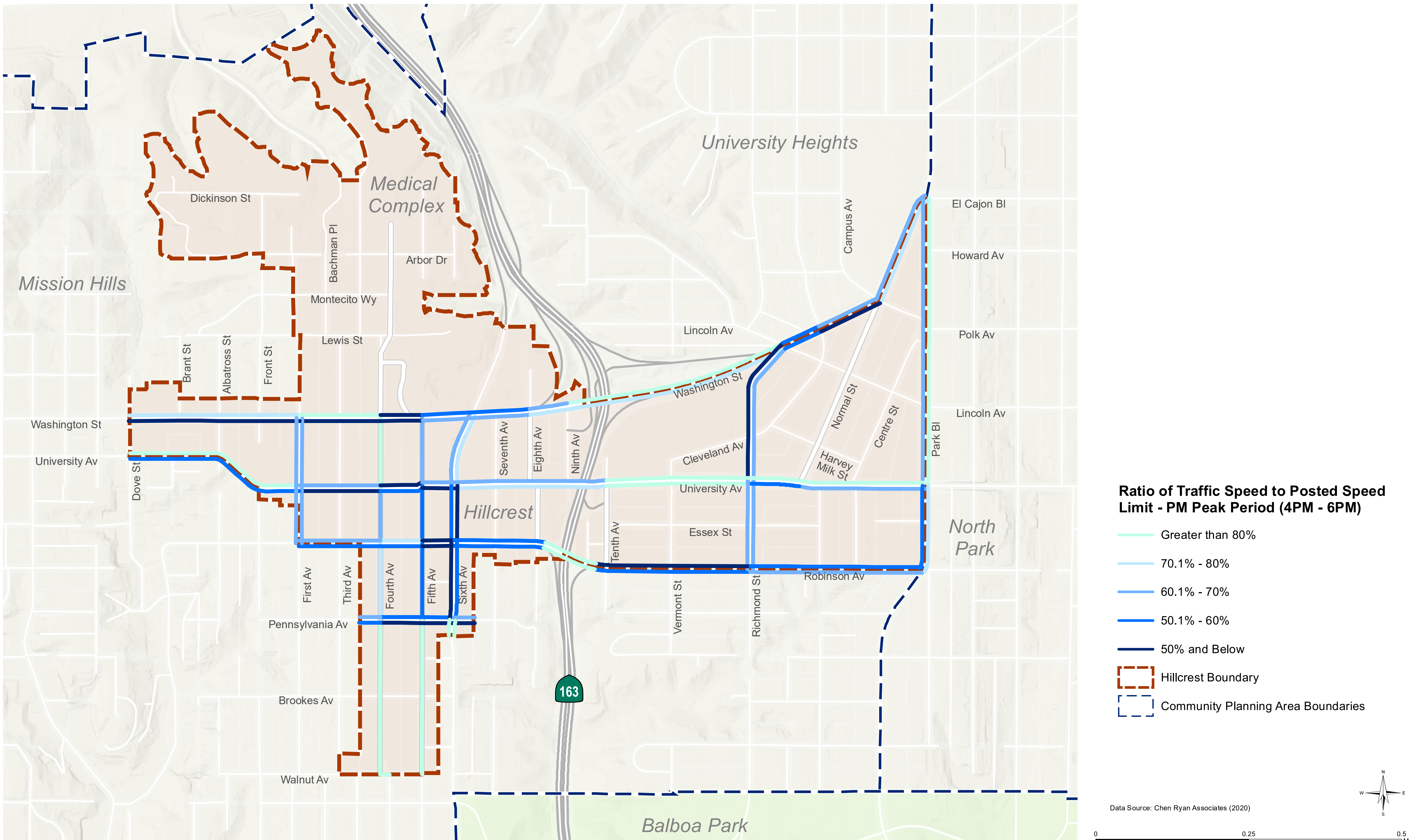
Table 1-29 Ratio of Average Travel Speeds

Roadway	From	To	Direction	Posted Speed (mph)	AM Average Speed (mph)	AM Average Speed/Posted Speed Ratio	Midday Average Speed (mph)	Midday Average Speed/Posted Speed Ratio	PM Average Speed (mph)	PM Average Speed/Posted Speed Ratio
Richmond Street	Cleveland Avenue	University Avenue	NB	30	16	0.52	15	0.51	19	0.62
			SB	30	14	0.46	13	0.42	14	0.46
Richmond Street	University Avenue	Robinson Avenue	NB	25	14	0.55	14	0.57	15	0.61
			SB	25	14	0.56	14	0.56	16	0.65
Normal Street	El Cajon Boulevard	Washington Street	EB	35	30	0.85	22	0.62	28	0.79
			WB	35	20	0.57	20	0.58	23	0.66
Park Boulevard	El Cajon Boulevard	University Avenue	NB	30	22	0.75	17	0.56	21	0.71
			SB	30	24	0.80	18	0.60	15	0.51
Park Boulevard	University Avenue	Robinson Avenue	NB	25	25	1.00	23	0.94	24	0.97
			SB	35	23	0.67	20	0.56	21	0.61



Ratio of Traffic Speed to Posted Speed Limit - AM Peak Period (7AM - 9AM)


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Washington St
Cleveland Av
University Av
Essex St
Vermont St
Richmond St
Robinson Av
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
Lincoln Av
163
Ratio of Traffic Speed to Posted Speed Limit - Midday Peak Period (11AM - 1PM)
Greater than 80%
70.1% - 80%
60.1% - 70%
50.1% - 60%
50% and Below
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles



University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Normal St
Centre St
Harvey Milk St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Ratio of Traffic Speed to Posted Speed Limit - PM Peak Period (4PM - 6PM)
Greater than 80%
70.1% - 80%
60.1% - 70%
50.1% - 60%
50% and Below
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles
N
S
E
W

1.5 Parking

2008 City of San Diego General Plan Mobility Element – Parking Management:

- *Parking that is reasonably available when and where it is needed through management.*
- *Solutions to community-specific parking issues through implementation of a broad range of parking management tools and strategies.*
- *New development with adequate parking through the application of innovative citywide parking regulations.*
- *Increased land use efficiencies in the provision of parking.*

Hillcrest's urban development mostly preceded the automobile era, and thus the neighborhood accommodates less auto parking typically then the prevailing forms of development in the City. As such, motorists in Hillcrest are more reliant on parking located off site from their destinations than compared to other City neighborhoods.

Few businesses within the community have their own dedicated parking or shared off-street parking arrangements, most are instead reliant on public parking sourced from on-street parking and small scattered public parking lots. As a result, it is uncommon for motorists in Hillcrest to find parking directly adjacent to their destinations. An unintended consequence of this built environment is the phenomenon of double-parking along streets within the neighborhood, often committed during commercial deliveries and passenger loading and unloading.

Within the community, on-street parking is permitted on most blocks, except for the Washington Street/Normal Street corridor east of Fifth Avenue and on isolated blocks of University Avenue and Robinson Avenue. On-street parking is metered where the street's adjacent land uses are primarily commercial. Those locations include along Washington Street (west of Fifth Avenue), most of University Avenue and much of the Hillcrest village area encompassed between Fourth and Sixth Avenues. Metered parking in Hillcrest costs $1.25 per hour and is restricted to two hours to manage demand and facilitate turnover. Enforcement of metered parking restrictions is on all days except for Sundays and holidays, from 10 AM to 8 PM. On-street parking is supplemented by several privately operated off-street facilities within the Hillcrest village area along Fourth and Fifth Avenue between Washington Street and Pennsylvania Avenue, which allow paid public parking. These centrally located parking facilities are intended to encourage trip-chaining behavior, where visitors park once and visit more than one destination.

On-street parking utilization in Hillcrest was most recently collected and analyzed in 2016 for a study commissioned by the Uptown Community Parking District. The peak weekday conditions observed for on-street parking during that study occurred between 6PM and 8PM. Between those hours, most residential streets (where parking is not metered and time restricted) had parking utilization exceeding 85%. On metered blocks, utilization during that period varied by location with some metered blocks in the village also exceeding 85%. At the time of the study, metered parking enforcement ended at 6 PM. A recommendation which emerged from the study to help manage demand during the peak period was to adjust the meter enforcement hours to extend to the current window which ends at 8 PM. On-street parking on primarily residential-fronted blocks are heavily occupied during many off-peak periods as well. This is attributed to lower parking turnover activity generated by neighborhood residents and the absence of parking time and cost restrictions. Often, visitors and commuters are incentivized to search for parking for parking on residential streets because of there are no cost or time restrictions.

Peak on-street parking utilization on weekends occurs between 12 PM and 3 PM, which is earlier in the day compared to weekday. This is because residents are more often at home during the day on weekends, compared to weekdays, while the activity peak periods of the destinations within the neighborhood remain constant throughout the week (mid-day to early evening). Meters are also not enforced on Sundays, which contributes to higher utilization and lower turnover. During the weekend peaks, most blocks of on-street parking throughout Hillcrest are utilized at 85% or more.

2.0 Mobility Needs and Future Direction

This chapter provides a discussion of pedestrian, bicycle, transit, and street and freeway mobility needs synthesized from findings from the existing conditions analyses.

2.1 Pedestrian Needs

The pedestrian environment affects us all whether we are walking to transit, a store, school, or simply walking from a parked car to a building. Most people prefer walking in places where there are sidewalks shaded with trees, lighting, interesting buildings, or scenery to look at, other people outside, neighborhood destinations and a feeling of safety. Pedestrian improvements in areas with land uses that promote pedestrian activities can help to increase walking as a means of transportation and recreation. Land use and street design recommendations that benefit pedestrians also contribute to the overall quality, vitality, and sense of community within a neighborhood.

Pedestrian needs identified in the Hillcrest community include locations with high pedestrian collisions, sidewalk connectivity issues, high existing pedestrian activity, and high pedestrian priority as reported by the update City of San Diego's Pedestrian Priority Model. These needs are depicted in **Figure 2-1**.

Pedestrian Priority Model

The Pedestrian Priority Model is used by the City to identify focus areas of the highest need for pedestrian improvements. The model is a composite based on an overlay of characteristics which include pedestrian-trip attracting land uses, types of demographic concentrations, and roadway characteristics. The model determines the areas where pedestrian demand and barriers are highest within communities, where improvements may be most beneficial.

In Hillcrest, the highest priority is the Hillcrest village area, between Washington Street and University Avenue, as well as Medical Complex subarea west of Fourth Avenue.

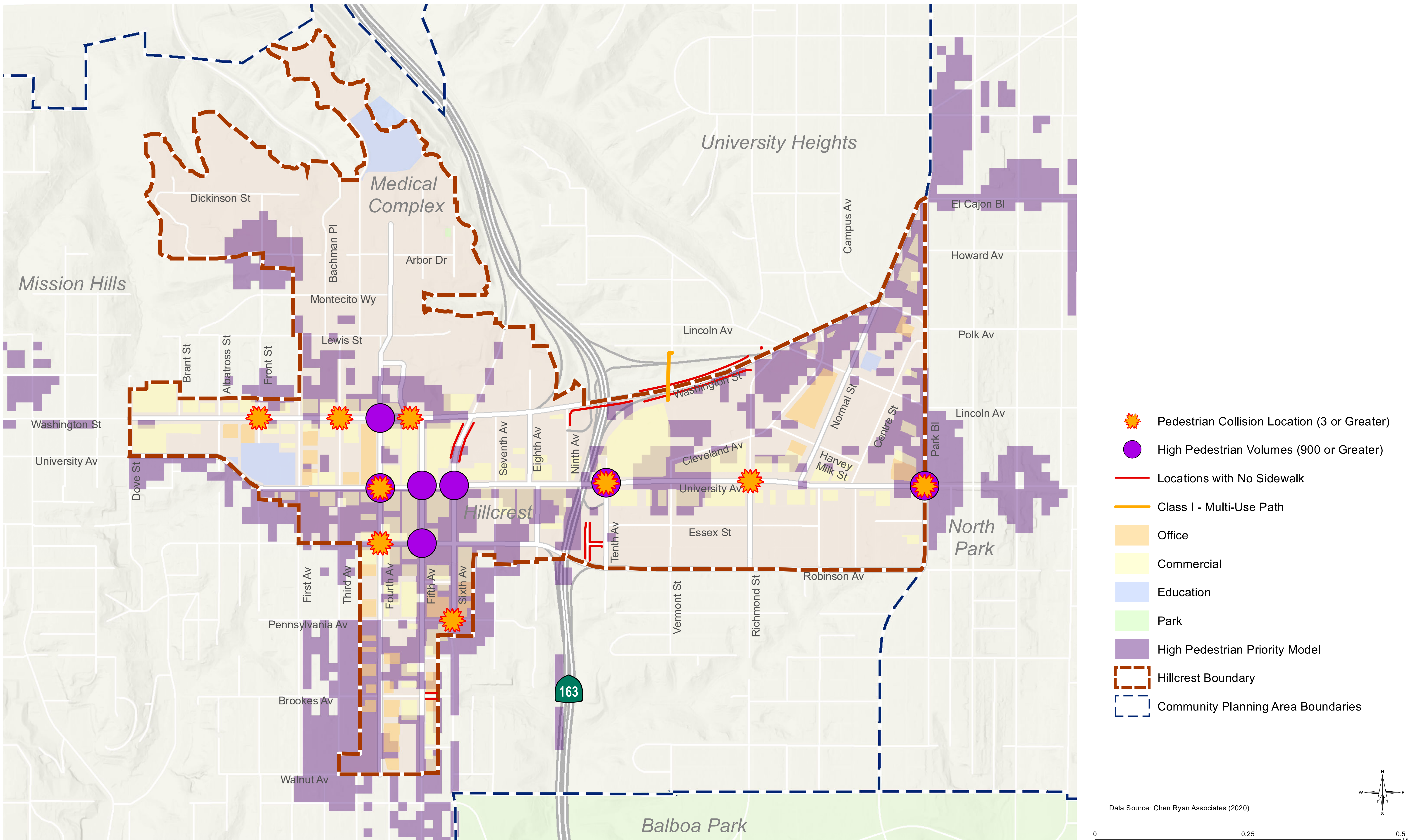
Pedestrian Activity

The highest pedestrian volumes in the community are within Hillcrest village area, where commercial activity is most concentrated within the community. Five of the six intersections with the high combined peak period volumes are in the village area:

- #8: Fifth Avenue & University Avenue (1,616)
- #15: Fifth Avenue & Robinson Avenue (1,263)
- #7: Fourth Avenue & University Avenue (1,243)
- #10: Tenth Avenue & University Avenue (1,027)
- #1: Fourth Avenue & Washington Street (966)
- #9: Sixth Avenue & University Avenue (965)

Pedestrian Safety

Several roadway environmental characteristics influence pedestrian comfort, including width, high traffic volumes and travel speeds, and adequate separation from traffic. Comfort and safety at intersection crossings is influenced by visibility from motorists, exposure within the roadway and presence of intersection traffic control features. Comfort is also aided by amenities within the pedestrian environment, including landscaping, shading and street furniture. These factors combined play a significant role in determining a person's willingness to make a trip by walking.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
Pedestrian Collision Location (3 or Greater)
High Pedestrian Volumes (900 or Greater)
Locations with No Sidewalk
Class I - Multi-Use Path
Office
Commercial
Education
Park
High Pedestrian Priority Model
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

Pedestrian-injury collisions are densely concentrated in the Hillcrest village area, where pedestrian activity is also highest in the community. There are six intersections where four or more collisions occurred during the five-year study period (2014-2018), most of those locations in the Hillcrest village area. These intersections include:

- Third Avenue and Washington Street
- Fourth Avenue and Robinson Street
- Fifth Avenue and Washington Street
- Fourth Avenue and University Avenue
- Richmond Street and University Avenue
- Park Boulevard and University Avenue

The intersection of Richmond Street and University Avenue met the roadway environment criteria of pedestrian collision systemic hotspots identified in the City's 2018 Systemic Safety Analysis Report (SSAR) and a majority of its collisions occurring at that location matched the accompanying hotspot crash scenario (motorist failure to yield to pedestrian in crosswalk while turning).

Sidewalk Accessibility and Connectivity

Sidewalk connectivity and accessibility is an important feature to consider for increasing walking activity levels across a community. A disconnected pedestrian network discourages people choosing to walk or bicycle to their destination. Furthermore, a discontinuous network with low-quality or unsafe segments may cause a potential active traveler to choose driving instead of walking. Understanding barriers to connectivity, such low-quality or missing sidewalk, is important for guiding long range planning recommendations.

There are few roadways with missing sidewalks in Hillcrest. Washington Street between Ninth Avenue and Lincoln Avenue, which connects Medical Complex to University Heights, is the most notable stretch of roadway with no sidewalk. Despite having no adjacent land uses, this segment is one of only three locations where a pedestrian can cross SR-163. Alternative walking routes are available; however, they require detour to University Avenue.

Planned Pedestrian Improvements

The City of San Diego *Pedestrian Master Plan – City-Wide Implementation Framework Report* (2006) established pedestrian route typologies to categorize sidewalks by function and environment. Specifically, the pedestrian route typologies are based on the roadway classification, planned village propensity, and adjacent land uses.

Figure 2-2 displays the seven pedestrian route typologies as defined in the Pedestrian Master Plan. The route type purpose, corresponding street classifications, and adjacent land uses are identified for each typology.

Figure 2-2 City of San Diego Pedestrian Route Typologies

Table 26: Route Types

ROUTE TYPE:	1. District Sidewalks	2. Corridor Sidewalks	3. Connector Sidewalks	4. Neighborhood Sidewalks	5. Ancillary Pedestrian Facilities	6. Path	7. Trail (Included for Reference Only, not a Focus of this Plan)
Purpose	Sidewalks Along Roads that Support Heavy Pedestrian Levels in Mixed-use Concentrated Urban Areas	Sidewalks Along Roads that Support Moderate Density Business & Shopping Districts with Moderate Pedestrian Levels	Sidewalks Along Roads that Support Institutional, Industrial or Business Complexes with Limited Lateral Access & Low Pedestrian Levels	Sidewalks Along Roads that Support Low to Moderate Density Housing with Low to Moderate Pedestrian Levels	Facilities Away or Crossing Over Streets such as Plazas, Paseos, Promenades, Courtyards or Pedestrian Bridges & Stairways	Walkways and Paved Paths that are not Adjacent to Roads that Support Recreational and Transportation Purposes	Unpaved Walk Not Adjacent to Roads Used for Recreational Purposes
Typical Adjacent "Street Design Manual" Classifications	All types of adjacent streets are possible	Commercial, Urban Collector, Urban Major & Arterial	Commercial, Industrial, Urban Major, Rural Collector & Arterial	Rural, Low Volume Residential, Residential Local & Sub-collector	Not associated with a street	Not associated with a street	Not associated with a street
Cross Reference to Related "Strategic Framework Plan" Definitions	Existing: Regional Centers, Urban Villages & Neighborhood Villages	Existing: Sub-regional Districts and Transit Corridors	Existing: Sub-regional Districts, Transit Corridors, & Suburban Residential along Major Arterials	All other Residential Areas not Classified under the Strategic Framework Plan	Most common in Regional Centers, Urban or Neighborhood Villages but can be in any area	Can occur in any area, but most often found in Recreation, Tourist or Open Space Areas	Can occur in any area, but most often found in Recreation or Open Space Areas
Typical Adjacent Land Uses	Mixed-use Housing, Commercial, Office & Entertainment with Urban Densities	Multiple Land Uses but may be Separated. Often Strip Commercial or Office Complex.	Open Space, Industrial Uses, Institutional Uses or other Pedestrian Restricted Uses	Single-family and Moderate Density Multi-Family with Limited Supporting Neighborhood Commercial	Adjacent Land Uses Vary	Adjacent Uses Vary, Often Recreational or Open Space or Housing	Open Space, Parks and Natural Areas

Source: City of San Diego Pedestrian Master Plan – City-Wide Implementation Framework Report (2006)

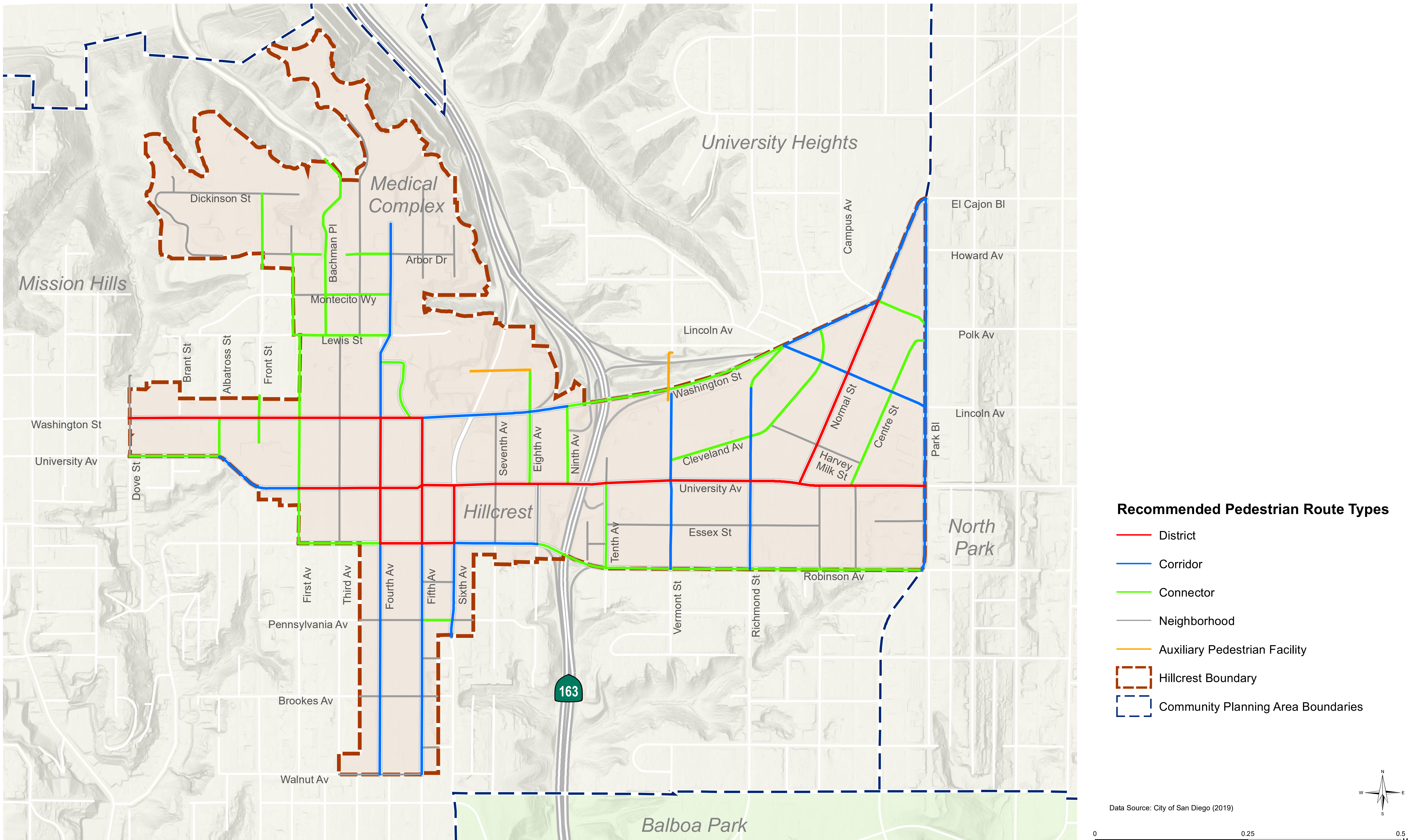
The Pedestrian Master Plan acknowledges there should be flexibility in the treatments and amenities for pedestrian facilities. **Figure 2-3** describes four treatment levels to consider for pedestrian facilities, including premium, enhanced, basic, and special use walkway improvements. Each feature is labeled as required, suggested, suggested if conditions or standards met, or not applicable.

Figure 2-4 displays the planned pedestrian route types for Hillcrest from the Uptown Community Plan (2019). As shown, the Hillcrest community is comprised of district, corridor, connector, and neighborhood route types.

Figure 2-3 Treatment Levels and Potential Improvements

TREATMENT LEVEL:	Treatment Level 1 "Premium" Walkway Improvements	Treatment Level 2 "Enhanced" Walkway Improvements	Treatment Level 3 "Basic" Walkway Improvements	Treatment Level 4 "Special Use" Walkway Improvements
Route Types Receiving These Treatment Levels (Unless Special Circumstances Exist*)	District Route Type / Special Pedestrian Zone	Corridor Route Type	Connector and Neighborhood Route Type	Path & Ancillary Route Types
*Special Circumstances that Warrant a Higher Treatment Level than Normal. Requirements in Each Column would Increase to the Column on its Left	Already Uses Highest Treatment Level	If within 1/4 mile of Transit/ School/ Ped. High Use/ Major Arterial	If within 1/4 mile of Transit/ School/ Maj. Commercial Facilities/ Maj. Arterials	Case-by-Case Basis
Provide Accessible Facilities Such As:				
1A) Curb ramps	!	!	!	?
2A) Audible/visual crosswalk signals	!	!	?	?
3A) Walkways & ramps free of damage or trip hazards	!	!	!	✔
4A) Pedestrian paths free of obstructions and barriers	!	!	!	✔
5A) Sidewalks with limited driveways and minimal cross-slope	!	✔	✔	✔
6A) Re-grade slope of walkway to meet ADA / Title 24 standards	?	?	?	?
7A) Repair, slice or patch lifts on walk surfaces or reset utility boxes to be flush	?	?	?	?
Provide Safety Features Such As:				
1S) Median refuges (a safe place to stand in the street)	!	✔	-	-
2S) Pedestrian popouts (curb / sidewalk extensions into street)	✔	✔	-	-
3S) High visibility crosswalk striping	!	✔	-	?
4S) Raised crosswalks or special paving materials to denote crosswalks	✔	✔	-	?
5S) Advance stop bars >10 feet from crosswalk	✔	✔	!	?
6S) Radar Speed Monitor & Display	?	?	?	?
7S) Reduced curb radii	✔	✔	✔	-
8S) Early pedestrian start at crossing signal (Lead Pedestrian Interval)	✔	?	-	?
9S) No Turn on Red at Intersection	?	?	?	?
10S) Mid-block crosswalks with ped. flashers but no traffic control	-	-	✔	-
11S) Automatic pedestrian detection & signal control	✔	-	-	?
12S) Mid-block crossing with signs, median or curb ext. & flashing lights in road	?	?	-	?
13S) Mid-block crosswalks with ped. actuated traffic control device	✔	?	-	-
14S) 1-Lane Mid-block with high contrast crossings, signs & center lane marker	?	?	✔	?
15S) Parkway planting for buffer between sidewalk and cars	!	!	!	?
16S) On-street parking for buffer between sidewalk and cars	!	✔	✔	-
17S) Adequate levels of pedestrian lighting	!	!	✔	✔
18S) Various traffic calming measures	✔	✔	✔	-
19S) Enforcement, education or encouragement solutions	?	?	?	?
20S) Missing sidewalks added or provide adeq. walk width clear of obstructions	?	?	?	?
Improve Walkability by Providing:				
1W) Above minimum walkway widths (> 5')	!	✔	?	?
2W) Trees that provide shade on walkways	!	!	✔	✔
3W) Street furnishings for comfort and enjoyment	!	✔	?	✔
4W) Countdown display crosswalk signals	✔	?	?	-
5W) Traffic control for crossings such as traffic signals or "All way stops"	!	✔	✔	✔
6W) Pedestrian scrambles (cross all directions of street)	?	-	-	?
Ensure Connectivity by Adding:				
1C) Missing sidewalk segments in areas where sidewalks mostly exist	!	!	✔	✔
2c) Missing sidewalks in areas where no sidewalks exist at all	!	✔	?	✔
3C) Connection pathways between streets	!	✔	✔	✔
4C) Narrow street widths or adding features to narrow for pedestrians	!	✔	✔	✔
5C) Destinations within walking distance of origins	!	✔	✔	✔
6C) Pedestrian bridges that avoid excessive ramp lengths	?	-	-	?
7C) Pedestrian crossing opportunities for all sides (legs) of an intersection	!	✔	✔	-
8C) Verify that pedestrian distances between land uses are reasonable & direct	?	?	?	?

LEGEND ("!"= required, "4" = suggested, "?"= suggested if conditions or standards met & "-" = not applicable)


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Centre St
Harvey Milk St
Park Bl
Campus Av
El Cajon Bl
Howard Av
Polk Av
163
Recommended Pedestrian Route Types
District
Corridor
Connector
Neighborhood
Auxiliary Pedestrian Facility
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: City of San Diego (2019)
0
0.25
0.5
Miles

Pedestrian Opportunities / Future Direction

Based on the metrics of demand analyzed for this study, Hillcrest is one of the most active pedestrian neighborhoods in the City. The pedestrian commute mode share is 6.5%, already near the City's horizon year 2035 Climate Action Plan target. Large volumes of pedestrian activity are present throughout Hillcrest village and along the University Avenue corridor to the east of SR-163.

Despite having all the components of high demand, the neighborhood must also contend with barriers and conflicts generated by the vehicular environment. There were three pedestrian fatalities and four severe pedestrian injuries in Hillcrest between 2014 and 2018. Pedestrians in the neighborhood have reported troubling encounters with motorists before and are generally wary of motorist behavior when crossing the roadway. Some safety countermeasures have been implemented throughout Hillcrest which have aided pedestrian visibility at crossings, such as Lead Pedestrian Intervals at select traffic signals, Rectangular Rapid Flash Beacon (RRFB) crossings, and continental crosswalks. For Hillcrest to build on its great performance as a pedestrian neighborhood, additional enhancements must be considered to ensure the safety record is improved.

2.2 Bicycle Needs

Bicycle infrastructure should provide for the safety and comfort of its users, and the bicycle network should facilitate connectivity within and between communities. Safety and comfort are of paramount consideration to cyclists, since by nature, they are more sensitive to how they experience the characteristics of the roadway environment compared to other types of travelers. A slight gap in comfortable roadway conditions within a system or along a route can often be detrimental enough to deter the choice of making a trip by that mode.

Figure 2-5 shows areas of cycling needs within Hillcrest, identified by high-crash locations, high bicycling stress roadways, and high cycling demand.

Bicycle Priority Model

The City's Bicycle Priority Model considers demand-based factors: inter-community demand, explained by the presence of or proximity and centrality to major activity centers such as smart growth areas and employment centers; and intra-community demand, based on concentrations of land uses and varieties of demographic populations. High detractors, based on collision history, traffic volumes, posted speeds, travel lanes, and slope, are combined with demand to determine priority.

Nearly all of Hillcrest has high bicycle demand and priority characteristics based on the Bicycle Priority Model. Peak period count data reveals that much of Hillcrest's bicycling demand is carried by University Avenue, where as many as 50 cyclists pass through the corridor during each commute peak period.

Figure 2-5 Bicycle Needs

Bicycle Activity

The highest bicycle demand activity in Hillcrest occurs along University Avenue, where each of the intersections with the highest combined bicycle volumes during the three peak periods combined are situated along University Avenue, they include:

- #10: Tenth Avenue and University Avenue (197)
- #12: Park Boulevard and University Avenue (192)
- #8: Fifth Avenue and University Avenue (181)
- #9: Sixth Avenue and University Avenue (179)
- #7: Fourth Avenue and University Avenue (165)

Bicycle Safety

Within Hillcrest, there were nine intersections with more than bicycling collision resulting in injury between 2014 and 2018. These intersections were:

- Centre Street & University Avenue
- Park Boulevard & University Avenue
- Fifth Avenue & Washington Street
- Fifth Avenue & Robinson Avenue
- Sixth Avenue & University Avenue
- Seventh Avenue & Robinson Avenue
- Eighth Avenue & University Avenue
- Richmond Street & Robinson Avenue
- Normal Street & University Avenue

Of the locations within Hillcrest which met the criteria of one of the three bicycle collision systemic hotspot roadway environments identified in the 2018 SSAR none of the locations experienced more than one bicycle collision which matched the accompanying hotspot crash scenario (bicyclist through movement control violation).

Bicycle Level of Traffic Stress

Bicycle Level of Traffic Stress (LTS) classifies the street network according to the estimated level of stress it causes cyclists. The measure takes into consideration a cyclist's physical separation from vehicular traffic, posted speed limits and number of travel lanes along a roadway, in addition to factors which may be present at intersection approaches such as right-turn only lanes and uncontrolled crossings. LTS scores range from 1 (lowest stress) to 4 (highest stress) and correspond to roadway conditions that different cycling demographics would find suitable for riding based on stress tolerance. LTS 2 or lower is considered suitable for most user groups.

Several major corridors are LTS 4 in their entirety through Hillcrest, including Washington Street, Park Boulevard and Sixth Avenue. University Avenue is LTS 2 west of Fifth Avenue where it is two lanes wide and LTS 3 east of Fifth Avenue where it is four lanes wide (and LTS 4 across SR-163, where its bike lanes temporarily drop). The Fourth and Fifth Avenue one-way couplet are LTS 3. Robinson Avenue is LTS 2 west of Tenth Avenue and LTS 3 to the east, due to the change in posted speed limit.

Planned Bicycle Improvements

Planned bicycle facilities were referenced from the recently adopted Uptown Community Plan (2019). In addition to identifying new alignments for bicycle facilities within Hillcrest, the Plan carried forward previous recommendations from the City of San Diego Bicycle Master Plan (2011) and SANDAG's San Diego Regional Bicycle Plan (2011).

Notable planned facilities in Hillcrest include several SANDAG Uptown Bikeway projects that are in various stages of implementation:

- Class II/Class III hybrid facility along Bachman Place (connecting to Mission Valley)
- One-way Class IV cycle tracks along the Fourth and Fifth Avenue couplet
- Continuous facility along University Avenue:
    - Bicycle boulevard west of First Avenue
    - Class II bike lanes between First Avenue and Fifth Avenue
    - Class IV cycle track from SR-163 to Park Boulevard

Bicycle Opportunities / Future Direction

Hillcrest is already one of the most active cycling neighborhoods in the City based on indicators of high demand summarized in the previous chapter. There is further potential for cycling growth in the community based on its existing and planned built environment, central geography, and its proximity to Downtown. Hillcrest already has adequate connections between some adjacent neighborhoods, including University Heights, Balboa Park and Bankers Hills. Connections to other adjacent neighborhoods, such as Mission Hills, Mission Valley and North Park, are less adequate, however planned projects are aimed at solidifying these connections.

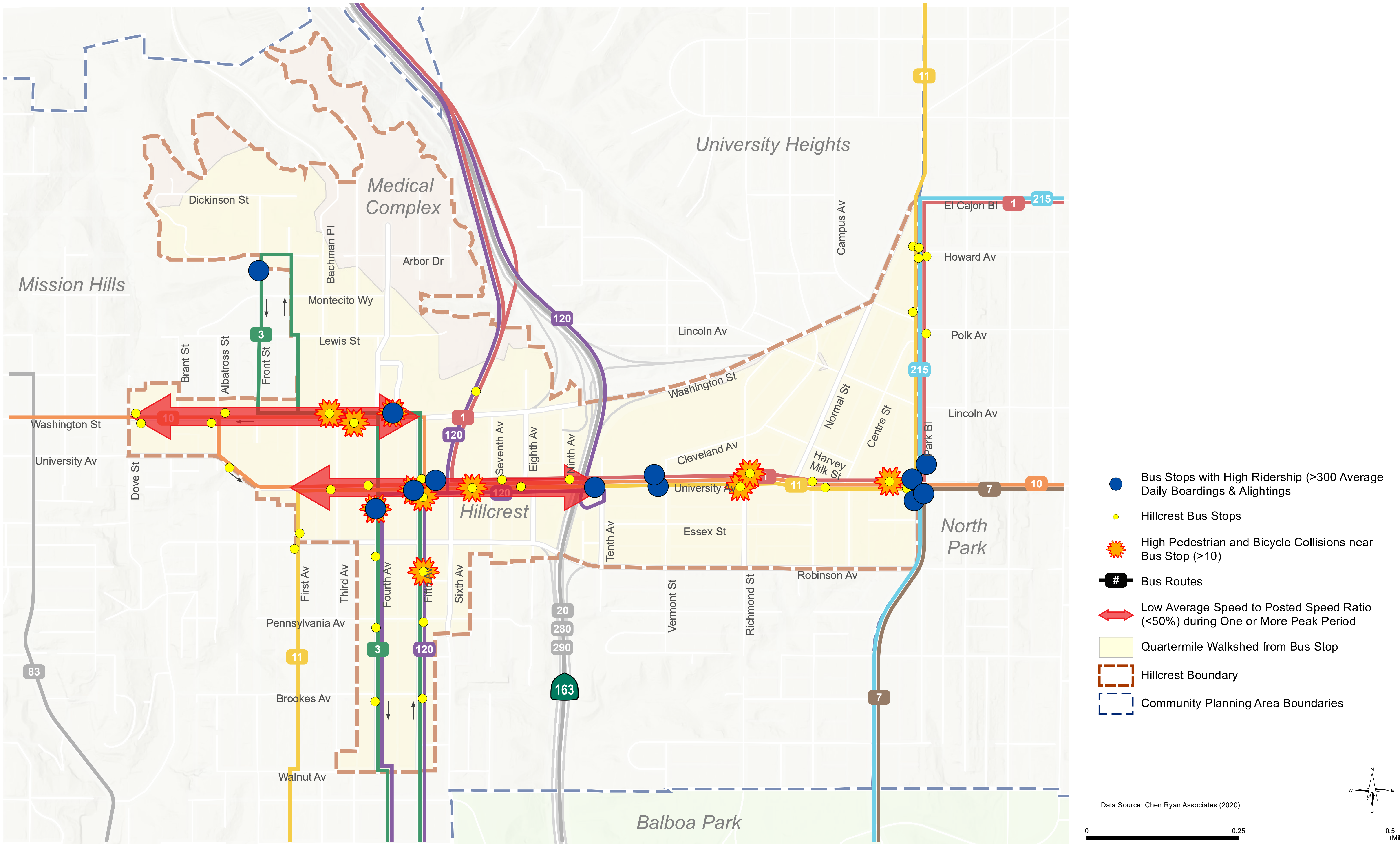
The installation of a continuous separated bicycle facility along University Avenue would be another major opportunity to boost cycling within the neighborhood. The corridor experienced a surge in observed cycling activity after Class II bike lanes were installed between Fifth Avenue and Normal Street. Despite the robust activity along University Avenue, sections of the corridor remain where cyclists must ride in mixed traffic under sub-optimal conditions.

2.3 Transit Needs

The City of Villages strategy supports better utilization of the region's transit system by directing the development of urban villages, employment centers, and other higher intensity land uses in areas that can be well served by transit. This will allow more people to live and work within walking distance of transit.

Within Hillcrest there are seven bus routes, including one *Rapid* bus route (#215) and two limited stop routes (#10 and #120). All seven bus routes serving Hillcrest operate at headways of fifteen minutes or better. Park Boulevard between El Cajon Boulevard and University Avenue features center-running transit only lanes which are utilized by the Rapid 215. Most of the community is within a quarter mile of a bus stop. Destinations and places reached by the Hillcrest-serving bus routes include Downtown, Fashion Valley, and San Diego State University, East San Diego, Southeastern San Diego/Encanto and La Mesa. The business community also operates a free circulator shuttle during the lunch peak period called the Hillcrest Lunch Loop.

These transit needs are illustrated in **Figure 2-6**.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Lincoln Av
Cleveland Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Essex St
Normal St
Centre St
Harvey Milk St
Campus Av
El Cajon Bl
Howard Av
Polk Av
Park Bl
Robinson Av
Vermont St
Richmond St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Pennsylvania Av
Brookes Av
Walnut Av
Bus Stops with High Ridership (>300 Average Daily Boardings & Alightings)
Hillcrest Bus Stops
High Pedestrian and Bicycle Collisions near Bus Stop (>10)
Bus Routes
Low Average Speed to Posted Speed Ratio (<50%) during One or More Peak Period
Quartermile Walkshed from Bus Stop
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

Transit Ridership

The Park Boulevard and University Avenue intersection has the highest transit passenger activity in Hillcrest, with a combined 2,100 average daily boardings and alightings occurring between the six separate bus stops at the intersection. The second busiest location is Fifth Avenue and University Avenue, where a combined 1,600 average daily boardings and alightings occur between the intersection's four bus stops. The busiest standalone bus stop is the Route 3 terminus at Front Street and Arbor Drive next to UCSD Hospital, which averaged 659 combined daily boardings and alightings.

Transit Rider Safety

Most transit users access transit stops by walking or biking. Therefore, it is essential to consider bus stops at or near locations with pedestrian and bicycling collision history. Within Hillcrest, there are three bus stops within 500 feet of where as many as 16 pedestrian or bicycle-injury collisions occurred between 2014 and 2018. The bus stop locations include:

- Washington Street and Fourth Avenue
- Washington Street and Fifth Avenue
- Fourth Avenue and University Avenue

On-time Performance

Five of the seven MTS bus routes serving Hillcrest are not meeting their on-time performance benchmarks, they include Routes 3, 7, 10, 11 and 120. The lowest on-time performing bus route which serves Hillcrest, at 78%, is Route 3 which goes between UCSD Medical Center and Euclid Transit Center, via Downtown.

In addition to MTS on-time performance metrics, this study analyzed roadway average travel speed during the peak periods and confirmed that congestion (average travel speed less than half of posted speed limit) occurs along various portions of University Avenue between Fourth Avenue and Tenth Avenue. This stretch of University Avenue is the busiest transit corridor in the community, with four high frequency bus routes (Routes 1, 10, 11 and 120) utilizing it as part of their alignment through Hillcrest. Traffic congestion and slower travel speeds during the peak periods can negatively impact the reliability of bus services. With no dedicated transit priority treatments along University Avenue, buses are frequently stuck in the same congestion as private vehicles. Implementation of transit priority measures may be desired along some portions of roadway within Hillcrest.

Planned Transit Improvements

SANDAG's *San Diego Forward: The Regional Plan* plans upgrades of several existing Hillcrest-serving local transit routes (Routes 10, 11 and 120) to *Rapid*-branded service by 2035. *Rapid* service may entail more distant (consolidated) stop spacing – allowing for faster, longer distance service; improved all-day frequencies, potential transit priority along portions of alignments, and other potential measures which may reduce dwell times.

The Regional Plan also plans for the existing *Rapid* 215 alignment to be converted to light rail, with the first phase to Mid-City opening in 2035. A streetcar loop along University Avenue, Fourth and Fifth Avenues, B Street, serving Hillcrest, Bankers Hill, Downtown and Balboa Park is also among the transit projects, planned for completion in 2035. At the time of this report, SANDAG is in the process of developing the Regional Plan 2021, which will feature the agency's *5 Big Moves* transportation strategy. The strategy aims to design the region's future transportation system around high-speed transit, multimodal corridors, mobility hubs, first and last mile mobility options, and transportation systems technology.

Transit Opportunities / Future Direction

Several existing transit routes which utilize University Avenue within Hillcrest are planned to be upgraded to *Rapid* service in the future. The adequate performance of these routes would be ensured if protected from the slow traffic speeds which congest University Avenue during the peak periods, making bus operations through the community susceptible to delay. Pedestrian safety is another major issue which impacts transit users. Many of the highest pedestrian-injury collision locations occur along University Avenue, where many persons begin or end their transit trip in Hillcrest.

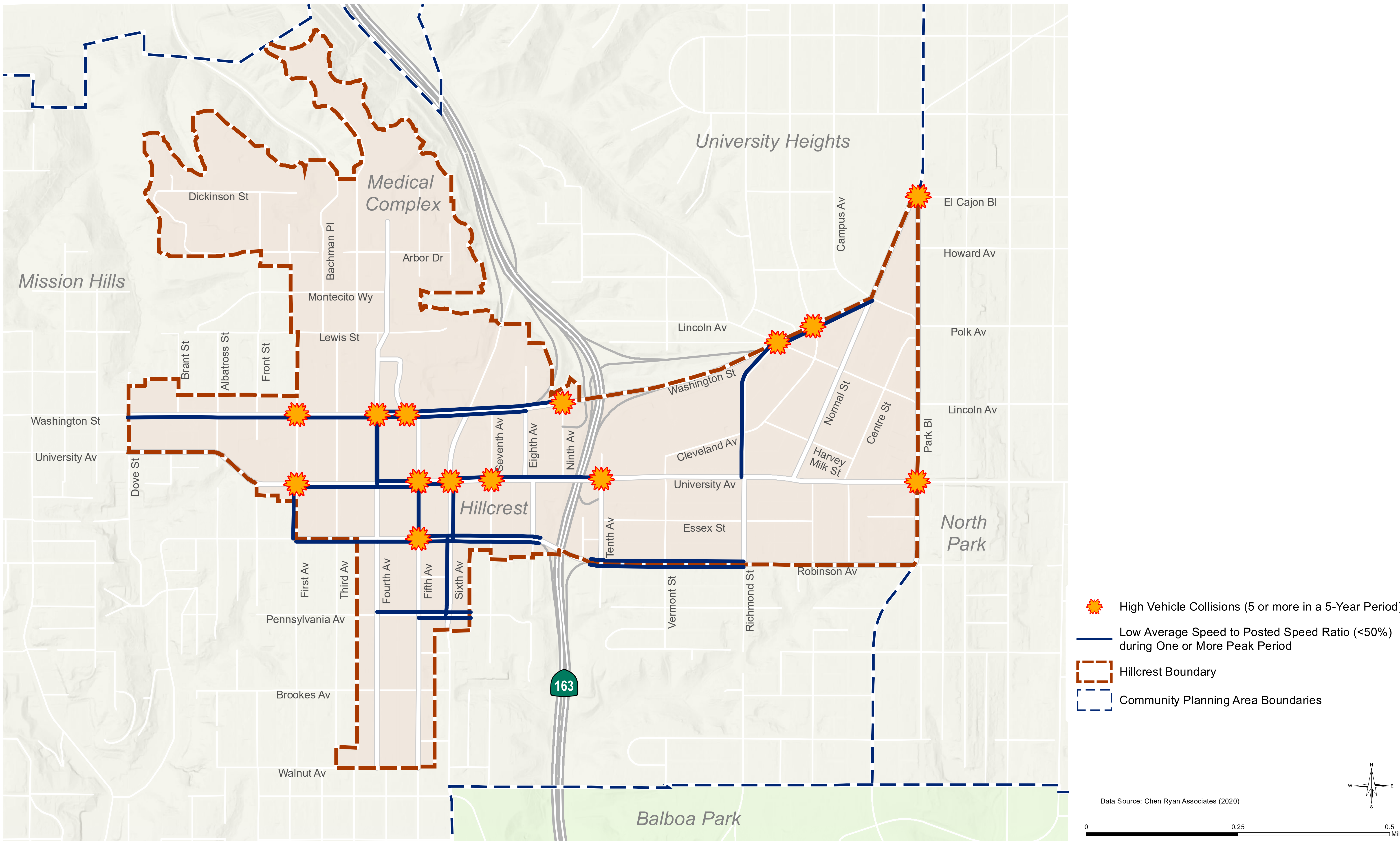
2.4 Vehicular Needs

Streets and freeways comprise the framework of our transportation system and play a major role in shaping the form of and quality of life within the community. When the street system is congested and has poor traffic safety, it can have a major impact on the community. The roadways affected by congestion during peak periods and intersections with the highest frequency of traffic collisions are shown in **Figure 2-7.**

Traffic Volumes

The Washington Street/Normal Street and University Avenue corridors are the major east-west thoroughfares of the community. Washington Street between Fourth Avenue and Lincoln Avenue has no on-street parking or access to fronting land uses. This portion carries the highest traffic volumes in the community, with daily traffic volumes reaching more than 40,000 near the SR-163 ramps. This same stretch of Washington Street also reaches the highest average speeds of any roadway within the community during the peak periods (greater than 35 mph in some locations). The other major east-west roadway, University Avenue, operates at slower speeds because it facilitates a variety of functions in addition to vehicular throughput which may generate traffic friction, including destination access, on-street parking, bus services and bicycle travel. West of Fifth Avenue, University Avenue narrows from four to two-lanes and operates at an average speed of below 15 mph during peak periods.

The major north-south corridors through Hillcrest include Sixth Avenue, the Fourth and Fifth Avenue one-way couplet, and Park Boulevard. Sixth Avenue terminates directly into a northbound ramp for SR-163, attracting nearly 35,000 daily trips north of University Avenue to and from the freeway. Fourth and Fifth Avenue forms a one-way couplet originating in Downtown and terminating just past Washington Street. These two roadways are lined with many destinations and form part of the community's commercial core. Park Boulevard, traversing the eastern edge of the community, is a four-lane major roadway with a center-running busway used by MTS Rapid Bus 215. Despite its large capacity, Park Boulevard between El Cajon Boulevard and University does not attract more than 11,000 daily trips.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Bachman Pl
Arbor Dr
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Pennsylvania Av
Brookes Av
Walnut Av
Lincoln Av
Cleveland Av
Essex St
Vermont St
Richmond St
Robinson Av
Normal St
Centre St
Harvey Milk St
Campus Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
High Vehicle Collisions (5 or more in a 5-Year Period)
Low Average Speed to Posted Speed Ratio (<50%) during One or More Peak Period
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2020)
0
0.25
0.5
Miles

Vehicular Safety

Within Hillcrest there were six intersections with 8 or more motorist injury collisions between 2014 and 2014. Five of those six locations occurred on the Washington Street/Normal Street corridor:

- Fourth Avenue & Washington Street (13)
- First Avenue & Washington Street (12)
- Cleveland Avenue & Washington Street (10)
- Normal Street/Park Boulevard & El Cajon Boulevard (10)
- Tenth Avenue & University Avenue (9)
- Lincoln Avenue & Washington Street (8)

Of the locations within Hillcrest which met the criteria of one of the three vehicular collision systemic hotspot roadway environments identified in the 2018 SSAR none of the locations experienced more than three traffic collisions which matched the accompanying hotspot crash scenario (through movement control violation resulting in a broadside).

Vehicular Travel Speeds

Congestion areas in Hillcrest are most concentrated west of SR-163 in the village, where during peak periods, heavy traffic volumes, short blocks and other sources of friction contribute to average travel speeds less than half of the posted speed limit. These conditions notably occur along University Avenue between First Avenue and Tenth Avenue; Robinson Avenue between First Avenue and Richmond Street; and Washington Street, between Dove Street and Ninth Avenue.

Planned Street Improvements

Uptown Impact Fee Study

The Uptown Impact Fee Study (IFS), adopted in 2016, identifies specific facilities that are needed to implement the goals of the community plan. Types of facilities include mobility projects (described within this section), parks and recreation, police, fire and rescue, and library facilities.

Among other public facilities, the IFS identified transportation-related future needs for the community, which would be funded through a combination of Development Impact Fees (DIF), subdivider-paid fees, TransNet revenue, or other, currently unidentified funding sources.

The IFS identified the following transportation-related improvements within Hillcrest. This list does not include projects that have been completed. Funded, partially funded and unfunded projects are listed along with project costs and funding sources, if known:

- Richmond Street from Cleveland Avenue to Robinson Avenue, expanded to two-lane with center left turn lane ($51,000, CIP)
- Robinson Avenue bridge widening over SR-163 ($7,713,000, CIP)
- Eighth Avenue and Robinson Avenue, new traffic signal (cost not specified, unfunded)
- Tenth Avenue and Robinson Avenue, new traffic signal (cost not specified, unfunded)
- Cleveland Avenue and Lincoln Avenue, new traffic signal (cost not specified, unfunded)
- First Avenue and Robinson Avenue, traffic signal improvement (cost not specified, unfunded)
- First Avenue and University Avenue, traffic signal improvement (cost not specified, unfunded)
- Third Avenue and Washington Street, traffic signal improvement (cost not specified, unfunded)
- Fourth Avenue and University Avenue, traffic signal improvement (cost not specified, unfunded)

- Fourth Avenue and Robinson Avenue, traffic signal improvement (cost not specified, unfunded)
- Fifth Avenue and University Avenue, traffic signal improvement (cost not specified, unfunded)
- Fifth Avenue and Robinson Avenue, traffic signal improvement (cost not specified, unfunded)
- Fifth Avenue and Washington Street, traffic signal improvement (cost not specified, unfunded)
- Sixth Avenue and Pennsylvania Avenue, traffic signal improvement (cost not specified, unfunded)
- Eighth Avenue and University Avenue, traffic signal improvement (cost not specified, unfunded)

2.5 Parking

The costs of building a large parking structure and land constraints within Hillcrest make the possibility of significantly increasing the community's supply of parking less likely. Effective parking management practices supplemented with the facilitation of alternative forms of mobility can maximize further use of a fixed supply of parking when increasing supply is not a feasible option. Within commercial areas of Hillcrest time restrictions are imposed in order facilitate turnover, enabling more unique visitors to make trips. When parking is priced accurately it allows a scarce supply of parking to be rationed efficiently, freeing up just enough supply to make parking easy to find no matter which location and filters users by their preferred medium of payment, in time or money. It also removes a hidden subsidy in most vehicular trips, which often skew transportation decisions in favor of driving. The emergence of shared electric-assist micro-mobility devices mitigates the disadvantages of parking remotely and enables some vehicular trips to be replaced altogether. The proliferation of ride-hailing services has also reduced the demand for long-term parking; however, these services can disrupt the operations of the roadway for other users if not appropriately managed. The allocation of space for staging and loading/unloading activities are necessary considerations to maximize the benefits of these services. The peak weekday conditions observed for on-street parking during that study occurred between 6PM and 8PM. Between those hours, most residential streets (where parking is not metered and time restricted) had parking utilization exceeding 85%. On metered blocks, utilization during that period varied by location with some metered blocks in the village also exceeding 85%. At the time of the study, metered parking enforcement ended at 6 PM. A recommendation which emerged from the study to help manage demand during the peak period was to adjust the meter enforcement hours to extend to the current window which ends at 8 PM. On-street parking on primarily residential-fronted blocks are heavily occupied during many off-peak periods as well. This is attributed to lower parking turnover activity generated by residents and the absence of parking time and cost restrictions. Often, visitors and commuters are incentivized to search for parking for parking on residential streets because of there are no cost or time restrictions.

Peak on-street parking utilization on weekends occurs between 12 PM and 3 PM, which is earlier in the day compared to weekday. This is because residents are more likely to be at home during the day on weekends, compared to weekday, while the activity peaks of the destinations are constant throughout the week (mid-day to early evening). Meters are also not enforced on Sundays, which contributes to higher utilization and lower turnover. During the weekend peaks, most blocks of on-street parking throughout Hillcrest are utilized at 85% or more.

Appendix B – Mobility Adjustment Tool

MOBILITY ADJUSTMENT TOOL

Documentation and Instruction Manual

FEBRUARY 2024

Prepared For

The City of SAN DIEGO

Prepared By

CR Associates
3900 Fifth Avenue, Suite 310
San Diego, CA 92103

Table of Contents

List of Figures

Mobility Adjustment Tool

The purpose of this Mobility Adjustment Tool (the "Tool") is to calibrate traffic volume outputs from transportation models against existing traffic counts. This includes calibrating existing and future average daily traffic (ADT) estimates for roadway segments and peak hour turning movements for intersections. The following sections describe the data requirements and methodologies for developing ADT and intersection volumes, followed by a detailed example of how to utilize the Tool.

The Tool operates entirely within Excel, requiring no additional software for functionality. However, for optimal results and efficiency, it is recommended to complement the Tool with GIS (Geographic Information System) software. This document was prepared utilizing ArcGIS Pro, but other versions of GIS (i.e., ArcMap) may achieve similar results.

It should be noted that the Tool was designed for intuitive use, catering to individuals of varying technical proficiencies, including those without advanced GIS or Excel expertise. While this document aims to provide enough guidance for understanding and utilizing the Tool efficiently, it does not substitute proper training and experience. Consequently, there are certain steps that are not elaborated upon extensively. Users are encouraged to reach out to staff with GIS and Excel experience for assistance when needed.

Following this introduction, the document is structured into the following sections:

- Roadway Segment Traffic Volumes: This section describes the data required and methodology utilized to develop roadway segment traffic volumes.
- Intersection Traffic Volumes: This section describes the data required and methodology utilized to develop intersection volumes.
- Instruction Manual: This section provides a step-by-step walkthrough of how to utilize the Tool.

Roadway Segment Traffic Volumes

To develop calibrated roadway segment traffic volumes, the Tool requires the following:

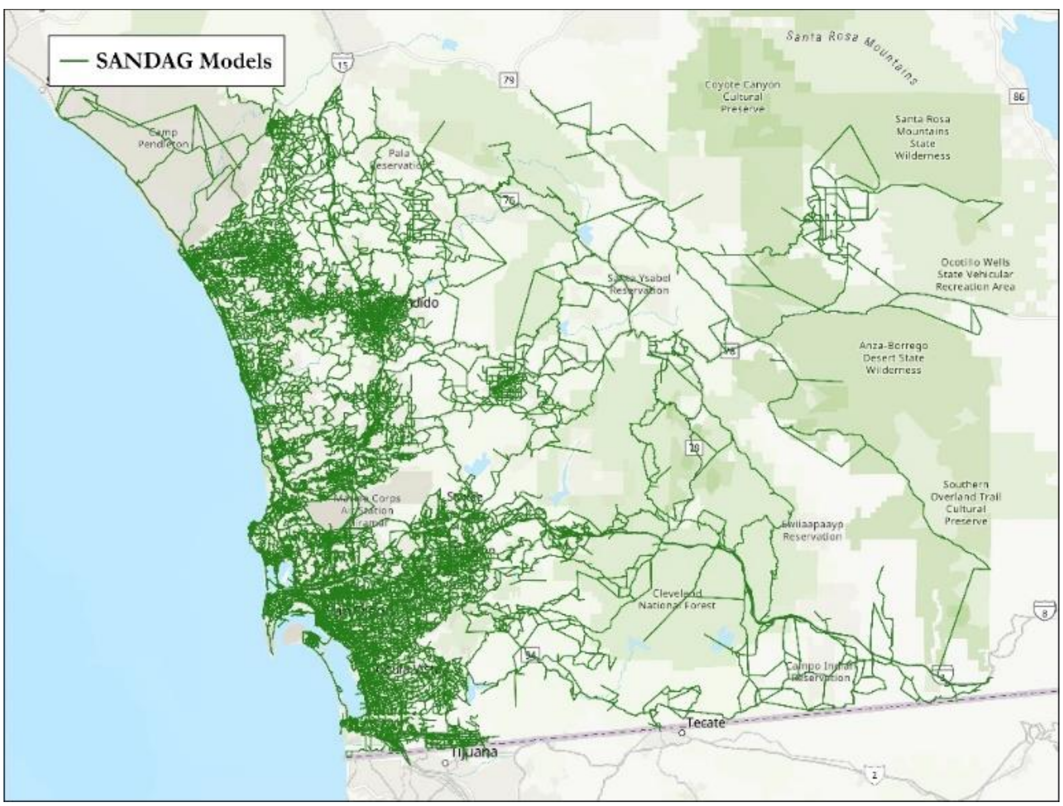
- Transportation Model Traffic Volume Outputs
- Traffic Counts

The following sections describe the above sets of data in detail.

Transportation Models

Transportation models are complex analysis tools used to forecast future scenarios of where people will live and how they will travel. The models serve as the foundation for determining the traffic growth between existing (Base) and long-term (Future) scenarios. Within the San Diego region, the most commonly utilized transportation models come from the San Diego Association of Governments (SANDAG). The SANDAG transportation models (SANDAG Models) are Activity-Based Models (ABM) that simulate individual and household transportation decisions for daily travel activities such as work, school, shopping, healthcare, and recreation. In other words, the SANDAG Models predict whether, when, and how travel occurs in the San Diego region. The SANDAG Models consist of more than 40,000 individual links representing the transportation network within the San Diego region. Among other data, each link contains ADT data, representing the vehicular trips projected as a result of model inputs, such as population and land uses. **Figure 1** displays an example of a SANDAG Model transportation network.

Figure 1 - SANDAG Models



SANDAG Models can be prepared for different scenarios that incorporate different land uses and model inputs. As is the case when models are prepared for Base and Future conditions. While the Base model is intended to reflect existing conditions, the Future model can reflect proposed changes to the transportation network (road diets, road widenings, new alignments, etc.) and land uses (increases in residential density, buildout of communities, transit-oriented development, etc.)

To allow for the comparison of model outputs across different models, each link is assigned a unique identifier known as the "HWYCOVID". The Tool takes advantage of this consistency across models to join data from the Base Model to the Future Model.

Traffic Counts

A transportation model may not accurately represent typical, day-to-day traffic conditions as the model assumptions, input parameters, and network representation do not fully capture the nuanced, complex, and unpredictable nature of the real-world transportation system. Therefore, calibration against traffic counts becomes crucial as it helps adjust the model to better reflect Base conditions, enhancing the model's accuracy, and providing more reliable predictions for Future conditions.

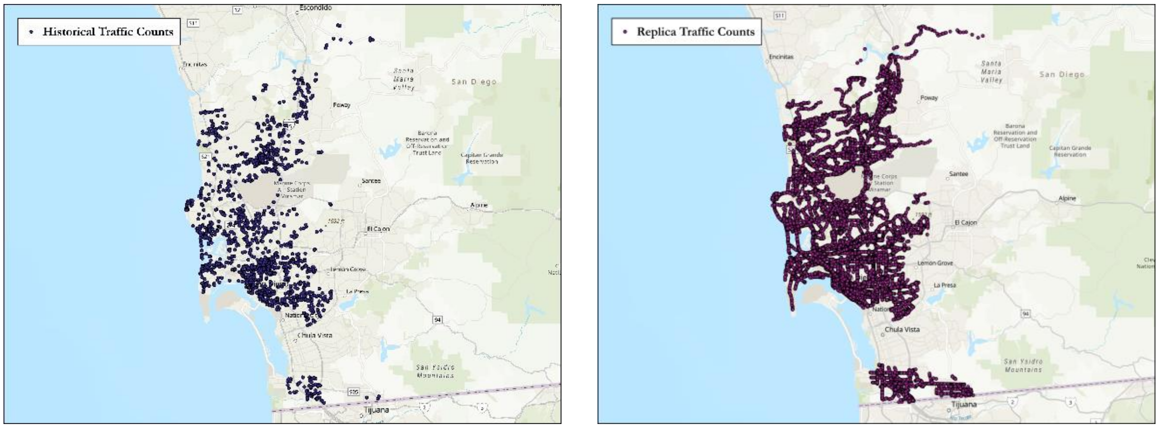
To calibrate model ADT, the Tool requires traffic count data that shares the model's HWYCOVID attribute. In other words, the Tool uses the HWYCOVID to join traffic counts to the Base and Future Model ADT. The following datasets, included in the Mobility Adjustment Tool Package, have been spatially joined[1] through GIS, providing each traffic count its corresponding HWYCOVID.

- ***Existing***: Traffic counts that were conducted within the last 2 years. Existing traffic counts can be sourced from the City's traffic count database, as well as technical reports such as traffic studies prepared for Transportation Impact Studies, Local Mobility Analyses, or Environmental Impact Reports.
- ***Historical***: Traffic counts derived from the City of San Diego historical traffic count database, provided by City staff. These are roadway segment traffic counts that were conducted more than 2 years ago. In general, traffic counts older than 2 years are not preferred, but for the purpose of this Tool they offer a cost-effective alternative to conducting new traffic at all study locations. However, it is important to consider historical counts come with limitations as changes in infrastructure, seasonal variations, and other factors can result in significant changes between historical and Existing conditions.
- ***Replica***: Replica is a platform that analyzes massive volumes of data from sources such as GPS devices, traffic sensors, mobile apps, social media platforms, credit card transactions, and other sources related to transportation and mobility. The platform provides average annual daily traffic (AADT) estimates on an annual basis.

To optimize accuracy and reliability, the Tool systematically calibrates Model ADT against available traffic counts, prioritizing data in a ranked order of Existing, Historical, and Replica. However, the Tool also offers the flexibility to select any of the available traffic count sources or "None", maintaining the Base Model ADT as-is. **Figure 2** displays the traffic count data included in the Mobility Adjustment Tool Package.

[1] Spatial Join: Joins attributes from one feature to another based on the spatial relationship

Figure 2 - Historical and Replica Traffic Counts



Methodology

To facilitate the calibration process, it is necessary to reduce the complexity and extents of the SANDAG Models to better align with the objectives of a Project Study Area. This ensures that the information is manageable and more relevant to the user's needs. The recommended approach for this is utilizing GIS to aggregate[2].

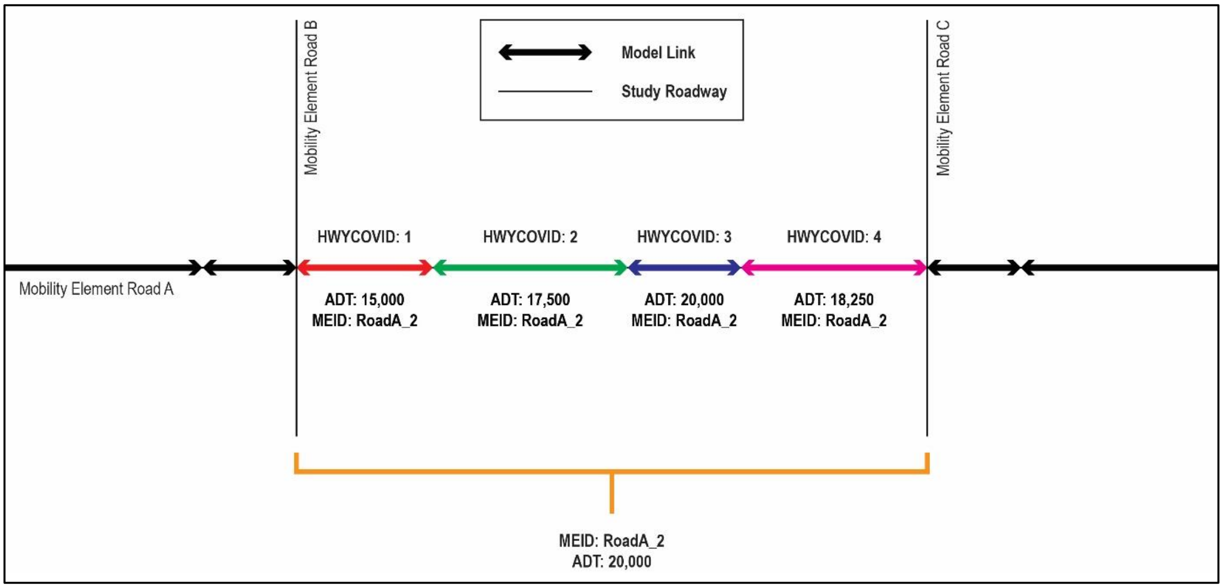
Aggregating Model Links to Study Roadway Segments

In the context of GIS, aggregating refers to the process of combining multiple smaller, more detailed geographic data points or segments into larger, less detailed, or more generalized groups. This process can involve summing, averaging, or selecting maximums from fine-grain elements, such as model links, to create a more simplified representation, such as Study Roadway Segments.

SANDAG Models consist of more than 40,000 model links. On the other hand, Study Roadway Segments are larger segments that typically span across several model links. To aggregate model links into Study Roadway Segments, a unique identifier, known as the Mobility Element ID (MEID) is required. Using GIS, every Study Roadway Segment, and every model link that makes up a segment, are assigned the same unique Mobility Element ID (MEID). This effort creates a table that relates HWYCOVID's (model links) to MEID's (Study Roadway Segments). The Tool then aggregates the ADTs for the model links into a single ADT representing the entire Study Roadway Segment. It is important to note that the aggregate process utilizes the merge rule of "maximum", meaning that the ADT for the Study Roadway Segment is the maximum observed across the model links that make up the segment. **Figure 3** displays how multiple model links are aggregated into a single Study Roadway Segment.

[2] Aggregating: Resampling of information based on specific aggregation strategies such as maximum, mean, medium, minimum or sum

Figure 3 – Aggregating Model Links to Study Roadway Segments



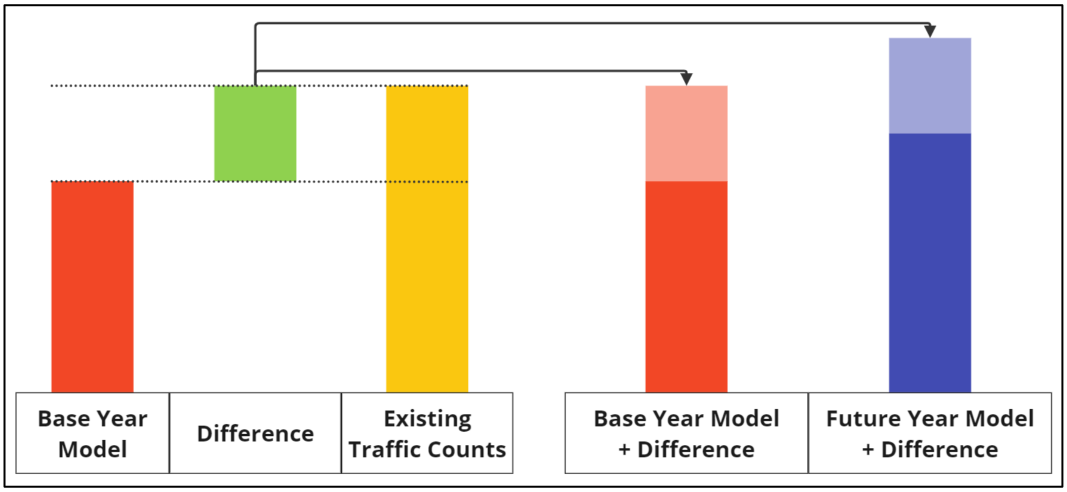
As shown above, the second segment of Road A, located between Road B and Road C, with an MEID of "RoadA_2" is made up of four model links with HWYCOVID's 1, 2, 3, and 4. Each model link contains Model ADT ranging from 15,000 to 20,000. By assigning each model link the MEID of the Study Roadway Segment they make up, "RoadA_2", the Tool can aggregate the data and determine that the ADT for "RoadA_2" is 20,000 (the maximum observed between HWYCOVID's 1 through 4).

The above example aggregates Model ADT, but the same process applies to traffic counts. As long as the HWYCOVID's of the traffic counts have been defined to make up a particular MEID, the Tool can aggregate traffic count data. In other words, aggregating not only optimizes the calibration process, but also allows for the Tool to associate attributes from different model link datasets (Model, Existing, Historical, and Replica ADT) to the attributes from the Study Roadway Segments (Roadway, From, and To).

Model Calibration

After aggregating, the next step is to calibrate the Base and Future Model ADT's utilizing the available traffic counts (Existing, Historical, or Replica). As mentioned previously, the Tool systematically calibrates Model ADT against traffic counts, prioritizing data in a ranked order of Existing, Historical, and Replica. The Tool first identifies the difference between Base Model ADT and the traffic count and applies the difference to both the Base and Future Models. As a result, the Base Model ADT is adjusted to reflect traffic count levels, and the Future Model ADT is adjusted to reflect the same growth prior to adjustments. **Figure 4** displays an example of the Base and Future Models being adjusted to reflect a set of existing traffic counts that were higher than Base Model ADT.

Figure 4 - Model Calibration



Fine-Tuning Calibration Results

In most cases the calibration results are adequate for high-level, long term planning purposes. However, the Tool is also intended to aid in the development of Future intersection turning movements, which is more sensitive to growth patterns, and to account for situations where engineering judgement is justified, the Tool offers optional fine-tuning. The available fine-tuning options are described below:

1. **None**: No further adjustments applied.
2. **Round**: Adjusts the calibrated result by rounding to the nearest hundred.
3. **Corridor**: Adjusts the segment's calibrated ADT to reflect the average growth observed across the corridor the segment corresponds to. The average growth is the average of the growth observed per segment of the corridor and not simply the growth between the sum of the Base and Future ADT.
4. **Overall**: Adjusts the segment's calibrated ADT to reflect the average growth observed across the entire Project Study Area. The average growth is the average of the growth observed per segment of the Project Study Area and not simply the growth between the sum of Base and Future ADT.
5. **User Input Override:** Overrides the Tool output.

It is important to recognize that there is not a one-size-fits-all approach when it comes to fine-tuning. Different situations may require different fine-tuning methods, if any, and careful consideration should be exercised when determining how and when to fine-tune.

Intersection Traffic Volumes

The Tool allows users to develop Future intersection traffic volumes based on existing intersection traffic volumes and the calibrated ADT results.

To develop intersection traffic volumes, Tool requires the following:

- Existing intersection turning movement traffic volumes
- Base and Future Model ADT per Intersection Leg

The following sections describe the above sets of data in detail.

Existing Intersection Turning Movement Volumes

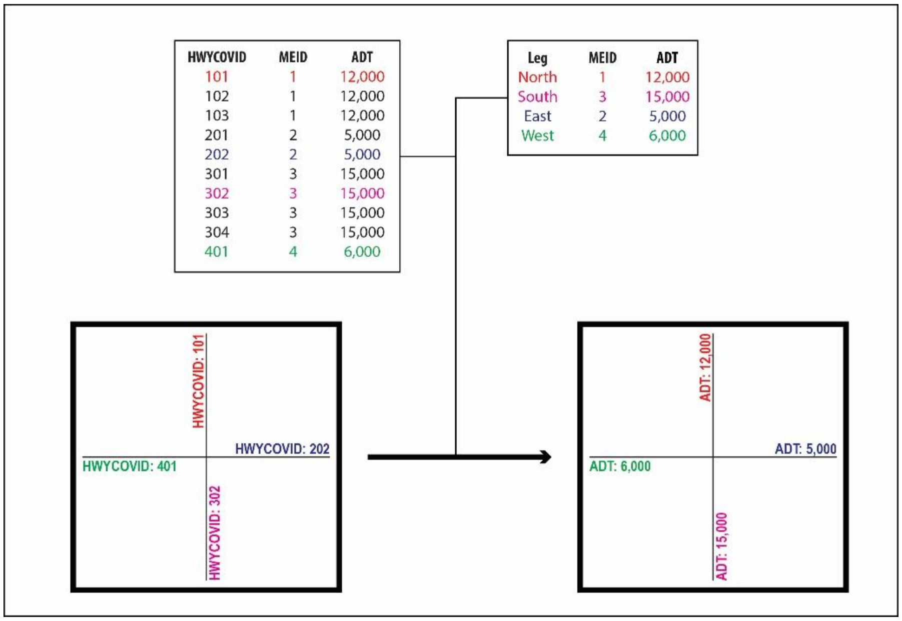
Intersection turning movement volumes refer to the quantitative representation of the traffic flow at an intersection, focusing specifically on the movements vehicles make when transitioning from one road to another. These movements typically include left turns, right turns, and through movements.

Existing intersection traffic volumes may be obtained by commissioning traffic counts or sourced from historical data such as traffic studies prepared for Transportation Impact Studies, Local Mobility Analyses, or Environmental Impact Reports.

ADT by Intersection Approach

The methodology for Future intersection volume development, described in detail further below, requires the identification of ADT (Base and Future) per approach of the intersection. By inputting the HWYCOVID of the model links that make up the legs of an intersection, the Tool utilizes the HWYCOVID and MEID relationships established in the Roadway Segment Traffic Volume development to assign Base and Future Model ADT. Figure 5 displays an example of how the assignment of HWYCOVID's produces Model ADT information for each intersection leg.

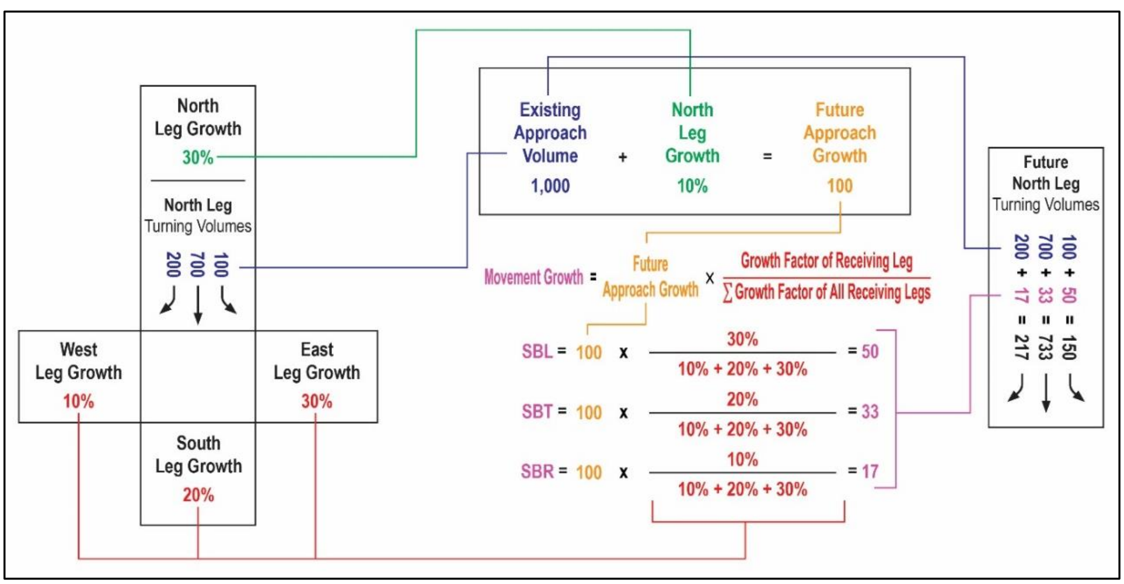
Figure 5 – ADT by Intersection Approach



Methodology

The development of Future intersection traffic volumes is based on the National Cooperative Highway Research Program (NCHRP) Report 255 methodology for estimating intersection turning movements, which is applicable when existing turning movement volumes and ADT by approach are available. The methodology involves determining the growth in approach volumes based on the growth between the approach ADT. The calculated growth is then distributed to receiving legs proportionally based on the individual growth of a receiving leg relative to the growth of all receiving legs. **Figure 6** below provides an example calculation for the southbound approach (north leg) of a four-legged intersection.

Figure 6 - Example Calculations of Future Intersection Traffic Volumes

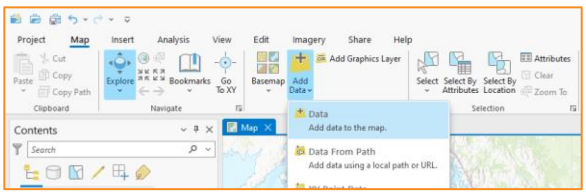


Instruction Manual

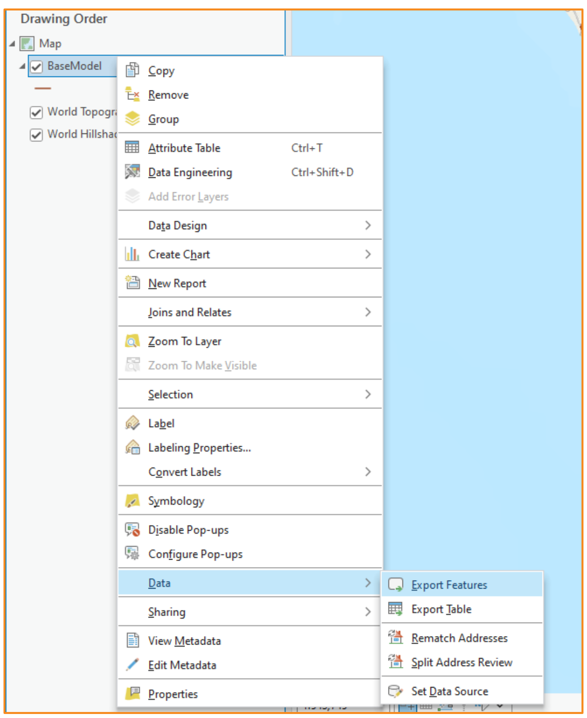
This section presents a detailed illustration of the Tool's functionality within the context of the Hillcrest Focused Plan Amendment (Hillcrest FPA). Though the walkthrough focuses on the Hillcrest FPA study area, it serves as a template for its broader application to other communities, corridor studies, or site-specific studies. By following the outlined steps, users will be equipped to adapt the tool to their study needs.

Prior to importing data into the Tool, it is essential to ensure that the data is properly formatted. The Tool has built-in scripts that check for specific formats. Inadequately formatted data can lead to errors during the importing process, potentially compromising the integrity of the analysis. The following sections provide a step-by-step guide on how to format each dataset.

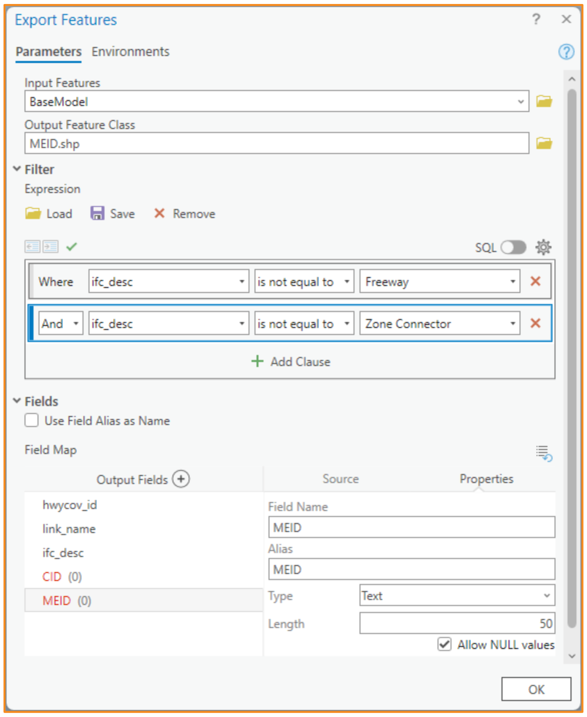
DEVELOP MEID FOR STUDY ROADWAY SEGMENTS



Use *Add Data* to import the Base Model located here:
Mobility Adjustment Tool\Shapefiles\SANDAG Models\BaseModel.shp



Use *Export Features* to create a copy of the Base Model. This copy will serve as the shapefile containing HWYCOVIDs and MEIDs.



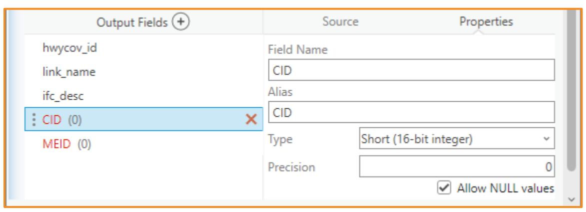
When using the Export features, name the export "MEID".

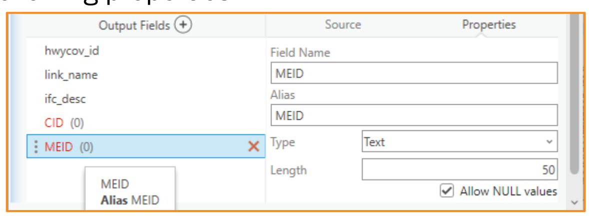
User the Filter section to filter out (avoid copying) "Freeway" and "Zone Connector" model links.

Use the Fields section to remove all fields except:

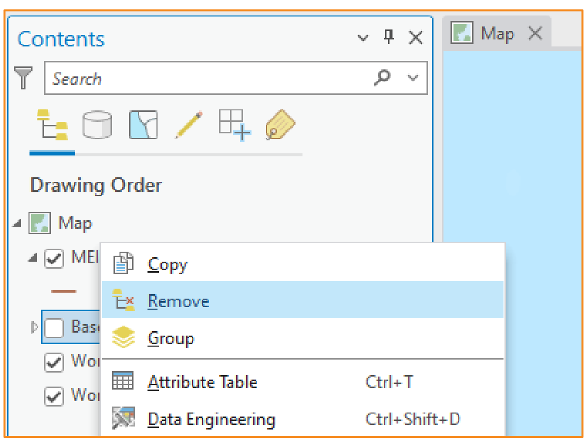
- hwycov_id
- link_name
- ifc_desc

Then add the "CID" and "MEID" fields with the following properties:

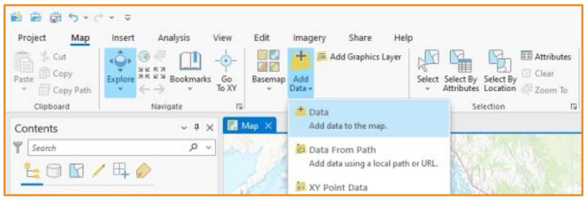


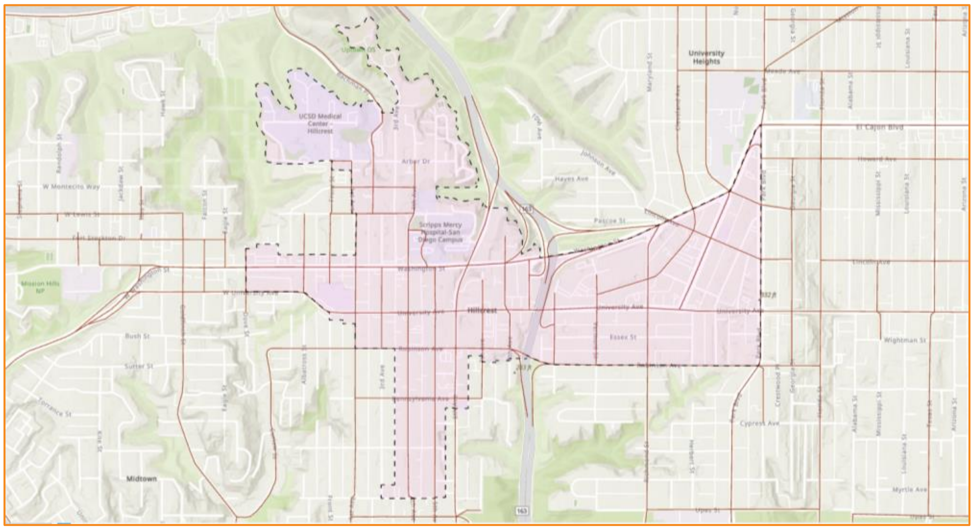


Remove the BaseModel from the Contents Pane



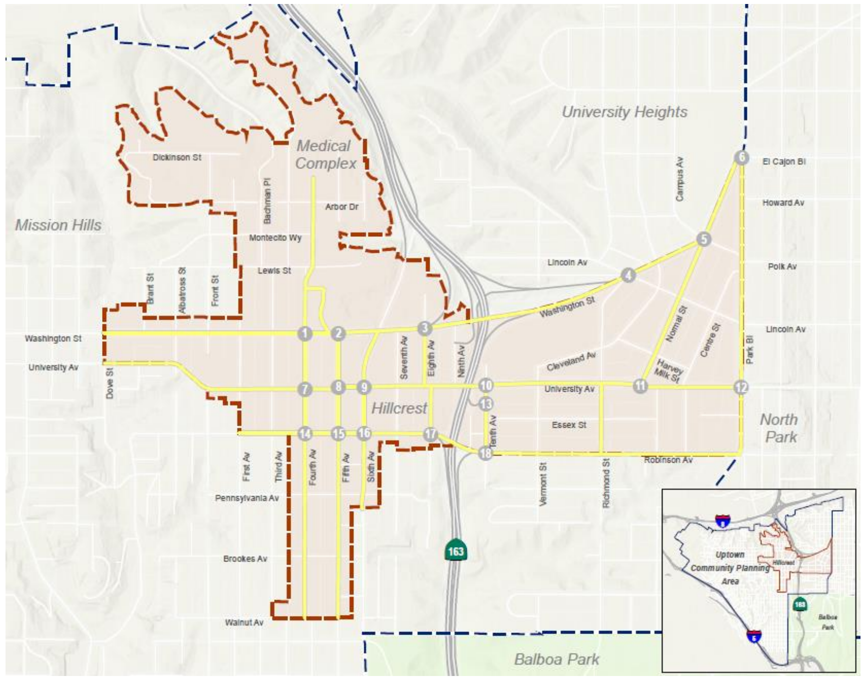
Use *Add Data* to import the Hillcrest FPA Boundary:
Mobility Adjustment Tool\Examples\Hillcrest\Shapefiles\Boundary_HillcrestFPA.shp

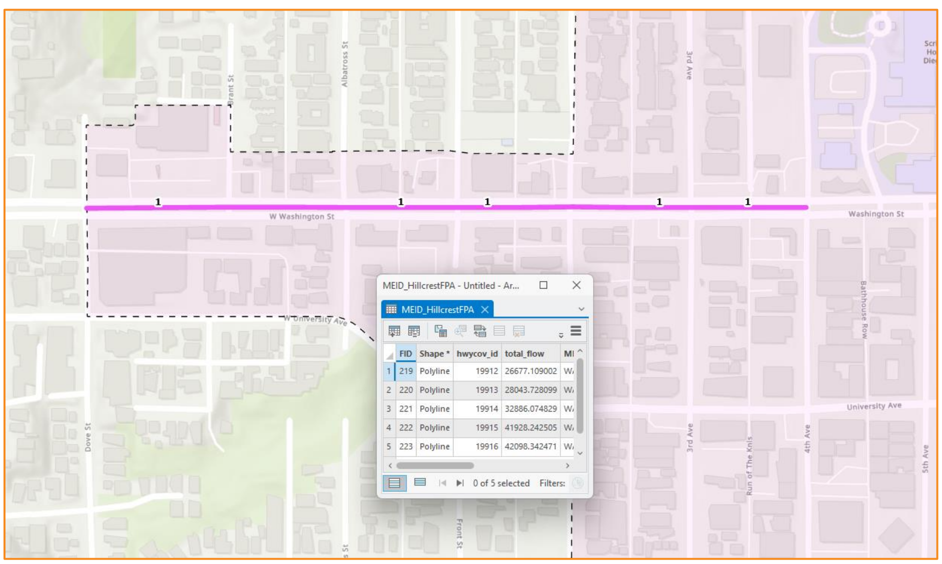




Referencing the Project Study Area from the *Hillcrest FPA Existing Conditions Mobility Assessment*, assign the same "CID" to links that make up each study roadway segment.

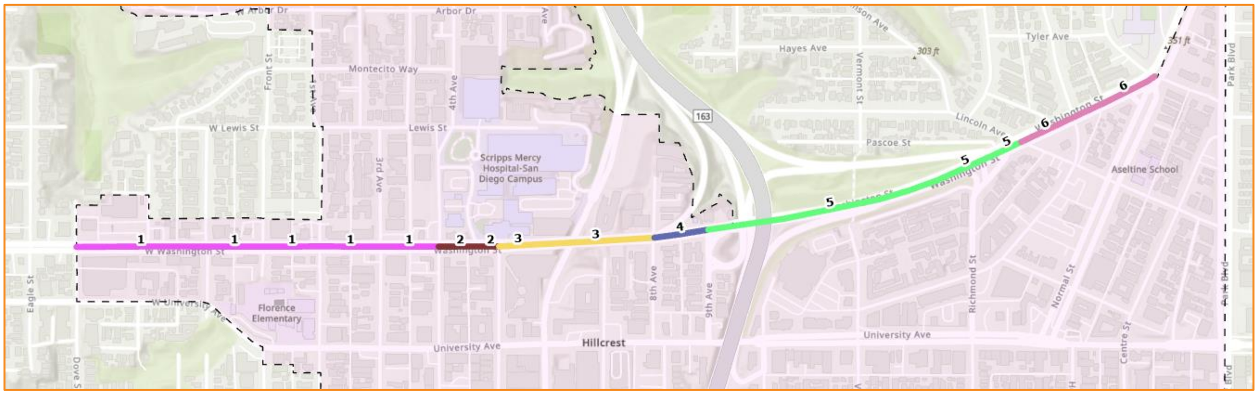
Roadway	From	To
East/West Roadway		
Montecito Way	Front Street	Fourth Avenue
Polk Avenue	Normal Street	Park Boulevard
Lewis Street	Front Street	Fourth Avenue
Washington Street	Dove Street	Fourth Avenue
Washington Street	Fourth Avenue	Fifth Avenue
Washington Street	Fifth Avenue	Eighth Avenue
Washington Street	Eighth Avenue	Ninth Avenue
Washington Street	Ninth Avenue	Lincoln Avenue
Washington Street	Lincoln Avenue	Normal Street
Lincoln Avenue	Washington Street	Normal Street
Lincoln Avenue	Normal Street	Park Boulevard
University Avenue	Dove Street	First Avenue
University Avenue	First Avenue	Fourth Avenue



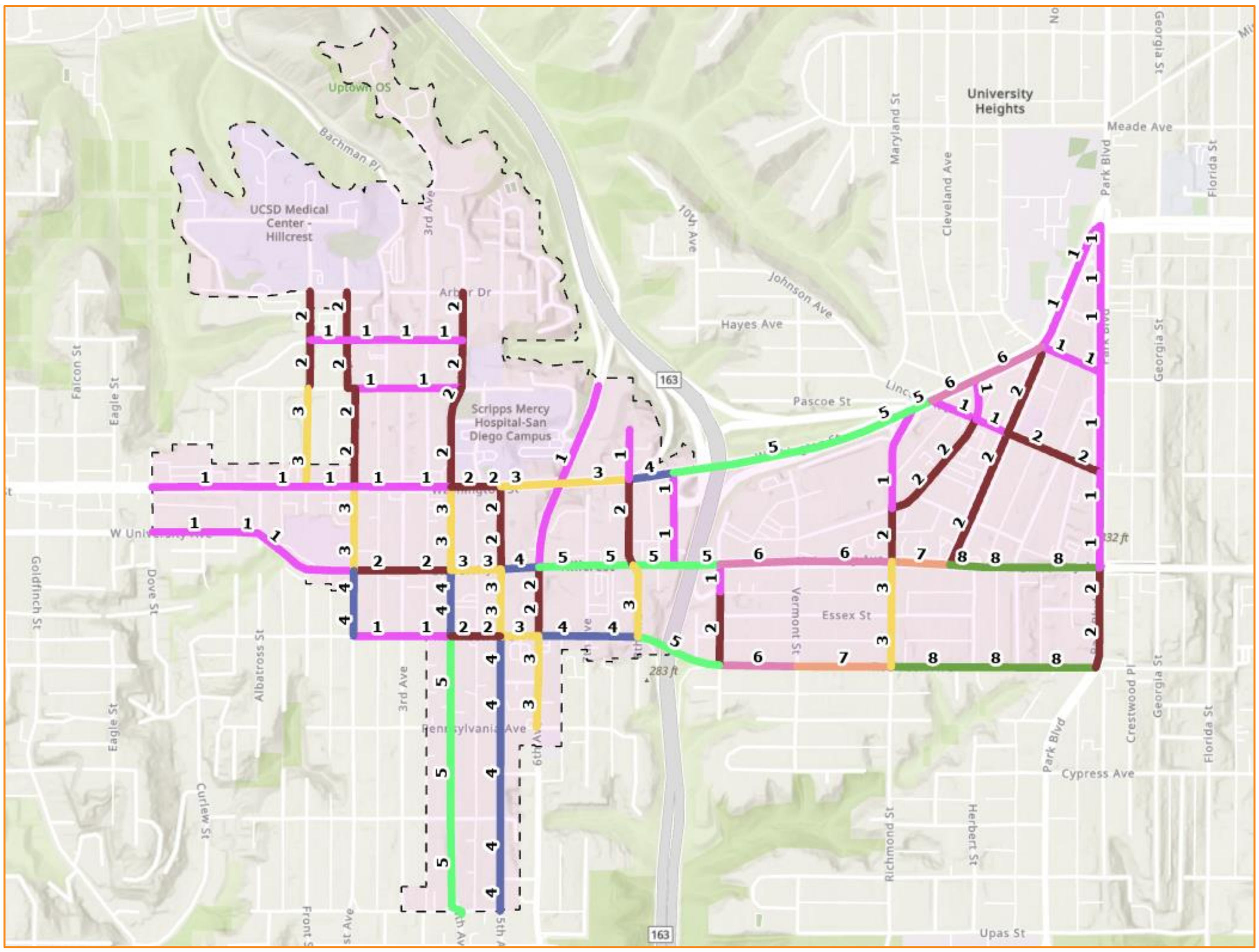


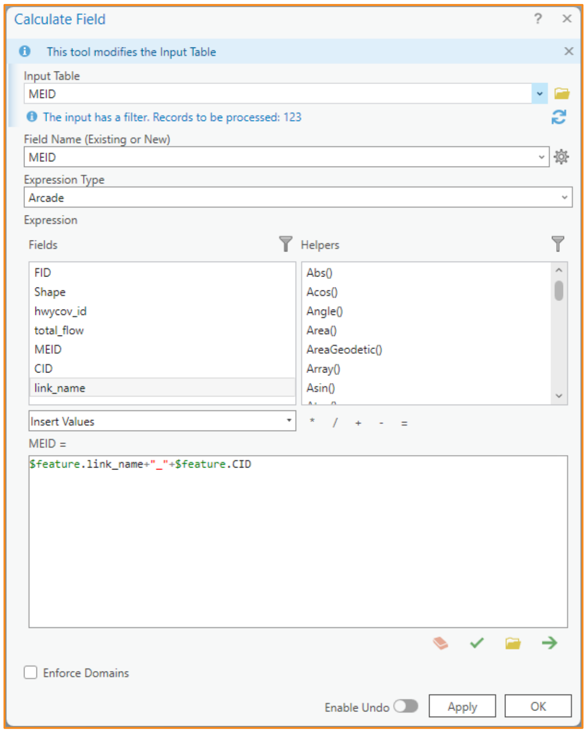
For this first example, focusing on Washington Avenue between Dove Street and Fourth Avenue, assign "1" as the CID for each of the five links that make up the study roadway segment.

Repeat for every study roadway segment along Washington Avenue.



Repeat for the entire study area.





Use *Calculate Field* to fill the MEID column (field) using the following expression:

$feature.link_name+"_"+$feature.CID

This joins “link_name” with “CID”.

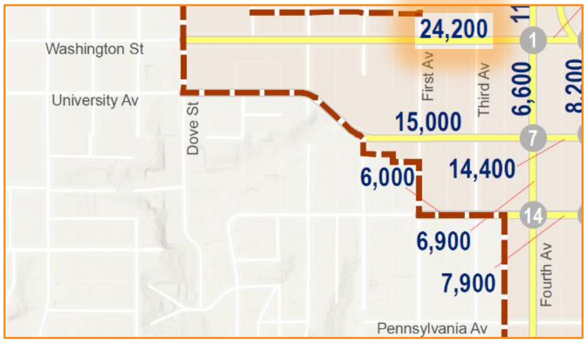
For example:

link_name = WASHINGTON
CID = 1
MEID = WASHINGTON_1

DEVELOPMENT OF MEID IS COMPLETE.

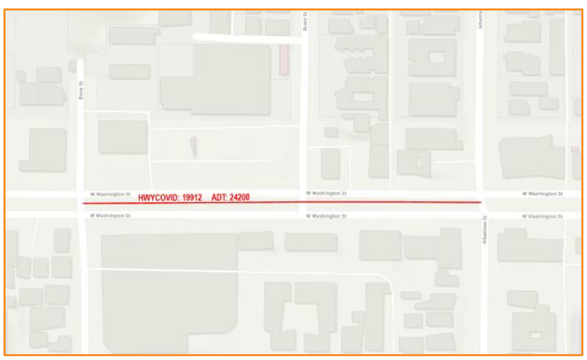
TRAFFIC COUNTS

The traffic counts included in the Mobility Adjustment Tool package have been processed through a Spatial Join through GIS. Spatial join is a method used in GIS to combine datasets based on their spatial relationships (i.e., within a distance, intersecting, overlapping, etc.).



For example, the Hillcrest FPA Existing Mobility Assessment identified a traffic count of 24,200 along Washington Avenue, between Dove Street and Fourth Avenue.

The SANDAG Model has a model link along that study roadway segment with HWYCOVID 19912.



The spatial join merges both sets of data and produces a shapefile with HWYCOVID 19912 and ADT 24,200.

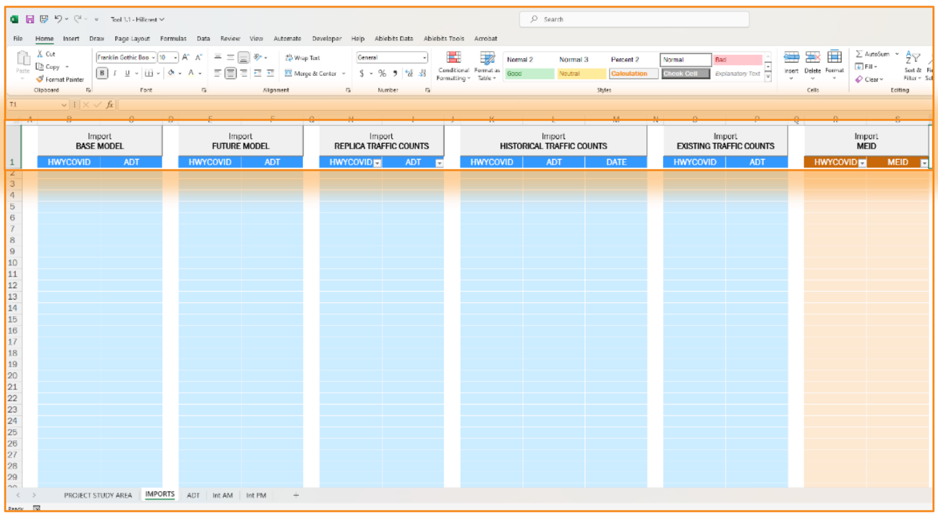
It is recommended that the provided shapefiles be continuously updated as new traffic counts become available. Over time, the shapefiles can serve as comprehensive databases for use in the development of volumes across the City of San Diego. That being said, due to the complexity of updating and maintaining such a database, this document does not offer instructions for that effort.

DEVELOPMENT OF ROADWAY SEGMENT ADT

To develop Future roadway segment ADT, the Tool requires the following inputs:

- Base Model
- Future Model
- Traffic Counts

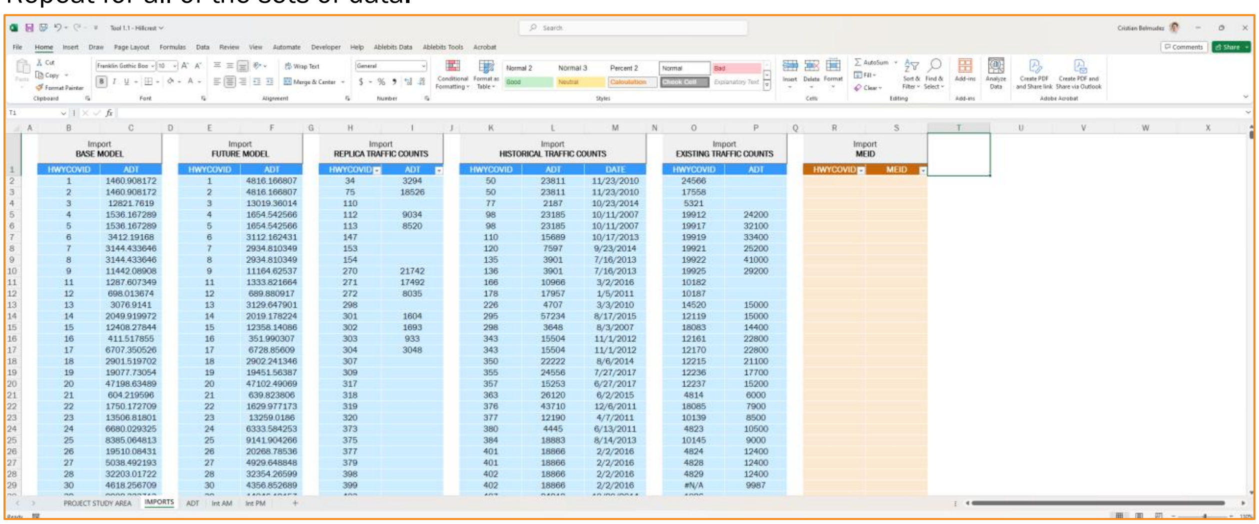
The Tool is pre-loaded with Existing, Historical, and Replica counts. Existing traffic counts were obtained from the Hillcrest FPA Existing Mobility Assessment. Historical traffic counts were obtained from the City of San Diego historical traffic count database. Replica traffic counts were obtained from the Replica platform for the year 2022.



Use the Import buttons located at the top of the "IMPORTS" sheet to import the .dbf file for the Base Model.

Note: The Import buttons only work with .dbf files. To import data in other formats (i.e., csv, text), copying and pasting values directly onto the tables is recommended.

Repeat for all of the sets of data.



	Import BASE MODEL		Import FUTURE MODEL		Import REPLICA TRAFFIC COUNTS		Import HISTORICAL TRAFFIC COUNTS			Import EXISTING TRAFFIC COUNTS		Import MEID	
1	HWYCOVID	ADT	HWYCOVID	ADT	HWYCOVID	ADT	HWYCOVID	ADT	DATE	HWYCOVID	ADT	HWYCOVID	MEID
2	1	1460.908172	1	4816.166807	34	3294	50	23811	11/23/2010	24566			
3	2	1460.908172	2	4816.166807	75	18526	50	23811	11/23/2010	17558			
4	3	12821.7619	3	13019.36014	110		77	2187	10/23/2014	5321			
5	4	1536.167289	4	1654.542566	112	9034	98	23185	10/11/2007	19912	24200		
6	5	1536.167289	5	1654.542566	113	8520	98	23185	10/11/2007	19917	32100		
7	6	3412.19168	6	3112.162431	147		110	15689	10/17/2013	19919	33400		
8	7	3144.433646	7	2934.810349	153		120	7597	9/23/2014	19921	25200		
9	8	3144.433646	8	2934.810349	154		135	3901	7/16/2013	19922	41000		
10	9	11442.08908	9	11164.62537	270	21742	136	3901	7/16/2013	19925	29200		
11	11	1287.607349	11	1333.821664	271	17492	166	10966	3/2/2016	10182			
12	12	698.013674	12	689.880917	272	8035	178	17957	1/5/2011	10187			
13	13	3076.9141	13	3129.647901	298		226	4707	3/3/2010	14520	15000		
14	14	2049.919972	14	2019.178224	301	1604	295	57234	8/17/2015	12119	15000		
15	15	12408.27844	15	12358.14086	302	1693	298	3648	8/3/2007	18083	14400		
16	16	411.517855	16	351.990307	303	933	343	15504	11/1/2012	12161	22800		
17	17	6707.350526	17	6728.85609	304	3048	343	15504	11/1/2012	12170	22800		
18	18	2901.519702	18	2902.241346	307		350	22222	8/6/2014	12215	21100		
19	19	19077.73054	19	19451.56387	309		355	24556	7/27/2017	12236	17700		
20	20	47198.63489	20	47102.49069	317		357	15253	6/27/2017	12237	15200		
21	21	604.219596	21	639.823806	318		363	26120	6/2/2015	4814	6000		
22	22	1750.172709	22	1629.977173	319		376	43710	12/6/2011	18085	7900		
23	23	13506.81801	23	13259.0186	320		377	12190	4/7/2011	10139	8500		
24	24	6680.029325	24	6333.584253	373		380	4445	6/13/2011	4823	10500		
25	25	8385.064813	25	9141.904266	375		384	18883	8/14/2013	10145	9000		
26	26	19510.08431	26	20268.78536	377		401	18866	2/2/2016	4824	12400		
27	27	5038.492193	27	4929.648848	379		401	18866	2/2/2016	4828	12400		
28	28	32203.01722	28	32354.26599	398		402	18866	2/2/2016	4829	12400		
29	30	4618.256709	30	4356.852689	399		402	18866	2/2/2016	#N/A	9987		

Navigate to the Project Study Area sheet. Fill in the table with the Study Roadway Segments attributes (Roadway, From, and To).

Project Study Area				
#	MEID	ROADWAY	FROM	TO
1		Montecito Way	Front Street	Fourth Avenue
2		Polk Avenue	Normal Street	Park Boulevard
3		Lewis Street	Front Street	Fourth Avenue
4		Washington Street	Dove Street	Fourth Avenue
5		Washington Street	Fourth Avenue	Fifth Avenue
6		Washington Street	Fifth Avenue	Eighth Avenue
7		Washington Street	Eighth Avenue	Ninth Avenue
8		Washington Street	Ninth Avenue	Lincoln Avenue
9		Washington Street	Lincoln Avenue	Normal Street
10		Lincoln Avenue	Washington Street	Normal Street
11		Lincoln Avenue	Normal Street	Park Boulevard
12		University Avenue	Dove Street	First Avenue

Then input the MEID associated with each Study Roadway Segment. For example, during the GIS exercise, Washington Avenue between Dove Street and Fourth Avenue was assigned the MEID of WASHINGTON_1.

Project Study Area				
#	MEID	ROADWAY	FROM	TO
1	Montecito_1	Montecito Way	Front Street	Fourth Avenue
2	Polk_1	Polk Avenue	Normal Street	Park Boulevard
3	Lewis_1	Lewis Street	Front Street	Fourth Avenue
4	Washington_1	Washington Street	Dove Street	Fourth Avenue
5	Washington_2	Washington Street	Fourth Avenue	Fifth Avenue
6	Washington_3	Washington Street	Fifth Avenue	Eighth Avenue
7	Washington_4	Washington Street	Eighth Avenue	Ninth Avenue
8	Washington_5	Washington Street	Ninth Avenue	Lincoln Avenue
9	Washington_6	Washington Street	Lincoln Avenue	Normal Street
10	Lincoln_1	Lincoln Avenue	Washington Street	Normal Street
11	Lincoln_2	Lincoln Avenue	Normal Street	Park Boulevard
12	University_1	University Avenue	Dove Street	First Avenue

Navigate to the ADT sheet. Click the Load the Project Study Area. The Project Study Area loads, pulling all of the data for each segment.

LOAD PROJECT STUDY AREA

LOAD PROJECT STUDY AREA
CLEAR CONTENTS / RESET

Project Study Area					Model ADT and Traffic Counts				
#	MEID	Roadway	From	To	Base Model	Future Model	Replica	Historical	Existing
1	Montecito_1	Montecito Way	Front Street	Fourth Avenue	5,061	6,344	0	0	0
2	Polk_1	Polk Avenue	Normal Street	Park Boulevard	5,485	10,787	0	0	0
3	Lewis_1	Lewis Street	Front Street	Fourth Avenue	6,149	8,628	0	0	0
4	Washington_1	Washington Street	Dove Street	Fourth Avenue	35,021	42,098	18,434	0	24,200
5	Washington_2	Washington Street	Fourth Avenue	Fifth Avenue	47,868	60,396	21,536	0	32,100
6	Washington_3	Washington Street	Fifth Avenue	Eighth Avenue	49,138	62,043	35,790	24,650	33,400
7	Washington_4	Washington Street	Eighth Avenue	Ninth Avenue	38,665	52,898	18,372	0	25,200
8	Washington_5	Washington Street	Ninth Avenue	Lincoln Avenue	40,621	53,464	31,503	24,650	41,000
9	Washington_6	Washington Street	Lincoln Avenue	Normal Street	33,074	42,082	18,844	11,574	29,200
10	Lincoln_1	Lincoln Avenue	Washington Street	Normal Street	6,974	10,658	0	11,574	0
11	Lincoln_2	Lincoln Avenue	Normal Street	Park Boulevard	5,223	7,398	0	0	0
12	University_1	University Avenue	Dove Street	First Avenue	13,645	18,674	6,976	11,628	15,000
13	University_2	University Avenue	First Avenue	Fourth Avenue	7,590	10,808	7,796	11,628	15,000
14	University_3	University Avenue	Fourth Avenue	Fifth Avenue	10,847	14,935	13,290	11,628	14,400
15	University_4	University Avenue	Fifth Avenue	Sixth Avenue	14,941	18,726	18,794	0	22,800

Calibration

By default, the Tool systematically calibrates Model ADT against available traffic counts, prioritizing data in a ranked order of Existing, Historical, and Replica. Selecting a different "Base Adjustment Method" will adjust the Base Model ADT to reflect the selected option instead (i.e., Historical, Replica, or Base Model).

Default, Existing, Historical, Replica, Base Model

Base Adjustment Method	Base Model (Adjusted)	Base Adjustment	Future Model (Adjusted)	Δ%
Default	5,061	0	6,344	25%
	5,485	0	10,787	97%
	6,149	0	8,628	40%
	24,200	-10,821	31,277	29%
Default	32,100	-15,768	44,629	39%

- Review the default results, including the new Base and Future Model ADT's and the percent growth between Base and Future, and select alternative Base Adjustment Methods, as needed.

Fine-Tuning

Fine-tune adjustments are applied to the Future Model (Adjusted) values. Fine-tuning allows the user to adjust the growth between Base and Future, overriding the model-based predicted growth with one of the following options:

None, Round, Corridor, Overall

Fine-Tune Adjustment Method	Fine-Tune Adjustment	Δ%	Future Model (Fine-Tuned)	Notes for Fine-Tuning
None	0		6,344	
	0		10,787	
	0		8,628	
	0		31,277	
None	0		44,629	

1. *None*: No further adjustments applied.
2. *Round*: Adjusts the calibrated result by rounding to the nearest hundred. This option is recommended over "None" and has a minimal change to model-based predictions.
3. *Corridor*: Future Model reflects the average growth observed across the corridor. It should be noted that the average growth is the average of the growth observed for each segment of the corridor rather than the growth between the sum of Base and Future ADT.
4. *Overall*: Future Model reflects the average growth observed across the entire Project Study Area. It should be noted that the average growth is based on the growth at each segment rather than the growth between the sum of Base and Future ADT.

User Override

If needed, or where Future ADT's have been obtained from other sources (i.e., traffic studies, technical reports, etc.) the User Override options can be utilized to override the Tool's calculations.

User Input Base	User Input Future

Final ADT

The final Base and Future Model ADT is presented at the end (right) of the table. These values are utilized for the development of intersection turning movement volumes.

Base	Future
5,061	6,344
5,485	10,787
6,149	8,628
24,200	31,277
32,100	44,629
33,400	46,305
25,200	39,432
41,000	53,843

Intersection Turning Movement Development

Model Years	
Base Model Year	2016
Future Model Year	2050

Input the Base Model Year and Future Model Year

Model Years	
Base Model Year	2016
Future Model Year	2050

#	Intersection	Existing Intersection Turning Movements											
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Fourth Ave & Washington St				197	100	84	78	455	95	181	950	177
2	Fifth Ave & Washington St	227	144	106			7		689			1,011	207
3	Eight Ave/SR-163 Off-Ramp & Washington St	5-Legged Intersection											
4	Richmond St/SR-163 On-Ramp & Washington St			14				397	657	187		780	1,818
5	Normal St/Campus Ave/Polk Ave & Washington St	5-Legged Intersection											
6	Park Bl & Normal St/El Cajon Bl	161	72	82	49	113	291	105	201	38	147	997	107
7	Fourth Ave & University Ave				109	223	34		285	32	175	359	
8	Fifth Ave & University Ave	21	224	152				15	368			514	299
9	Sixth Ave & University Ave	74	696	46	152	849	332	354	143	13	106	357	180
10	Tenth Ave & University Ave	89	38	10	6	58	36	39	225	80	355	579	20
11	Normal St & University Ave				29		43	44	191			787	31
12	Park Bl & University Ave	94	166	50	40	249	39	35	122	38	69	649	59
13	Tenth Ave & SR-163 NB On-Ramp	627	133	1	3	58	425				0	2	3
14	Fourth Ave & Robinson Ave				84	323	35		161	24	43	111	
15	Fifth Ave & Robinson Ave	39	329	66				49	187			138	36
16	Sixth Ave & Robinson Ave	1	605	54	4	989	50	103	141	13	70	127	22
17	Eight Ave & Robinson Ave	5-Legged Intersection											
18	Tenth Ave & Robinson Ave	18	14	0	33	1	35	168	172	12	2	239	375

Input Intersection Names and Existing Turning Movement Volumes.

HWYCOVID by Leg			
N	S	E	W
16034	17566	19917	19916
	17569	19919	19918
10135	14786	19924	19923
10191	14208	10190	17621
17567	17570	18083	12120
17568	17573	12161	18084
11635	10137	12170	12161
49875	10142	12215	12190

Input the HWYCOVID's located at each intersection leg.

Note: To facilitate the assignment of HWYCOVIDs, it is recommended to utilize GIS as a visual aid by opening a SANDAG Model and turning on the HWYCOVID label.

The Tool then identifies the MEIDs associated with the input HWYCOVID and pulls the Base and Future Model ADT (final) from the ADT sheet.

The Tool calculates the Future Intersection Traffic Volumes based on the ADT information for each leg. The following methods are used in ranking order:

- ***Default***: Growth between Base and Future Model ADT
- ***Corridor***: Utilizes the average growth observed along the corridor the intersection leg corresponds to.
- ***Minimum***: Where default growth or corridor growth is unavailable, the Tool calculates the growth factor based on the user-selected minimum growth factor.
    - ***1.0% Annual Growth:*** This will calculate the total growth between Base and Future assuming a 1.0% annual growth compounded annually.
    - ***Overall:*** This utilizes the Overall growth observed across the Project Study Area (calculated from the ADT sheet).

Growth Factor By Leg			
N	S	E	W
44%	44%	39%	29%
	39%	39%	39%
44%	87%	31%	31%
44%	45%	44%	53%
44%	52%	28%	21%
39%	54%	17%	28%
23%	21%	41%	17%

Minimum Growth	
Method	***Growth Factor***
1.0% Annual Growth	40.3%

Minimum Growth	
Method	***Growth Factor***
Overall	44.4%

Future Intersection Turning Movements (Unadjusted)

These are the volumes that the Tool calculates. These should be reviewed in detail, including checks for volume balancing and reasonable growth.

Future Intersection Turning Movements (Unadjusted)										
NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
0	0	260	170	130	150	520	160	380	1,080	370
150	200	0	0	10	0	830	0	0	1,250	210
5-Legged Intersection										
0	20	0	0	0	500	740	410	0	950	2,030
5-Legged Intersection										
120	130	110	180	370	170	260	110	320	1,190	260
0	0	160	310	70	0	310	70	250	390	0
330	200	0	0	0	60	390	0	0	550	350
750	140	310	940	400	380	190	40	200	430	280
80	40	20	80	50	80	260	160	490	660	100
0	0	70	0	100	110	210	0	0	820	160
200	80	120	290	80	60	140	50	150	720	230
330	120	110	200	530	0	0	0	0	10	10
0	0	200	370	110	0	200	50	70	150	0
420	130	0	0	0	110	230	0	0	170	60
630	110	110	1,030	140	130	200	40	100	180	50
5-Legged Intersection										
20	0	50	20	60	250	210	70	50	290	440

OPTIONAL ADJUSTMENT FEATURE:

After adjusting the intersection volumes, the user may input the volumes back into the Tool under the "Adjusted" section and check to make sure that Future Volumes are greater than Existing Volumes.

Future Intersection Turning Movements (Adjusted)												Check For Future > Existing											
NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR

Technical Memo 1 – Active Transportation Analysis

TO: Claudia Brizuela, City of San Diego

FROM: Eric Sindel and Sasha Jovanovic, CR Associates

DATE: May 13, 2024

RE: Active Transportation Memorandum

This memorandum accompanies the delivery of the Hillcrest Focused Plan Amendment (FPA) area's planned bicycle and pedestrian network data. The data, maps and summaries provided here include the planned networks for each active transportation mode, the performance measures of each network under buildout conditions (Bicycle Level of Traffic Stress and Pedestrian Environmental Quality Evaluation, for the bicycle and pedestrian networks, respectively), and documents the changes required to the roadway cross-section needed to obtain the space necessary to implement the unbuilt projects of each planned network.

Bicycle Facilities

Figure 1 shows the planned bicycle network by classification within the Hillcrest FPA area. The future network is comprised of Class I Bike Paths, Class II Bike Lanes, Class III Bike Routes, Bus-Bike Lanes, Enhanced Class III Bike Boulevards, and Class IV Cycle Tracks. The mileage for each classification under existing and planned conditions is summarized in **Table 1**. As shown in the map and table, Class IV – Cycle Track comprises over one-third of the mileage in the planned network.

Table 1: Bicycle Mileage by Classification

Classification	Existing Conditions (Miles)	Planned (miles)
Class I - Bike Path	0.1	0.4
Class II - Bike Lane	1.8	2.9
Class II/III – Bike Lane (SB) / Bike Route (NB)	0	0.1
Class III - Bike Route	2.4	0.6
Class IV - Cycle Track	0[1]	3.1
Bus-Bike Lane	0	0.5
Bicycle Boulevard - Enhanced Class III	0	0.7
Total	**4.3**	**8.3**

Footnote:

[1] Existing Conditions was completed July 2020 prior to the completion of several bicycle facilities in Hillcrest, including Fourth Avenue and Fifth Avenue cycle tracks. See Attachment 1 for Existing Conditions Report.

Figure 2 shows the Bicycle Level of Traffic Stress (LTS) of all streets within the FPA area under future conditions. This measure was applied to all roadways in the community traversable by bicycle, regardless of the presence of a bicycle facility. **Table 2** summarizes roadway centerline mileage by

LTS score in the FPA area. As shown in the map and table, most of the study area scored in the category of LTS 2 or better. In contrast, the LTS scores under existing conditions were primarily LTS 3 and 4 along many major corridors within the community. Appendix D in the Existing Conditions Report describes the criteria and scoring for the LTS performance measure.

Table 2: Mileage by LTS Score

LTS Score	Miles
LTS 1-2	12.5
LTS 3	0.8
LTS 4	1.0
Total	**14.3**

All proposed bicycle facilities not fully built to classification were assessed to determine the implementation method necessary considering the recommended facility's width requirements, the roadway's existing curb to curb width, the planned classification of the roadway, and presence of parking to determine what change to the roadway is needed for project implementation. **Table 3** summarizes those expected methods needed to complete the implementation of the bicycle network by mileage. Approximately 2.5 miles of the FPA's bicycle network are already built to classification, leaving just under 6 miles of roadway where implementation methods are needed. As shown, the primary implementation methods are travel lane removals ("road diets") and parking lane removals. About 1.6 miles of bikeway can be implemented without the need for modifications.

Table 3: Implementation Method for Unbuilt Sections of Bicycle Network

Implementation Method	Miles
Travel Lane Removal ("Road Diet")	2.0
No Modifications Needed (e.g., Sharrows and striping without changing lane widths)	1.6
Parking Lane Removal	1.4
Shoulder Conversion	0.5
Lane Width Reduction	0.3
Total	**5.7**

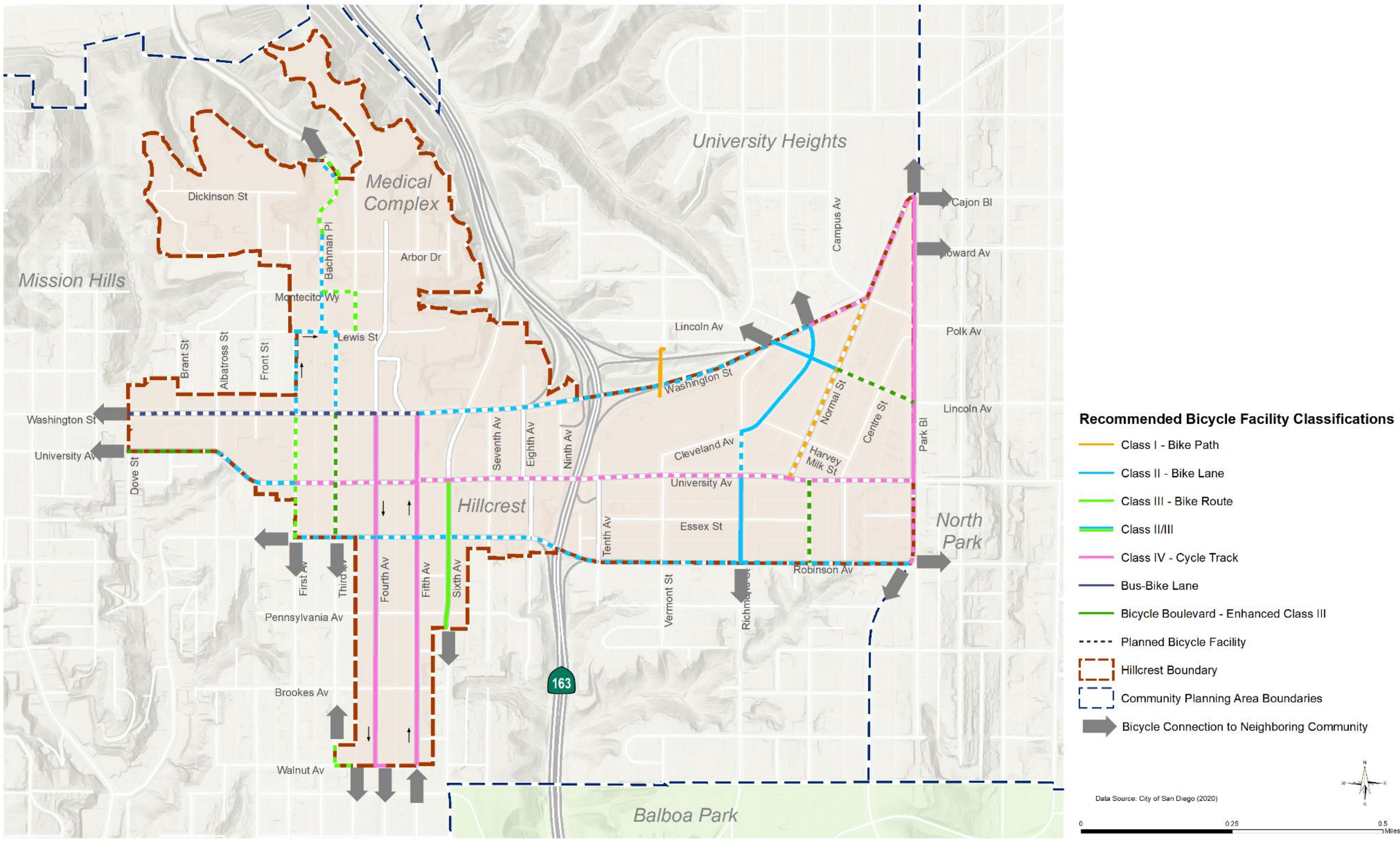
The planned bicycle network shapefile ***(provided with this memo)***, includes the following fields, which are consistent with the City of San Diego's efforts to standardize transportation network GIS data attributes:

- Street
- From
- To
- Functional Class
- Class
- Class Type
- Category (existing v. planned)
- Shape Length (in feet)
- Miles

- Implementation Mechanism
- Edit date/user
- Bidirectional
- Community
- Source

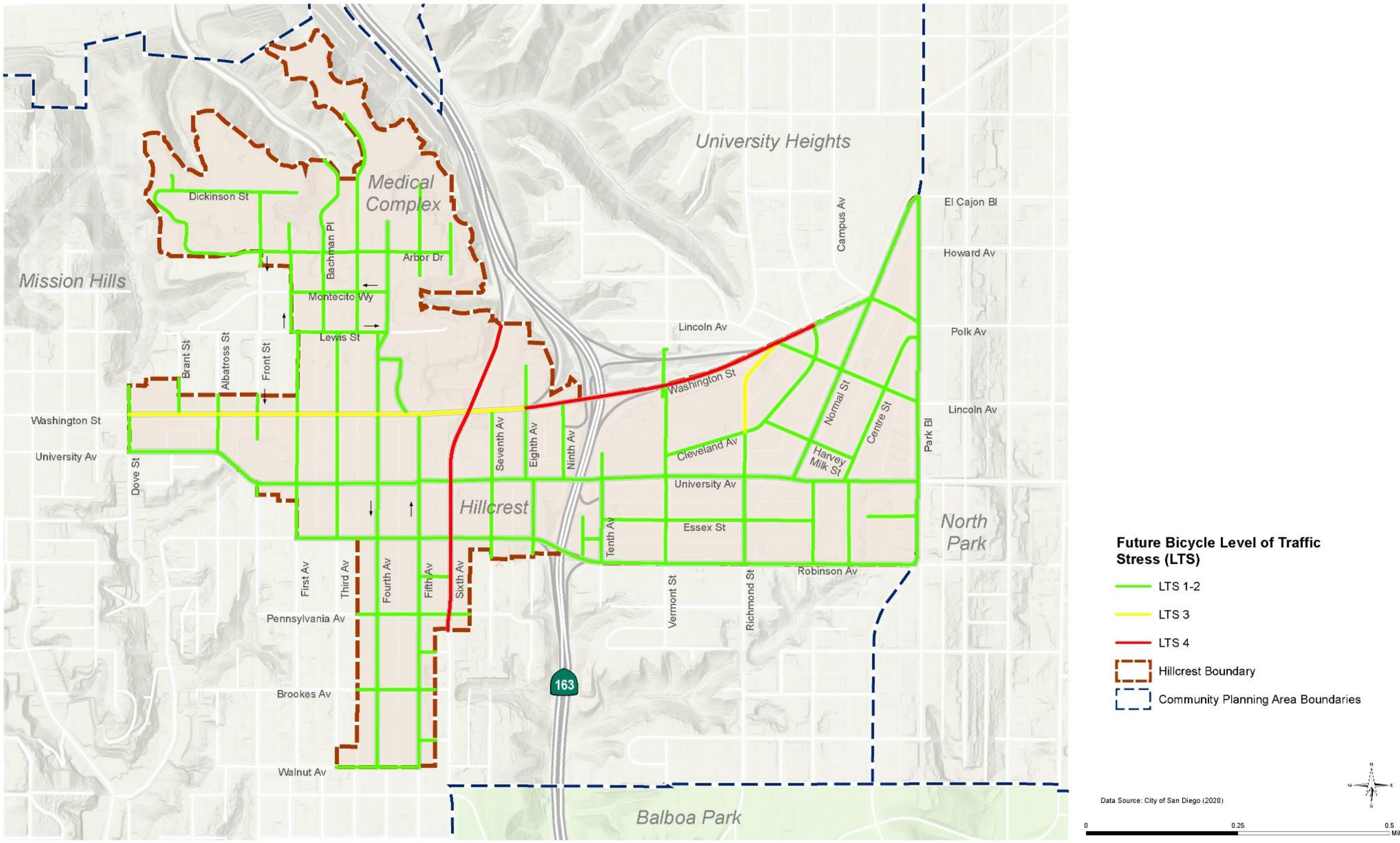
C+R
ASSOCIATES

Figure 1 - Planned Bicycle Facilities



C+R ASSOCIATES

Figure 2 - Future LTS Score



Pedestrian Facilities

Figure 3 shows planned pedestrian route types within the Hillcrest FPA area. The route types are comprised of Districts, Corridors, Connectors, Neighborhood Streets, and Auxiliary Pedestrian Facilities (the typology assigned to the Vermont Street multi-use bridge over Washington Street). **Table 4** summarizes the mileage of pedestrian route type planned within the Hilcrest FPA area. As shown, the Corridor, recommended along 4.4 miles of roadway in the FPA area, is the most common planned pedestrian route type.

Table 4: Mileage by Pedestrian Route Type

Route Type	Miles
District	2.5
Corridor	4.8
Connector	3.4
Neighborhood	3.1
Auxiliary Pedestrian Facility	0.2
Total	**14.0**

Figure 4 shows future Pedestrian Environmental Quality Evaluation (PEQE) scores within the study area along select walkway segments and crossing locations, reflecting the assumed standard of infrastructure and amenity each route type should have.

Table 5 summarizes the PEQE scores by mileage of walkway segments (including both sides of the street) within the study area for future and existing conditions. Under future conditions, Low PEQE scoring walkways are eliminated, while primarily High PEQE scoring walkways increase.

Table 5: PEQE Walkway Segment Summarized by Mileage

PEQE Score	Existing Miles	Future Miles	Change in Miles (+/-)
High	9.9	11.3	+1.4
Medium	3.2	3.2	+0.0
Low	1.0	0.0	-1.0
Total	**14.1**	**14.5**	**+0.4**

Table 6 summarizes the PEQE scoring by intersection crossing location and compares the future and existing conditions. Under future conditions, most approaches improve to High PEQE scores, and no Low PEQE scoring crossings remain.

Table 6: PEQE Scores by Intersection Crossing Location

PEQE Score	Existing Number of Approaches	Future Number of Approaches	Change in Number of Approaches (+/-)
High	0	127	+127
Medium	149	45	-104
Low	23	0	-23
Total	**172**	**172**	**0**

Table 7 summarizes the recommended pedestrian improvements at crossing locations, derived from the changes assumed under future PEQE conditions. Some pedestrian improvements such as high visibility crosswalks were recommended throughout the Hillcrest FPA area, while other types of improvements such as Lead Pedestrian Intervals (LPI) and No Turn on Red at signalized intersection crossings were recommended for District pedestrian route types as well as some Corridor Pedestrian route types. As shown, the most common intersection pedestrian improvements are the addition of pedestrian signage, addition of LPI to the pedestrian crossing phase, and the installation of high-visibility crosswalks.

Table 7: Intersection Pedestrian Improvement

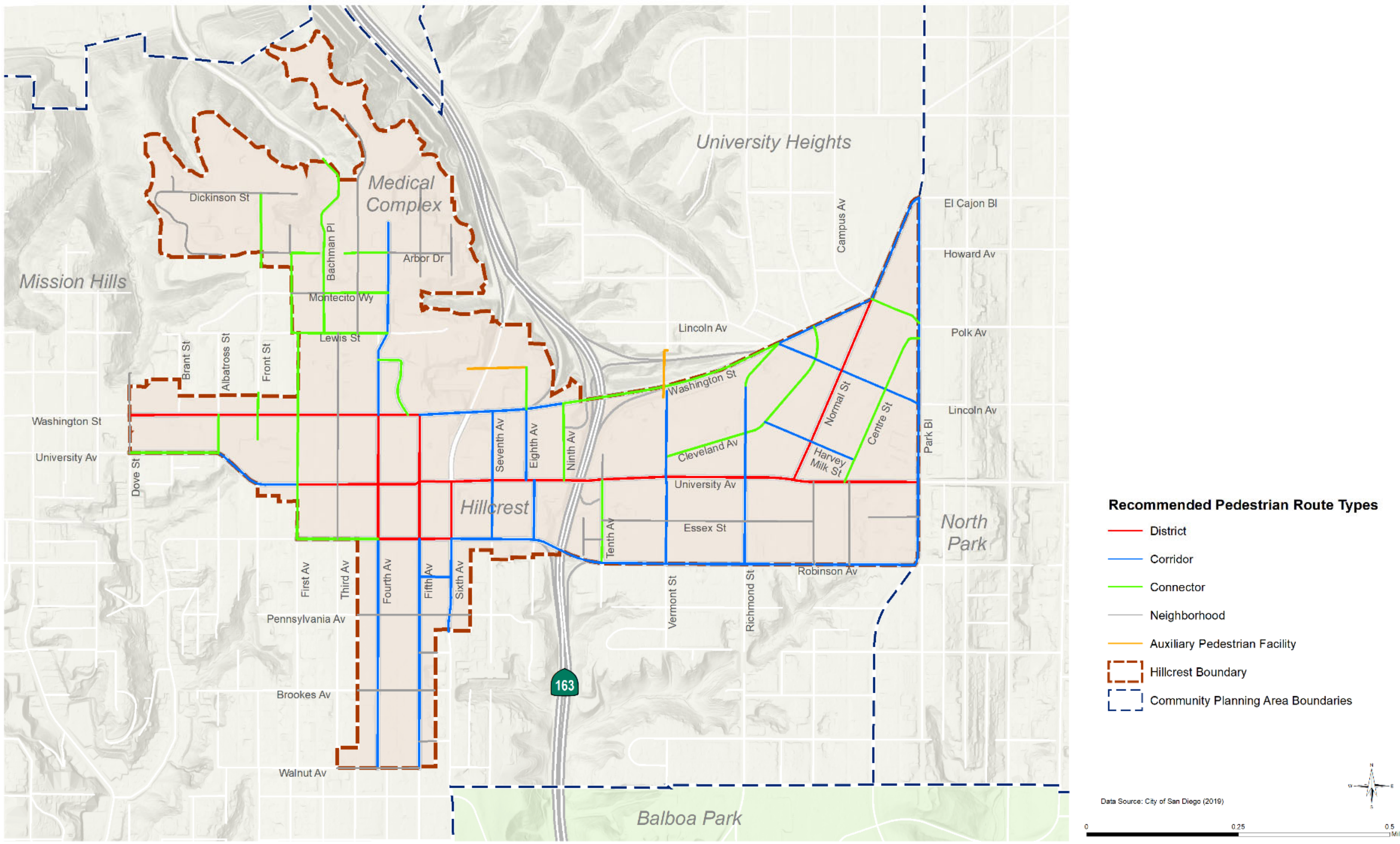
PEQE Score	Crossing Legs
Add Pedestrian Signage (by Crossing Leg)	161
LPI (by Crossing Leg)	100
No Turn on Red (by crossing leg)	4
High-Visibility Crosswalk	36
Bulbouts	39
Upgrade Curb Ramp to ADA	16
New ADA Curb Ramp Installation	3
Total	**355**

Table 8 summarizes pedestrian improvements along the walkway segments derived from changes assumed under future PEQE conditions. As shown, the primary improvements include upgraded lighting, increased buffer treatments, sidewalk widening, and sidewalk infill.

Table 8: Walkway Segment Pedestrian Improvement

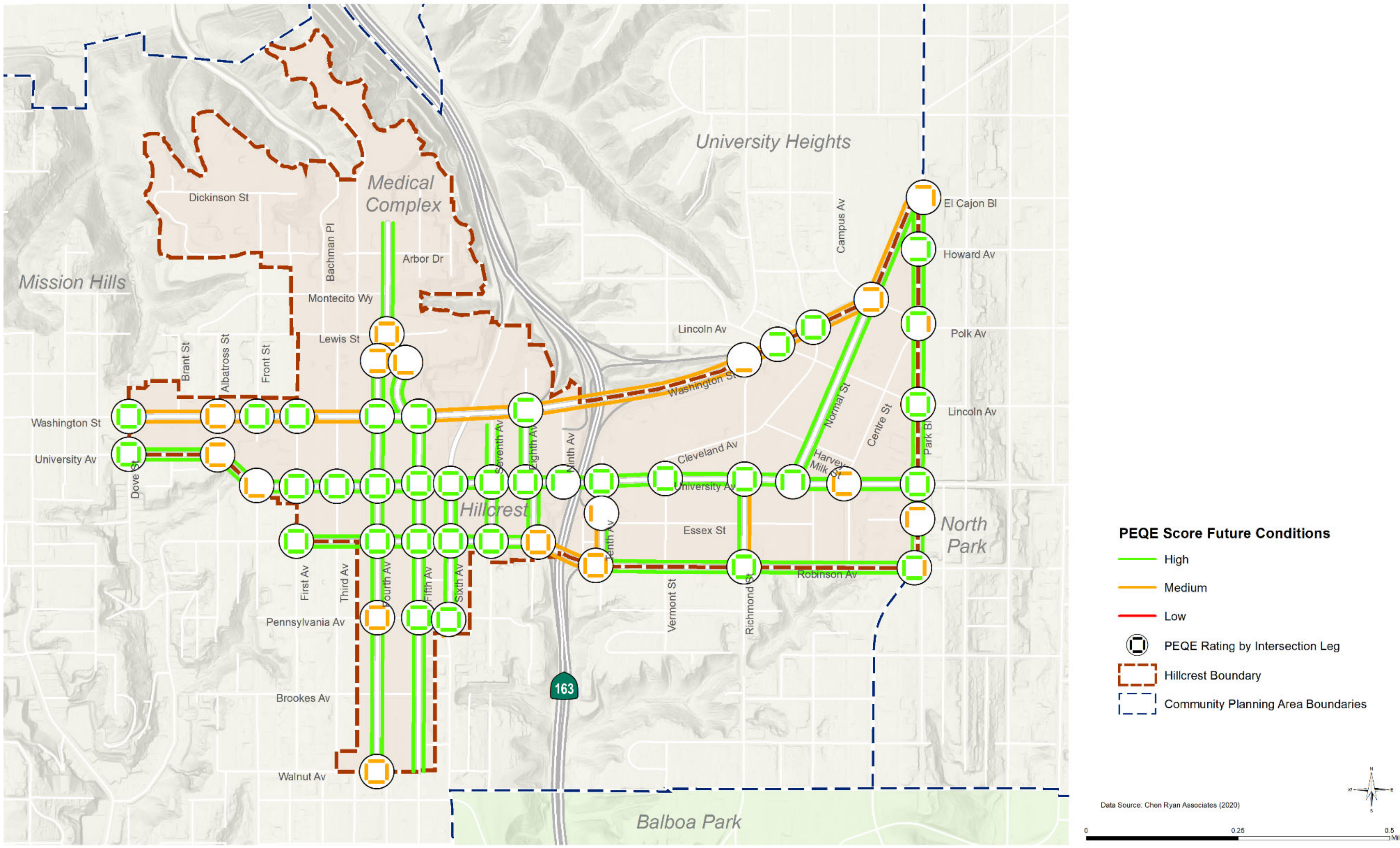
Improvement	Miles
Pedestrian Scale Lighting	2.2
Increased Horizontal Separation between Sidewalk and Street	1.1
Addition of Vertical Buffer between Sidewalk and Street	0.7
Widen Sidewalk	0.7
Sidewalk Infill	0.6
Total	**5.3**

Figure 3 - Pedestrian Route Types



C+R ASSOCIATES

Figure 4 - Future PEQE Score



The planned pedestrian route type shapefile was prepared in association with this memo and includes the following fields, which are consistent with the City of San Diego's efforts to standardize transportation network GIS data attributes:

- Street
- From
- To
- Functional Class
- Class
- Class Type
- Category
- Shape Length (in feet)
- Miles
- Implementation Mechanism
- Edit date/user
- Bidirectional
- Community
- Source

In addition to the planned pedestrian route type shapefile, the following shapefiles were also prepared:

Pedestrian Intersection Improvements: Intersection shapefile representing the following fields:

- ID & Code
- Intersection Name / Cross Street
- Intersection Leg
- Improvement Type: Advanced Stop Bar, Bulbout, High-Visibility Crosswalk, LPI, New ADA Ramp, Pedestrian Signage, and Ramp Upgrade to ADA

  Note: Each improvement type is its own separate feature

Pedestrian Improvements Segments: Segment shapefile were also prepared and include the following fields, which are consistent with the City of San Diego's efforts to standardize transportation network GIS data attributes:

- Street
- From
- To
- Functional Class
- Class
- Class Type
- Category
- Shape Length (in feet)
- Miles

- Implementation Mechanism
- Edit date/user
- Bidirectional
- Community
- Source

Technical Memo 2 - Transit and Traffic Operations Analysis

TO: Claudia Brizuela; City of San Diego

FROM: Jonathan Sanchez, PE, TE, PTOE, CR Associates
Phuong Nguyen, TE, CR Associates

DATE: May 14, 2024

RE: Hillcrest Focused Plan Amendment – Future Conditions Traffic Operation Analysis (TOA)

This technical memorandum documents the traffic operations analysis conducted for the Hillcrest Focused Plan Amendment (Hillcrest FPA). The analysis results presented herein reflect the Hillcrest FPA Mobility Element network and the City of San Diego Blueprint plan (Blueprint SD).

Introduction

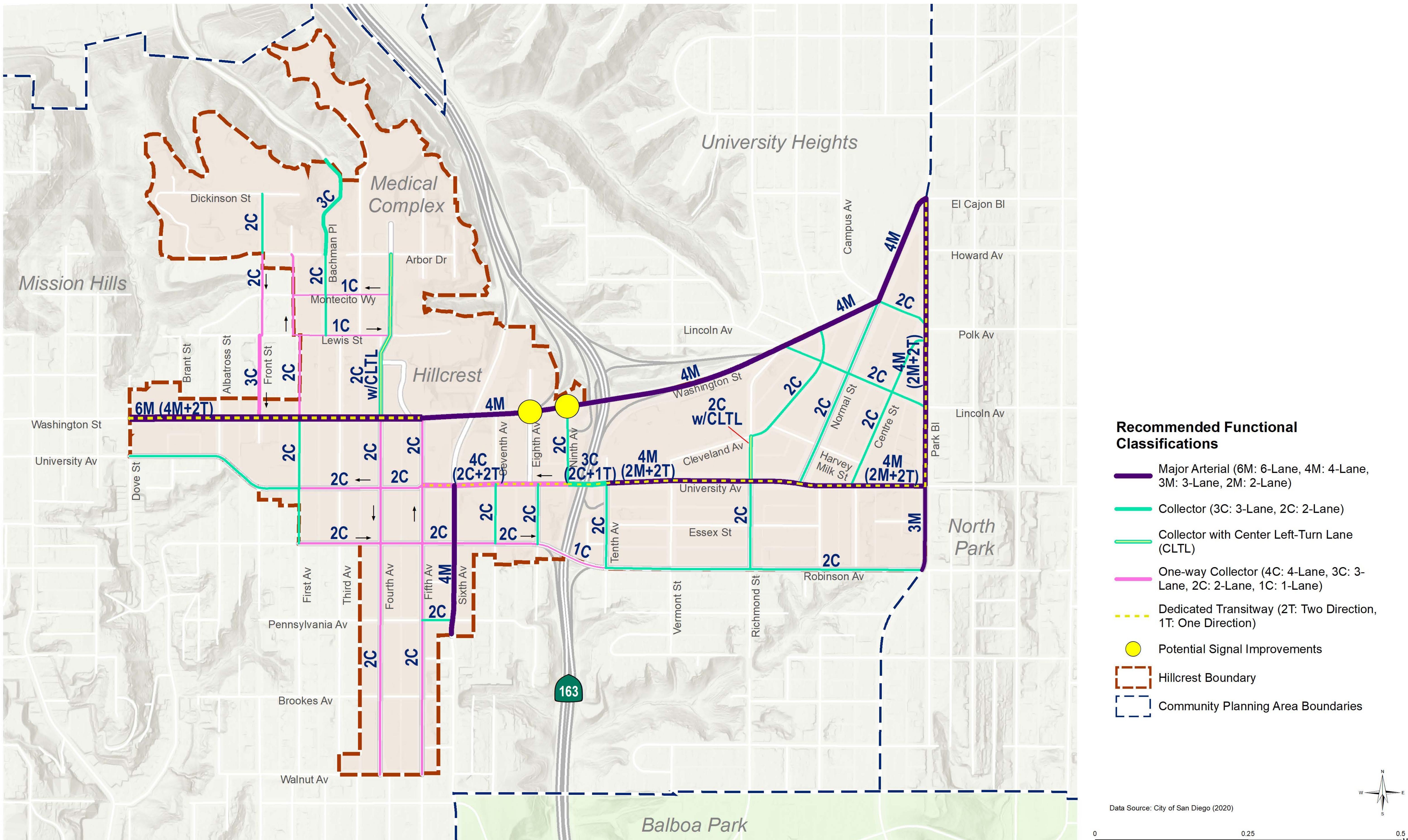
The traffic operations analysis for the Hillcrest FPA incorporates the proposed changes within the mobility element network, which includes updates to the active transportation network, transit network, and roadway network. Detailed accounts of the active transportation and transit network modifications are presented in a separate technical memorandum, while the envisioned changes to the roadway network are depicted in **Figure 1**. Intersection geometrics were also modified to reflect the Hillcrest FPA Mobility Element network and are shown in **Figure 2**.

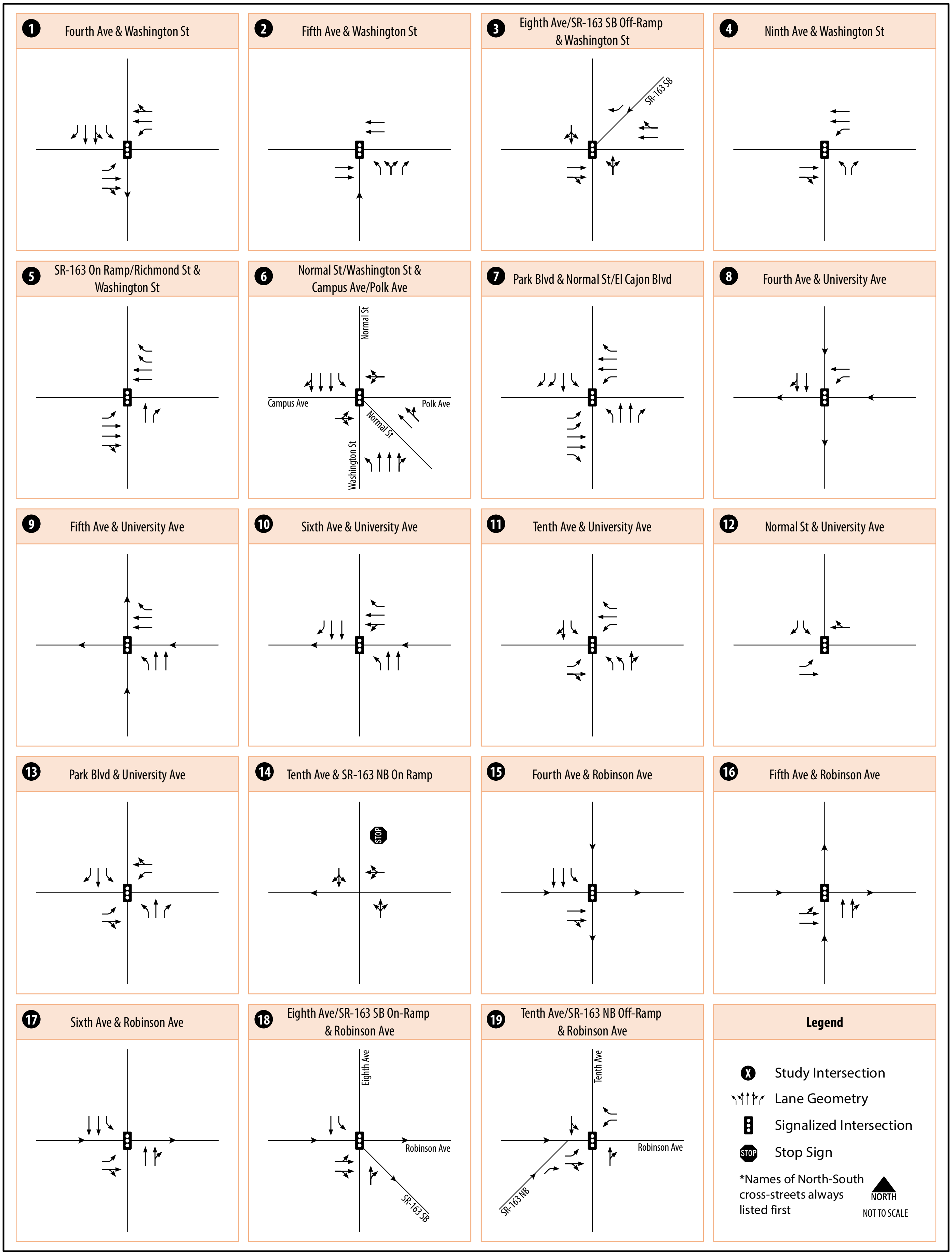
Moreover, the analysis takes into account the proposed land uses identified in the Blueprint SD model. Blueprint San Diego represents a forward-thinking strategy for citywide planning, aiming to proactively define and achieve the City's objectives related to housing, climate, and mobility at the community plan level. This method acknowledges the distinct traits of each community, offering a citywide blueprint to steer future land use alterations in alignment with the City's broader goals regarding climate, infrastructure, environmental considerations, and the housing quotas set by the state-mandated Regional Housing Needs Assessment Plan. It aims to create an equitable groundwork for future city development that promotes the City's environmental justice aims. Further details on Blueprint SD are available on the City's website, with technical modeling details provided in **Attachment A**.

Traffic volumes for the Hillcrest FPA were derived from the Blueprint SD model outputs, then adjusted to mirror the proposed Mobility Element in a two-phase approach. The project team initially analyzed the model outputs from Blueprint SD to estimate the traffic volumes upon completion of the Hillcrest FPA, employing the City of San Diego Mobility Adjustment Tool. This tool offers a structured approach to estimate future average daily traffic volumes to develop intersection turning movements following the methodology outlined in the National Cooperative Highway Research Program Report (NCHRP) 255.

Subsequently, the calculated intersection turning movement volumes underwent further refinement to account for localized factors:

- Major Projects: Adjustments were made to traffic volumes to reflect the impact of significant approved or planned projects, such as the UCSD 2019 Hillcrest Campus Long Range Development Plan and the Scripps Mercy Hospital Campus Project, which are expected to significantly increase traffic in the study area.


University Heights
Medical Complex
Mission Hills
Hillcrest
North Park
Balboa Park
Dickinson St
Arbor Dr
Montecito Wy
Lewis St
Bachman Pl
Brant St
Albatross St
Front St
Washington St
University Av
Dove St
Pennsylvania Av
Brookes Av
Walnut Av
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Seventh Av
Eighth Av
Ninth Av
Tenth Av
Cleveland Av
Essex St
Robinson Av
Vermont St
Richmond St
Lincoln Av
Campus Av
Normal St
Centre St
Harvey Milk St
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
6M (4M+2T)
4M
4C (2C+2T)
3C (2C+1T)
4M (2M+2T)
2C w/CLTL
3M
3C
2C
1C
Recommended Functional Classifications
Major Arterial (6M: 6-Lane, 4M: 4-Lane, 3M: 3-Lane, 2M: 2-Lane)
Collector (3C: 3-Lane, 2C: 2-Lane)
Collector with Center Left-Turn Lane (CLTL)
One-way Collector (4C: 4-Lane, 3C: 3-Lane, 2C: 2-Lane, 1C: 1-Lane)
Dedicated Transitway (2T: Two Direction, 1T: One Direction)
Potential Signal Improvements
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: City of San Diego (2020)
0
0.25
0.5
Miles



Hillcrest Focused Plan Amendment
Future Conditions Traffic Operation Analysis

Figure 2
Intersection Geometrics
Hillcrest FPA

- Roadway Configuration: Adjustments to traffic volumes also considered changes in the roadway network's layout and capacity, particularly the transformation of University Avenue and Robinson Avenue between First Avenue and Tenth Avenue from two-way streets into a one-way couplet in order to provide dedicated transit lanes and improve transit operations.

The Hillcrest FPA Average Daily Traffic volumes are shown in **Figure 3**, and the final intersection turning movements are show in **Figure 4**.

Vehicular Performance

This section outlines the Mobility Element's roadway and intersection designs, along with the Level of Service (LOS) conditions. The capacity of each roadway segment was determined using the roadway geometrics illustrated in Figure 1 and the roadway capacity figures from the City of San Diego Transportation Study Manual (COSDTSM). Analysis of intersection operations was performed utilizing the traffic analysis software Synchro, adhering to the operational analysis methods for both signalized and unsignalized intersections as specified in the 2016 Highway Capacity Manual (HCM 6). A summary of the analysis methodologies and underlying assumptions can be found in **Attachment B**.

Roadway Operation Analysis

Table 1 displays the Hillcrest FPA roadway classification designations, capacity thresholds, estimated daily traffic volumes, volume to capacity ratios, and resulting levels of service. It is important to note that bicycle facilities need further evaluation to determine the best configuration. Where curb to curb widths along major arterials are too constrained to provide a dedicated bicycle facility, bicycling could be accommodated within transit lanes. The design of the parkway should follow the appropriate mobility element roadway classification from the City of San Diego Street Design Manual based on the number of non-transit lanes. For instance, a 6-lane Major Arterial with two lanes dedicated to transit would function as a 4-lane Major Arterial, and thus, the parkway design requirements would correspond to those of a 4-lane Major Arterial.

Table 1 - Hillcrest FPA – Roadway Segment LOS Results

Roadway	Segment	Hillcrest FPA				
		Cross-Section	Capacity (LOS E)[1]	ADT	V/C	LOS
Montecito Way	Front Street to Fourth Avenue	1-Lane Collector (one-way)	7,500	7,400	0.987	E
Polk Avenue	Normal Street to Park Boulevard	2-Lane Collector w/o TWLTL	8,000	8,000	1.000	E
Lewis Street	Front Street to Fourth Avenue	1-Lane Collector (one-way)	7,500	8,900	1.187	F
Washington St	Dove Street to Fourth Avenue	6-Lane Major Arterial w/ Dedicated Transit Lanes[2]	40,000	33,500	0.838	D
Washington St	Fourth Avenue to Fifth Avenue	6-Lane Major Arterial w/ Dedicated Transit Lanes[2]	40,000	47,600	1.190	F
Washington St	Fifth Avenue to Eighth Avenue	4-Lane Major Arterial	40,000	49,300	1.233	F
Washington St	Eighth Avenue to Ninth Avenue	4-Lane Major Arterial	40,000	42,400	1.060	F
Washington St	Ninth Avenue to Lincoln Avenue	4-Lane Major Arterial	40,000	56,200	1.405	F
Washington St	Lincoln Avenue to Normal Street	4-Lane Major Arterial	40,000	39,800	0.995	E
Lincoln Ave	Washington Street to Normal Street	2-Lane Collector w/o TWLTL	8,000	16,800	2.100	F

Table 1 - Hillcrest FPA – Roadway Segment LOS Results

Roadway	Segment	Hillcrest FPA				
		Cross-Section	Capacity (LOS E)[1]	ADT	V/C	LOS
Lincoln Ave	Normal Street to Park Boulevard	2-Lane Collector w/o TWLTL	8,000	13,800	1.725	F
University Avenue	Dove Street to First Avenue	2-Lane Collector w/o TWLTL	8,000	20,100	2.513	F
University Avenue	First Avenue to Fourth Avenue	2-Lane Collector (one-way)	17,500	12,400	0.709	C
University Avenue	Fourth Avenue to Fifth Avenue	2-Lane Collector (one-way)	17,500	15,000	0.857	D
University Avenue	Fifth Avenue to Sixth Avenue	4-Lane Collector (one-way) w/ Dedicated Transit Lanes[3]	17,500	17,700	1.011	F
University Avenue	Sixth Avenue to Ninth Avenue	4-Lane Collector (one-way) w/ Dedicated Transit Lanes[3]	17,500	23,600	1.349	F
University Avenue	Ninth Avenue to Tenth Avenue	3-Lane Collector w/ Dedicated Transit Lane[4]	20,000	23,600	1.180	F
University Avenue	Tenth Avenue to Richmond Street	4-Lane Major Arterial w/ Dedicated Transit Lanes[5]	20,000	34,700	1.735	F
University Avenue	Richmond Street to Normal Street	4-Lane Major Arterial w/ Dedicated Transit Lanes[5]	20,000	27,000	1.350	F
University Avenue	Normal Street to Park Boulevard	4-Lane Major Arterial w/ Dedicated Transit Lanes[5]	20,000	18,800	0.940	E
Robinson Avenue	First Avenue to Fourth Avenue	2-Lane Collector (one-way)	17,500	11,600	0.663	C
Robinson Avenue	Fourth Avenue to Fifth Avenue	2-Lane Collector (one-way)	17,500	14,000	0.800	D
Robinson Avenue	Fifth Avenue to Sixth Avenue	2-Lane Collector (one-way)	17,500	16,600	0.949	E
Robinson Avenue	Sixth Avenue to Eighth Avenue	2-Lane Collector (one-way)	17,500	22,000	1.257	F
Robinson Avenue	Eighth Avenue to Tenth Avenue	1-Lane Collector (one-way)	7,500	20,870	2.783	F
Robinson Avenue	Tenth Avenue to Vermont Street	2-Lane Collector w/o TWLTL	8,000	17,000	2.125	F
Robinson Avenue	Vermont Street to Richmond Street	2-Lane Collector w/o TWLTL	8,000	15,500	1.938	F
Robinson Avenue	Richmond Street to Park Boulevard	2-Lane Collector w/o TWLTL	8,000	14,000	1.750	F
Front Street	Dickinson Street to Arbor Drive	2-Lane Collector w/o TWLTL	8,000	14,500	1.813	F
Front Street	Arbor Drive to Lewis Street	2-Lane Collector (one-way)	17,500	9,400	0.537	B
Front Street	Lewis Street to Washington Street	3-Lane Collector (one-way)	26,000	14,500	0.558	C
First Avenue	North of Arbor Drive to Arbor Drive	2-Lane Collector w/o TWLTL	8,000	19,700	2.463	F
First Avenue	Arbor Drive to Washington Street	2-Lane Collector (one-way)	17,500	18,400	1.051	F
First Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	13,500	1.688	F
First Avenue	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	15,500	1.938	F
Fourth Avenue	Arbor Drive to Washington Street	2-Lane Collector (one-way)	17,500	27,200	1.554	F
Fourth Avenue	Washington Street to University Avenue	2-Lane Collector (one-way)	17,500	7,300	0.417	A
Fourth Avenue	University Avenue to Robinson Avenue	2-Lane Collector (one-way)	17,500	9,200	0.526	B

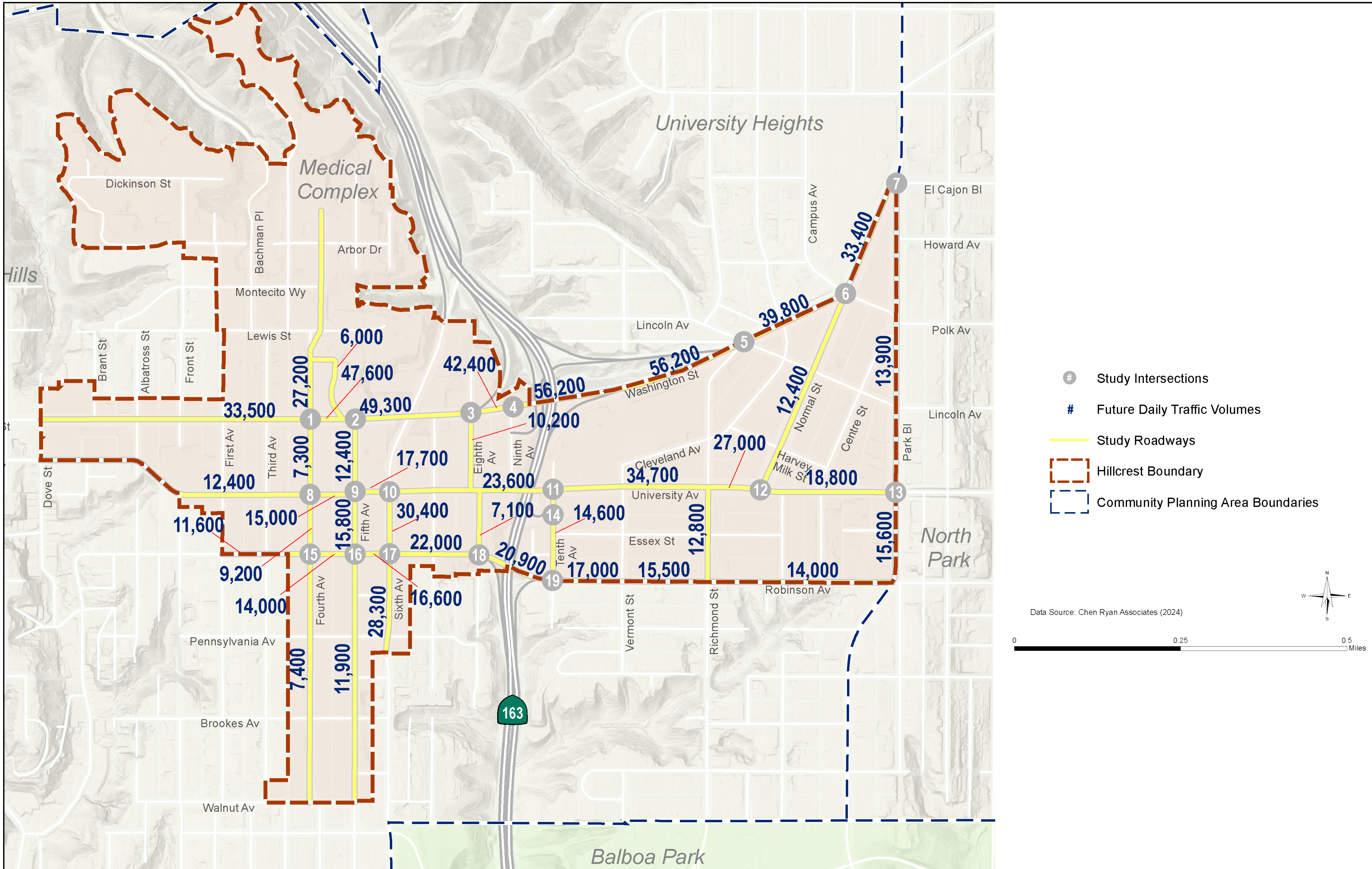
Table 1 - Hillcrest FPA – Roadway Segment LOS Results

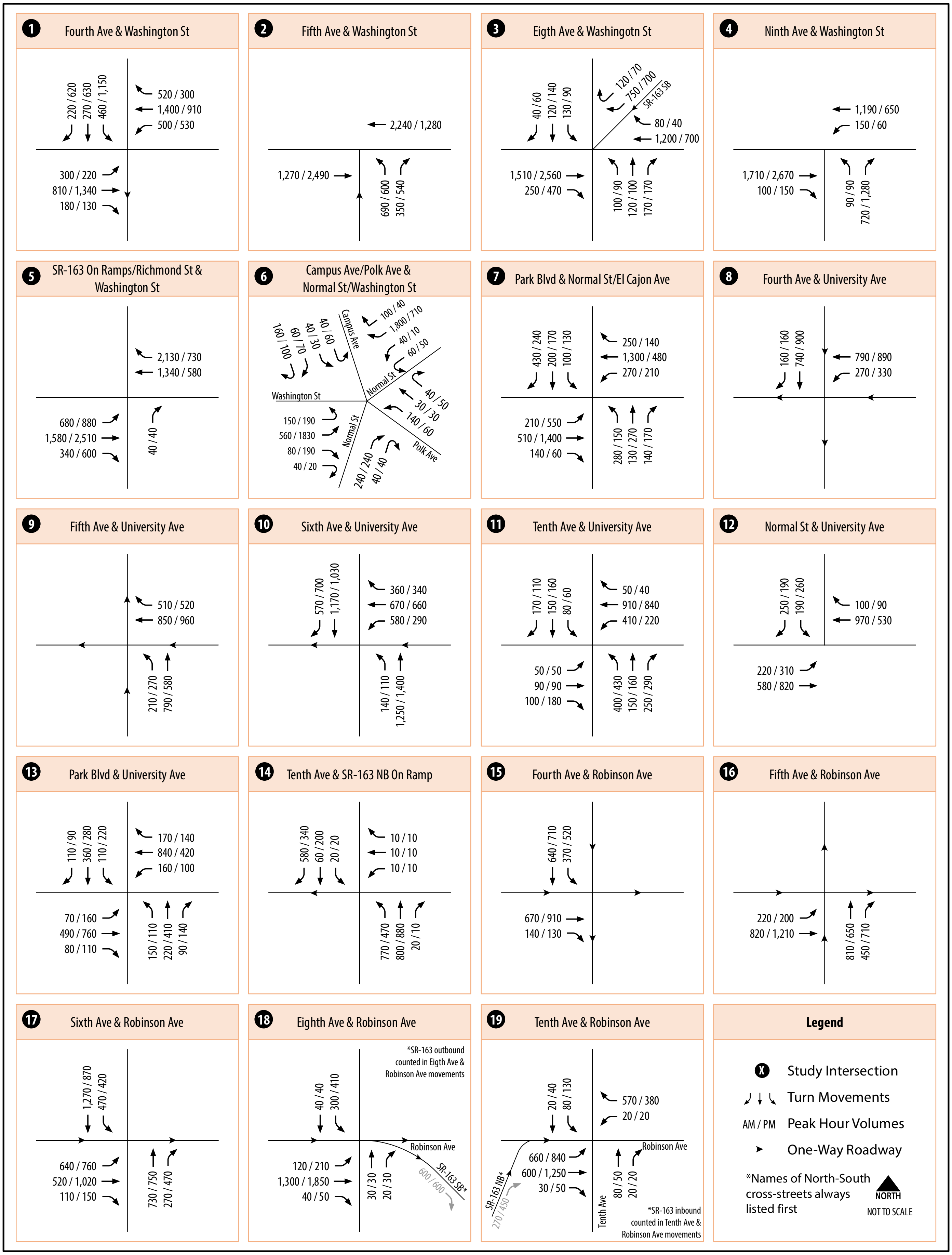
Roadway	Segment	Hillcrest FPA				
		Cross-Section	Capacity (LOS E)[1]	ADT	V/C	LOS
Fourth Avenue	Robinson Avenue to Walnut Avenue	2-Lane Collector (one-way)	17,500	7,400	0.423	A
Fifth Avenue	Washington Street to University Avenue	2-Lane Collector (one-way)	17,500	12,400	0.709	C
Fifth Avenue	University Avenue to Robinson Avenue	2-Lane Collector (one-way)	17,500	15,800	0.903	**E**
Fifth Avenue	Robinson Avenue to Walnut Avenue	2-Lane Collector (one-way)	17,500	11,900	0.680	C
Sixth Avenue	University Avenue to Robinson Avenue	4-Lane Major Arterial	40,000	30,400	0.760	D
Sixth Avenue	Robinson Avenue to Pennsylvania Avenue	4-Lane Major Arterial	40,000	28,300	0.708	C
Eighth Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	10,200	1.275	**F**
Eighth Avenue	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	7,100	0.888	**E**
Ninth Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	19,800	2.475	**F**
Tenth Avenue	University Avenue to SR-163 NB On-Ramp	2-Lane Collector w/o TWLTL	8,000	18,600	2.325	**F**
Tenth Avenue	SR-163 NB On-Ramp to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	14,600	1.825	**F**
Richmond Street	Cleveland Avenue to University Avenue	2-Lane Collector w/ TWLTL	15,000	6,800	0.453	B
Richmond Street	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	12,800	1.600	**F**
Normal Street	El Cajon Boulevard to Washington Street	4-Lane Major Arterial	40,000	33,400	0.835	D
Normal Street	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	12,400	1.550	**F**
Park Boulevard	El Cajon Boulevard to University Avenue	4-Lane Major Arterial w/ Dedicated Transit Lanes[5]	20,000	13,900	0.695	C
Park Boulevard	University Avenue to Robinson Avenue	3-Lane Major Arterial	30,000	15,600	0.520	B

Source: CR Associates (2024)

Notes:
Bold indicates substandard LOS E or F.
[1] Roadway capacity based on number of vehicular travel lanes.
[2] Four vehicular travel lanes and two transit lanes within existing curb-to-curb width.
[3] Two vehicular travel lanes and two transit lanes within existing curb-to-curb width.
[4] Two vehicular travel lanes and one eastbound-only transit lane within existing curb-to-curb width.
[5] Two vehicular travel lanes and two transit lanes within existing curb-to-curb width.

As shown in Table 1, the implementation of the Hillcrest FPA Mobility Element would result in seven roadway segments operating at substandard LOS E and 31 roadway segments operating at substandard LOS F. In comparison, the "without" Mobility Element conditions would results in four roadway segments operating at substandard LOS E and 35 roadway segments operating at substandard LOS F. Under the Existing conditions, there are two roadway segments operating at substandard LOS E and 16 roadway segments operating at substandard LOS F. The roadway segments LOS results for the "without" Mobility Element and Existing conditions is included in **Attachment C.**


University Heights
Medical Complex
Hills
North Park
Balboa Park
Dickinson St
Arbor Dr
Bachman Pl
Montecito Wy
Lewis St
Brant St
Albatross St
Front St
First Av
Third Av
Fourth Av
Fifth Av
Sixth Av
Eighth Av
Ninth Av
Tenth Av
Dove St
Pennsylvania Av
Brookes Av
Walnut Av
Washington St
Lincoln Av
Cleveland Av
University Av
Essex St
Harvey Milk St
Normal St
Centre St
Campus Av
Vermont St
Richmond St
Robinson Av
Park Bl
El Cajon Bl
Howard Av
Polk Av
163
33,500
27,200
6,000
47,600
49,300
42,400
56,200
10,200
7,300
12,400
17,700
23,600
34,700
27,000
12,400
18,800
39,800
33,400
13,900
15,000
11,600
15,800
30,400
7,100
14,600
12,800
22,000
20,900
17,000
15,500
14,000
15,600
9,200
14,000
16,600
28,300
7,400
11,900
Study Intersections
Future Daily Traffic Volumes
Study Roadways
Hillcrest Boundary
Community Planning Area Boundaries
Data Source: Chen Ryan Associates (2024)
0
0.25
0.5
Miles



Hillcrest Focused Plan Amendment
Future Conditions Traffic Operation Analysis

C+R

Figure 4
Future Intersection Turning Movements
Hillcrest FPA

Intersection Operation Analysis

Table 2 presents the traffic control types, peak hour intersection delays, and peak hour LOS results for the study are. Intersection LOS calculation worksheets are provided in **Attachment D.**

Table 2 - Peak Hour Intersection LOS Results

#	Intersection	Peak Hour	Future (Preferred)		
			Control	Delay	LOS
1	4th Ave & Washington St	AM PM	Signal	140.4 111.1	**F** **F**
2	5th Ave & Washington St	AM PM	Signal	68.3 117.2	**E** **F**
3	8th Ave & Washington St	AM PM	Signal	205.8 220.4	**F** **F**
4	9th Ave & Washington St	AM PM	Signal	8.4 41.7	A D
5	SR 163 On Ramps/Richmond St & Washington St	AM PM	Signal	87.8 18.2	**F** B
6	Normal St/Washington St & Campus Ave/Polk Ave	AM PM	Signal	47.4 54.4	D D
7	Park Blvd & Normal St/El Cajon Ave	AM PM	Signal	162.8 79.2	**F** **E**
8	4th Ave & University Ave	AM PM	Signal	40.8 54.2	D D
9	5th Ave & University Ave	AM PM	Signal	53.9 47.9	D D
10	6th Ave & University Ave	AM PM	Signal	51.5 45.6	D D
11	10th Ave & University Ave	AM PM	Signal	94.2 78.8	**F** **E**
12	Normal St & University Ave	AM PM	Signal	89.0 15.0	**F** B
13	Park Blvd & University Ave	AM PM	Signal	205.1 240.9	**F** **F**
14	10th Ave & SR 163 NB On Ramp	AM PM	No Control	N/A N/A	
15	4th Ave & Robinson Ave	AM PM	Signal	18.1 22.0	B C
16	5th Ave & Robinson Ave	AM PM	Signal	41.2 146.7	D **F**
17	6th Ave & Robinson Ave	AM PM	Signal	72.3 202.0	**E** **F**
18	8th Ave & Robinson Ave	AM PM	Signal	19.4 45.7	B D
19	10th Ave & Robinson Ave	AM PM	Signal	46.1 64.0	D **E**

Source: CR Associates (2024)

Note:
Bold indicates substandard LOS E or F.

As detailed in Table 2, the implementation of the Hillcrest FPA would lead to two intersections operating at substandard LOS E and seven intersections at substandard LOS F during the AM peak hour. The PM peak hours would see three intersections at substandard LOS E and six intersections at substandard LOS F. In contrast, the Existing Conditions show two intersections operating at substandard LOS E and one intersection at substandard LOS F during the AM peak hour. For the PM peak hours under Existing Conditions, there is one intersection at substandard LOS E and three intersections at substandard LOS F. The peak hour intersection LOS results for Existing Conditions are provided in **Attachment E.**

Transit Operation Analysis
University Avenue, a vital link for several current and future transit lines serving the Hillcrest community and surrounding areas, was transformed into a one-way couplet along with Robinson Avenue, between First Avenue and Tenth Avenue. This transformation was aimed at optimizing the roadway network by minimizing conflicts at major intersections, establishing an exclusive transit lane from Fourth Avenue to Tenth Avenue, and adding protected bicycle lanes.

Furthermore, an arterial analysis assessing the average travel speed for buses on University Avenue was performed, with the findings presented in **Table 3**.

Table 3 - Transit Average Speed along University Avenue

Approach	Existing		Future[1]		Hillcrest FPA	
	AM	PM	AM	PM	AM	PM
EB	12.4	11.2	11.1	8.1	19.7	19.1
WB	14.5	13.9	12.9	13.0	19.6	19.2

Source: CR Associates (2024)

Note:
[1] This represents future conditions (traffic volumes) but keeping same existing conditions geometry.

As shown in Table 3, with the implementation of the Hillcrest FPA Mobility Element, the average travel speed for buses along University Avenue would improve significantly when compared to both the Existing and "without" Mobility Element conditions. Arterial analysis worksheets are provided in **Attachment F.**

The proposed transit network is considered a preliminary blueprint, as transit planning and operations require regional assessment, typically overseen by the San Diego Association of Governments (SANDAG) and the San Diego Metropolitan Transit System (SDMTS). Further engineering studies are necessary to confirm the efficiency of the proposed transit system. Nevertheless, the following enhancements are advised for the Hillcrest Focused Planning Area (FPA):

1. Establish lanes designated for buses and bikes on Washington Street, stretching from Dove Street to Fifth Avenue. This should include a transit signal and queue jumper at the Fourth Avenue and Washington Street intersection. Here, eastbound buses would stay in the bus/bike exclusive lane, using the queue jumper to head south on Fourth Avenue. They would then proceed in a bus-only left turn lane at Fourth Avenue & University Avenue to make a left onto University Avenue. Buses heading west on Washington Street would use the exclusive lane at Fourth Avenue & Washington Street and the queue jumper to continue west on Washington Street.
2. Install signals exclusively for transit, along with queue jumpers and blank-out "No Turn On Red" signs along corridors with dedicated transit lanes, to reduce conflicts between passenger vehicles and bus/bike traffic.
3. Convert the existing southbound left-turn lane at Fourth Avenue & University Avenue into a bus-only lane as part of the one-way couplet strategy.

Attachment A - Blueprint Technical Memorandums

MEMO

TO: City of San Diego

FROM: Rick Curry, Sara Khoeini

SUBJECT: Blueprint Methodology Documentation

DATE: October 5, 2022

PROJECT SUMMARY

The City of San Diego's Climate Action Plan is oriented towards dramatically reducing Greenhouse Gas emissions from all energy sectors within the City of San Diego. On-road transportation related emissions account for approximately 40 percent of GHG emissions in the city of San Diego. The City of San Diego, through a variety of planning and policy documents, has focused transportation related reductions on reducing auto trip distances and mode shift to non-auto travel modes.

The goal of this project is to develop a data-driven planning process for the City of San Diego to maximize weekday daily alternative transport mode use such as walking, biking, micro-mobility, and transit. The final output map of this process highlights areas in the City of San Diego that are receptive to future housing and retail development through the forecasting year of 2050 that would help achieve the mode share goals.

The main benefit of this planning process compared to traditional scenario planning (based on the SANDAG travel demand model) is the time saving of running the entire ABM2+ model in addition to the revisions required from SANDAG Service Bureau. Furthermore, scenario planning itself is an iterative process that involves thoughtful consideration to suggest reasonable scenarios for testing with the model and it is not guaranteed that the suggested scenarios will include the best possible scenario. The SANDAG ABM2+ is very good at answering questions of "what will it be" and "what if" questions such as "what will the mode share be in 2050 based on the existing general plan land use?" or "what will the transit mode share be if we added a new transit line?". The advantage of the Metamodel optimization process is that it helps to answer questions on "how do we" such as "how do we minimize auto mode share?".

The Metamodel estimated in this process uses the zonal data from ABM2+ to relate land use densities and transit attributes to alternative transportation mode use. The latter step of the process uses the estimated model to optimize alternative transport mode use as a function of zonal attributes. The Metamodel provides a much faster trial/testing process for scenarios from which insights may be gleaned to refine assumptions and develop a preferred scenario with the most desired outcomes. This memo explains the data-driven planning process for the City of San Diego and includes three main steps of model estimation (Section 1), application (Section 2), and visualization (Section 3). The Section 4 explains the technical requirement to run the entire process and Section 5 provides a glossary of technical terms.

SECTION 1: MODEL ESTIMATION

The input data for this project comes from various sources from the SANDAG 2021 Regional Plan including the SANDAG regional travel demand model inputs and outputs, Transit Priority Area (TPA) planned stops, and residential, retail, and mixed-use densities. The unit of analysis in this project is the SANDAG defined Master Geographic Reference Area (MGRA) which is the smallest zoning system of SANDAG's travel demand model (ABM2+). The model has been estimated for the ABM2+ base year of 2016. The dependent variable of the model, which comes from the SANDAG ABM2+, is the share of trips at each MGRA that use alternative transport modes (non-auto modes including walk, bike, micro-mobility, and transit) called "non-auto propensity".

The variables that are significant in explaining non-auto propensity at each MGRA are dwelling unit density, retail employment density, mixed-use density, the competitiveness of transit services for work commute travel, proximity to TPA high-quality transit stops, and household vehicle ownership. The estimated coefficients for all the variables reflect an increasing relationship with the response variable except for vehicle ownership. In other words, increasing dwelling, retail, and mixed-use densities will increase non-auto propensity, while having a higher rate of average vehicle ownership decreases the non-auto propensity. The model goodness of fit was high at 0.72 and the least square linear regression has been used for model estimation.

SECTION 2: MODEL APPLICATION

The estimated model has been used in the model application step to maximize non-auto propensity and predict the most receptive locations to add residential units and retail development in future years. In the residential and retail optimization step, a ranking score was given to each MGRA based on optimizing non-auto propensity in the estimated model. This ranking score was then aggregated with transit and mixed-use score to calculate the final prioritization score of each MGRA for future residential and retail developments. The transit score was based on transit accessibility to job locations out of SANDAG ABM2+ as well as closeness to TPA high-quality transit stops (with higher weights for rail and BRT stops) using the SANDAG 2021 Regional Plan 2050 Vision transit network and stops. The mixed-use score is calculated based on the following formula[1]:

$$Mix\ Score\ = \frac{Intersections\ *\ (DU\ Density\ * F1)\ *\ (Retail\ Employment\ Density\ * F2)}{Intersections\ +\ (DU\ Density\ * F1) +\ (Retail\ Employment\ Density\ * F2)}$$

Where: $F1 = {}^{Mean\ Intersections}/_{Mean\ DU\ Density}$

$F2 = {}^{Mean\ Intersections}/_{Mean\ Retail\ Employment\ Density}$

Intersection Count in the mixed-density formulation explains urban form and walkability. The final combined prioritization score divided the MGRAs into 14 groups with a higher score indicating higher priority for future developments.

Locations outside the jurisdiction of the City of San Diego or areas not considered for redevelopment during the Blueprint process have been excluded from the model applications. These exclusion areas include Port of SD, airports, Airport Land Use Compatibility Plan safety zones exclusions, cemeteries, military establishments, attractions, hiking trails, golf courses, conservation/non-development land, schools and universities, large medical facilities, government/public land, federal land, parks, and industrial/research and development land uses.

[1] Equation based on previous work by SANDAG and Portland Metro.
SANDAG 4D Model Development, published March 2010:
https://www.sandag.org/uploads/publicationid/publicationid_1602_13320.pdf, page 12
Metro Travel Forecasting Trip Model Methodology Report. Metro Planning Department, Travel Forecasting Division, 2001.

[2] ArcGIS Desktop Help 9.2 - Implementing Inverse Distance Weighted (IDW) (esri.com)

SECTION 3: VISUALIZATION

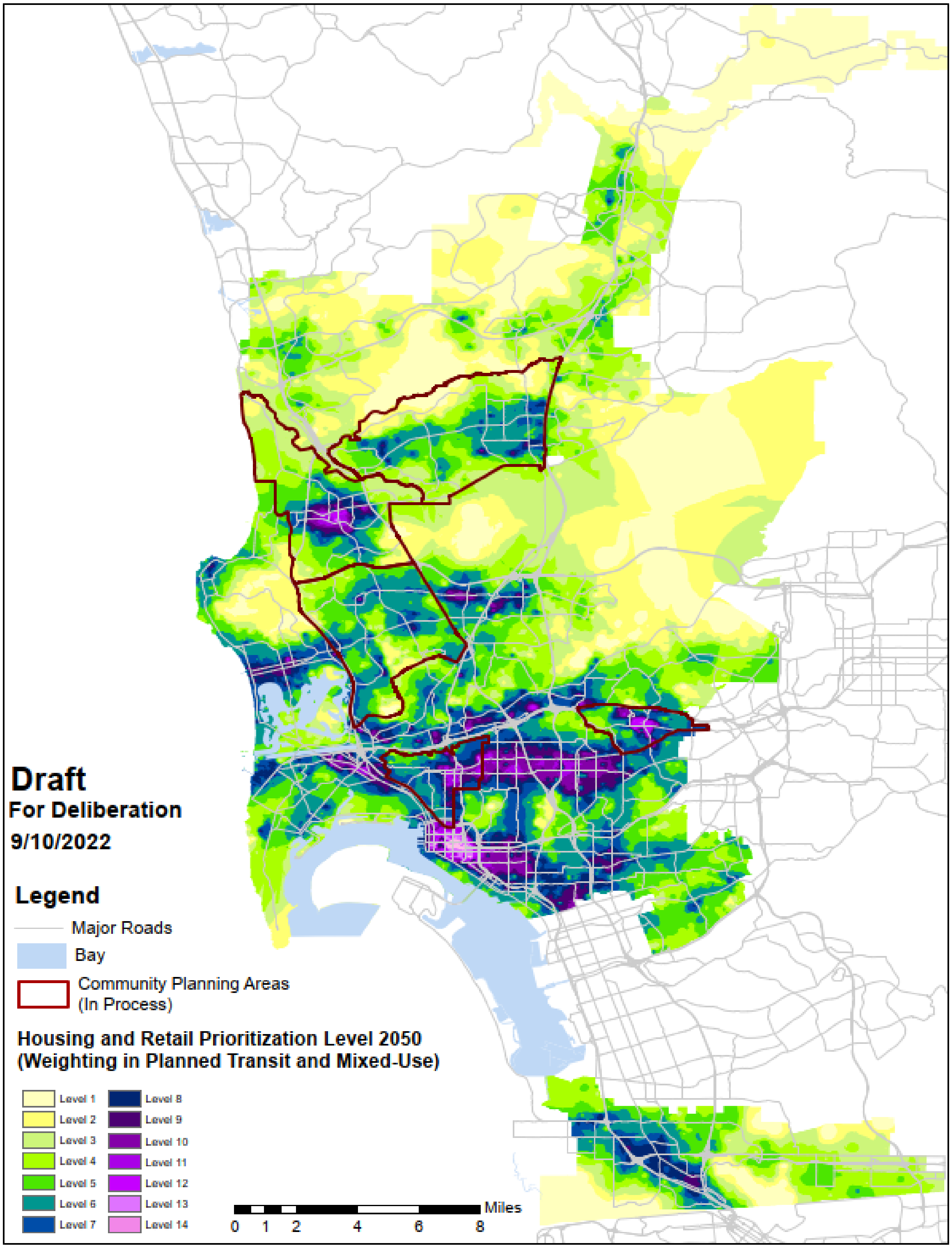
While the ranking scores were calculated at the MGRA level, the optimization results were mapped in a heatmap format using the Inverse Weighted Distance function[2] in ArcGIS to enhance the visualization. The heatmap generation process considers the exclusion areas meaning that the ranking score for the exclusion zones were considered as zero, but the blending of values often shades them as a low-level score.

The final combined prioritization scores (14 levels) of MGRAs are visualized in Figure 1. Levels 1 to 3 are color-coded in yellow representing the areas with very low recommendation for future developments. Starting from level 4 to level 6 where the green color pops up, the map highlights the areas with low-medium priority for developments. Level 7 (blue) to 9 (dark purple) highlights areas with medium priority for development considering all the interacting factors. At level 10 (dark purple) to level 14 (light purple**),** the areas with the highest receptiveness for future developments to maximize non-auto propensity are illustrated. Areas with existing or predicted transit accessibility, residential-commercial mixed-use development, and walkability are very well highlighted with higher ranks in the map and future developments in these areas have the higher potential to maximize the use of alternative transportation modes and contribute to sustainability goals of the Blueprint Plan.

SECTION 4: TECHNICAL PROCESS

The model estimation and application steps have all been scripted in Python using Jupyter Notebook and stored in a GitHub repository. The script reads the ABM2+ outputs shared by SANDAG, implements data cleaning and compilation steps to prepare the estimation and application variables into a feather file and then estimate the model. Using the same python scripting system, the model application step produces the optimized scores. Input data, such as transit and mixed-use variables, have been calculated in QGIS and ArcGIS and imported into the Python script. The final map visualization (heat map) has been prepared in ArcGIS using the Spatial Analyst extension.

Figure 1: Blueprint Draft Map (produced by WSP)



SECTION 5: GLOSSARY OF TECHNICAL TERMS

ABM2+ is the most recent version of the SANDAG Activity-based Model used within the 2021 Regional Plan. (https://www.sandag.org/index.asp?subclassid=120&fuseaction=home.subclasshome)

ArcGIS is the main Esri Software for analyzing Geographic Information Systems. (https://www.esri.com/en-us/home)

GitHub is a distributed version control for various programming languages. (https://github.com/)

GitHub repository is a location in the GitHub platform where the files and codes corresponding to the projects and their respective versions as a part of revision history are stored, managed, and used.

Goodness of fit of a statistical model describes how well it fits a set of observations.

Jupyter Notebook is an open-source web application that you can use to create and share documents that contain live code, equations, visualizations, and text. Jupyter Notebook is maintained by the people at Project Jupyter. (https://jupyter.org/)

Least square linear regression method is a form of regression analysis that establishes the relationship between the dependent and independent variables along a linear line.

Python is a programming language that lets you work quickly and integrate systems more effectively. (https://www.python.org/)

QGIS is a free and open-source cross-platform desktop geographic information system (GIS) application that supports viewing, editing, printing, and analysis of geospatial data. (https://www.qgis.org/en/site/)

Spatial Analyst extension is an extension for ArcGIS that provides advanced spatial modeling and analysis capabilities for both raster and feature data. (https://www.esri.com/en-us/arcgis/products/arcgis-spatial-analyst/overview)

MEMO

TO: **City of San Diego**

FROM: **WSP (Sara Khoeini, Rick Curry, and Xianting Huang)**

SUBJECT: **Summary of Updates in Three Model Run Inputs (H197127)**

DATE: **01/17/2024**

Introduction

The objective of this task order is to reconstruct the three Blueprint input files for the SANDAG (San Diego Association of Governments) ABM (Activity-Based Model) run. This reconstruction is necessitated by discrepancies identified in the base General Plan land use data, initially provided by SANDAG to WSP for the calculation of the input files, and the handling of group quarters within the input files. An additional request was made to conduct a thorough review of all final inputs at the MGRA level to ensure that the inputs for the final model run are in alignment with the City of San Diego's CPA (Community Plan Area)-level plans. This memo explains all the updates taken to the input file generated in the previous task order. If further information is needed related to the entire process of converting the Blueprint land uses to SANDAG ABM model run inputs, please refer to the memo entitled “Conversion of Blueprint Land Use to SANDAG Model Run Inputs” dated January 17, 2024.

Update Description

1. Update the base data from Series 14 DS-39 to DS-41 for forecast year 2050

The base data, encompassing single-family units, multi-family units, and mobile homes, has been utilized in tandem with Blueprint inputs. This approach ensures that where the base data exceeds the Blueprint unit estimates, the base data is preferentially used. Additionally, this base data has been instrumental in the update of employment and enrollment forecasts to align with housing estimates. A comprehensive explanation detailing the application of the Series 14 DS-41 year 2050 forecast pattern in the model input calculations is provided in the memo entitled “Conversion of Blueprint Land Use to SANDAG Model Run Inputs” dated January 17, 2024.

2. Update the number of retail employees

To calculate the revised number of retail employees after updating residential dwelling units based on Blueprint inputs, two key measures were considered. Firstly, the overall ratio of retail to housing units was maintained at a constant level (number of retail employees to number of housing units equals 0.28), in line with the base data (DS-41 Year 2050). Secondly, a retail index variable was developed to ensure that any increase in retail units aligns with the City's community plans. Below is the definition of values assigned to the retail index of each MGRA and reviewed by City of San Diego staff.

- A retail Index of zero means there should be no retail.

- Retail Index of one means there is retail today and/or in the future and can grow more than DS-41 year 2050 Retail based on blueprint residential units override.

- Retail Index of two means retail should be kept at DS-41 year 2050 and no extra retail should be added. All exclusion zones (zones that were excluded from Blueprint due to residential building constraints) are in this group.

3. Decrease in total dwelling units in Hillcrest from ~39,000 to ~31,000 in Model Run 2

City staff requested a reduction in the total number of additional residential dwelling units (DUs) in Hillcrest, decreasing from approximately 39,000 to about 31,000, in alignment with the Hillcrest Draft Focused Plan Amendment. Table 1 presents a comprehensive breakdown of the Blueprint residential units by geographical area for each model run after all the updates have been made.

Table 1 Model run inputs residential units by geography

	Model Run 1	Model Run 2	Model Run 3
Model Year	2050	2050	2050
Transportation Network	2050 SCS Build	2050 SCS Build	2050 SCS Build
Model Version	14.3.0	14.3.0	14.3.0
Additional City of SD DU (2022 to 2050) compared to LUDU2022	255,963	312,895	414,650
Remainder Region	SCS	SCS	SCS
University Growth (DU) (2022 to 2050)	20,555	32,655	32,246
Uptown Growth (DUs) (2022 to 2050)	12,566	33,448 (31,430 in Hillcrest)	22,247
College Area Growth (DUs) (2022 to 2050)	13,352	27,976	22,018
Clairemont Mesa Growth (DUs) (2022 to 2050)	12,627	24,182	19,624

4. Generate online maps for visualization of model inputs

WSP utilized online interactive GIS tools to visualize the inputs for the model run, thereby facilitating the City's review process. The online maps feature three delta layers: dwelling unit override minus GP14, dwelling unit override minus LUDU22, and retail override minus GP14. Additionally, they display the retail index, total override dwelling units (Single-Family Dwelling Units [SFDU], Multi-Family Dwelling Units [MFDU], Mobile Home Dwelling Units [MHDU]), and total override retail units. Links to these online maps are provided below. Please be aware that some final adjustments may have been made subsequent to the creation of these maps.

- Link to model run 1 inputs visualization: MR1
- Link to model run 2 inputs visualization: MR2
- Link to model run 3 inputs visualization: MR3

5. Update the preparation of the input file for SANDAG

The preparation of model run inputs, formatted according to SANDAG's specifications, has been executed using a Python script. This script processes the final override dwelling units from the Blueprint final outputs. In this iteration, instead of providing specific residential unit counts by type (Single-Family Dwelling Units [SFDU], Multi-Family Dwelling Units [MFDU], and Mobile Homes [MH]), we have supplied the deltas, i.e., the positive and negative differences. These deltas represent the total Blueprint dwelling units in SFDU and MFDU minus the DS-42 Build SCS data for all Major Geographic Reporting Areas (MGRAs) in the City of San Diego. Rows exhibiting zero deltas were eliminated. This approach preserves any group quarter values in the model run input file, a notable improvement from previous methods where overriding total dwelling units led to the exclusion of group quarters. Additionally, we incorporated a new check to ensure that the reduction of dwelling units in any MGRA does not exceed the total number of households in that area. Where this was the case, the number of removed dwelling units was capped at the total household count for each MGRA.

MEMO

TO: **City of San Diego**

FROM: **WSP (Sara Khoeini, Rick Curry, and Xianting Huang)**

SUBJECT: **Conversion of Blueprint Land Use to SANDAG Model Run Inputs (H197127)**

DATE: **1/17/2024**

Introduction

This memo details the construction of three Blueprint scenario input files for the SANDAG (San Diego Association of Governments) Activity-Based Model 2+ (ABM 2+) model run based on the forecasts of growth in recently completed community plan updates (CPUs) and specific Master-Geographic Reference Area (MGRA) inputs for a few upcoming and draft CPUs. To augment these Blueprint inputs, we also incorporated data from additional sources including the Regional Land Use and Dwelling Unit Inventory (LUDU) for the year 2022, Series 14 Sustainable Communities Strategy (SCS) land use pattern (DS-42) for the year 2050, and Series 14 General Plan (DS-41) land use pattern for the year 2050, applying specific conditions to refine our final input estimates for the model run.

The calculations were carried out across three Excel Worksheets, each associated with a specific blueprint scenario. This document articulates the assumptions and rationales behind these calculations, while a separate slide deck will provide detailed documentation of all tabs and columns in the spreadsheets. The scope of this document is limited to the MGRAs within the City of San Diego and excludes any areas, termed as exclusion zones, where the City has no land use control, which are regulated due to law, or which are unlikely to change due to existing use of the land. For MGRAs outside the City of San Diego limits, the model utilizes data from SCS 2050.

Methodology of Model Inputs Calculation

This section outlines the methodology employed for calculating the Blueprint-related inputs for each model run. Table 1 presents a comprehensive overview of the attributes associated with each model run. This includes a comparison of the additional dwelling units relative to the Series 14 General Plan 2050 (GP-14 2050), highlighting the variations across different model runs. Additionally, the table provides specific insights into four selected Community Planning Areas (CPAs) which have CPUs in progress: University, Hillcrest, College Area, and Clairemont Mesa, demonstrating how the model's inputs differ in these areas. Blueprint changes only those areas identified as being advantageous to addressing climate and mobility goals. All other areas in the City of San Diego are assumed to remain consistent with the GP-14 2050.

Model run 1 serves as the base Blueprint scenario, featuring 255,963 additional dwelling units in comparison to LUDU 2022. In contrast, model run 3 intensifies the growth level by a factor of 1.6 across all city Blueprint zones uniformly. Meanwhile, model run 2 functions as a calibration model, incorporating customized inputs specifically for the four selected CPUs - University, Hillcrest FPA, College Area, and Clairemont Mesa. For the remaining CPAs, model run 2 maintains the unit growth from model run 1.

Table 1 Model Run Inputs by Geography (City of SD)

	Model Run 1	Model Run 2	Model Run 3
Model Year	2050	2050	2050
Transportation Network	2050 SCS Build	2050 SCS Build	2050 SCS Build
Model Version	14.3.0	14.3.0	14.3.0
Additional City of SD DU (2022 to 2050) compared to LUDU2022	255,963	312,895	414,650
Remainder Region	SCS	SCS	SCS
University Growth (DU) (2022 to 2050)	20,555	32,655	32,246
Uptown Growth (DUs) (2022 to 2050)	12,566	33,448 (31,430 in Hillcrest)	22,247
College Area Growth (DUs) (2022 to 2050)	13,352	27,976	22,018

For estimating the count of override dwelling units by unit type (single-family, multi-family, and mobile home), we first uniformly downscale the unconstrained Blueprint dwelling units, to constrained Blueprint dwelling units based on the anticipated overall growth in the entire city of San Diego (refer to Table 1). After a uniform downscale, we found that the estimated growth values in a few CPAs are not coordinated with the CPA-level planned growth. To accommodate CPA-level planned growth as well the overall city-level growth, we added some CPA-level factors to a few CPAs. The final MGRA-level constrained Blueprint dwelling units then served as the foundational basis for estimating the number of dwelling units in each MGRA, categorized by unit type, as explained in the steps below.

1. Number of multi-family dwelling units per MGRA

The number of multi-family dwelling units in each MGRA is determined by taking the maximum value of multi-family units among the Blueprint (BP) base constrained value, the LUDU 2022, and the GP-14 2050.

2. Number of single-family dwelling units per MGRA

We include single-family dwelling units in each MGRA in addition to multi-family dwelling units only if the existing or planned single-family dwelling units is more than the constrained Blueprint dwelling units. Under this condition, the number of single-family dwelling units is determined by selecting the higher value between the LUDU 2022 and the GP-14 2050.

3. Number of mobile homes per MGRA

The count of Blueprint mobile homes is set to match the number of mobile homes from the GP-14 2050, but only under the condition that the total unit count from GP-14 2050 exceeds the aggregate of the Blueprint-calculated single-family and multi-family units determined in the previous steps. If this condition is not met, the number of mobile homes is considered to be zero.

4. Number of employees and school enrollment per MGRA by category (non-retail)

Although the Blueprint primarily addresses dwelling unit inputs, it is necessary to proportionally augment employment and enrollment figures to prevent an imbalance in trip frequency and length to access life opportunities for the additional population. The increase in employment and enrollment in the Blueprint model run inputs should be calibrated to maintain a consistent ratio of opportunities to the population as established in the GP-14 2050 data. All employment categories and school enrollments will undergo proportional adjustments using a unified coefficient. However, the adjustment for retail employment will be uniquely guided by specific recommendations from the City of San Diego which are explained below.

5. Number of retail employments per MGRA

The calculation of updated retail employees in each MGRA is based on the specific retail index value assigned to each MGRA. The designation of a retail index value for each MGRA was based on inputs from the City of San Diego planners. The implications of these retail index values are as follows.

- Retail Index Equals Zero: This indicates that the retail employee count in the respective MGRA should remain at zero.
- Retail Index Equals One: This suggests that retail presence is permissible in the MGRA, with the flexibility to increase the employee count as necessary.
- Retail Index Equals Two: This implies that the retail employee count should be maintained at the level specified in the GP-14 2050, with no increases. All exclusion zones (zones that were excluded from Blueprint due to residential building constraints) are in this group.

The number of retail employees in the MGRAs permitted by their respective retail index values will be increased. This adjustment is made to ensure that the ratio of retail units to population in the entire city of San Diego remains consistent with the same ratio derived from the GP-14 2050. Localized MGRA adjustments with respect to population in the area allowed for addressing areas that may be underserved with the hope to create shorter trips and more active transportation friendly trips.

Data Summary by Model Run

Following the application of the outlined calculations across the three spreadsheets corresponding to the three model runs, we have computed the input values for each model run. These values include single-family dwelling units, multi-family dwelling units, mobile homes, retail employment, other employment categories, and school enrollment figures for each MGRA within the City of San Diego. Table 2 provides a comprehensive summary, showcasing the total number of dwelling units and retail employment figures for each model run. Additionally, it presents a comparison with the total figures from the LUDU 2022 and the GP-14 2050.

Table 2 Dwelling Units and Retail Employment Summary by Model Run

Model Run	Source	Single-family	Multi-family	Mobile home	Retail Employment	Total Dwelling Units
Model Run 1	LUDU22	288,146	260,067	4,872	N/A	553,085
	GP-14 2050	304,367	377,812	4,962	196,551	687,141
	BP 2050	**278,790**	**526,577**	**3,681**	**229,930**	**809,048**
Model Run 2	LUDU22	288,146	260,067	4,872	N/A	553,085
	GP-14 2050	304,367	377,812	4,962	196,551	687,141
	BP 2050	**273,388**	**589,850**	**2,742**	**243,908**	**865,980**
Model Run 3	LUDU22	288,146	260,067	4,872	N/A	553,085
	GP-14 2050	304,367	377,812	4,962	196,551	687,141
	BP 2050	**252,295**	**713,014**	**2,426**	**255,348**	**967,735**

Standardizing the Model Inputs for SANDAG Service Bureau

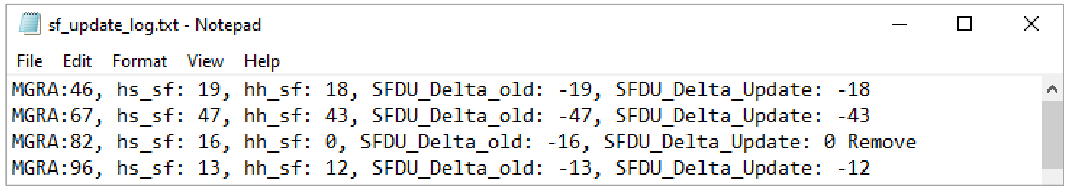
1. Creation of Client Project Input Files for Land Use Deltas

Using the client land-use form template, three model-run spreadsheets were transformed into three long-formatted tables as model-run inputs via Python code. The model run inputs comprise of four columns where changes were made: lu_code, LU Description, MGRA, and Dwelling Unit. Note that the Dwelling Unit column represents the delta value, calculated as the difference between calculated override dwelling units and the dwelling units from the SCS 2050.

While the SANDAG client land-use form uses the term "dwelling unit" it is actually referring to households. The dwelling unit/household input value is used in the generation of the synthetic population for the zone. Dwelling units and households are not equivalent as the SANDAG forecast includes typical occupancy levels by area. Occupancy levels reflect the number of units available for sale or rent including short-term vacation rentals which are prevalent in beach communities and Downtown. While the BP process is determining future unit totals by type the SANDAG land use override process is treating them as households.

Considering the disparity between housing structure (hs) and household (hh) in the baseline forecast, it is important to make sure that, when preparing the input spreadsheet, the values under hh_ (sf, mf, mh) are considered and cannot go below the baseline values. Taking MGRA 46 as an example, where hs_sf is 19, and hh_sf is 18 in the original file, we first attempted to remove 19 single-family households based on the calculation spreadsheets. However, this resulted in negative household values, risking a crash in the conversion tool. Therefore, adjustments to the delta value are necessary, and in this case, the delta DU should change from -19 to -18. Log files have been prepared to document all MGRAs where delta values were modified (refer to Figure 1) due to household issues, ultimately resulting in a slight discrepancy in total dwelling units (refer to Table 3) compared to the original override DU presented in Table 2. The final step for the input spreadsheet is splitting it into two files: one for all negative deltas and another for all positive deltas. The land use converter will be executed twice per SANDAG's updated procedures.

Figure 1 Log File Example



sf_update_log.txt - Notepad

File Edit Format View Help

```
MGRA:46, hs_sf: 19, hh_sf: 18, SFDU_Delta_old: -19, SFDU_Delta_Update: -18
MGRA:67, hs_sf: 47, hh_sf: 43, SFDU_Delta_old: -47, SFDU_Delta_Update: -43
MGRA:82, hs_sf: 16, hh_sf: 0, SFDU_Delta_old: -16, SFDU_Delta_Update: 0 Remove
MGRA:96, hs_sf: 13, hh_sf: 12, SFDU_Delta_old: -13, SFDU_Delta_Update: -12
```

Table 3 Dwelling Units Final Input Summary by Model Run

Model Run	Single-family	Multi-family	Mobile home	Total Dwelling Units
Model Run 1	280,267	532,392	3,716	**816,375**
Model Run 2	274,910	595,367	2,808	**873,085**
Model Run 3	255,081	717,410	2,497	**974,988**

2. Update of MGRA Based Input Files for Employment and Enrollment

After receiving the MGRA-based synthetic population files from SANDAG, we proceeded to update columns related to employment and school enrollment. In the case of non-retail and school enrollment, we adjusted their values to align with the added population to keep the city-level ratio of the resource to population the same. We added additional amounts of non-retail employment and school enrollment only in MGRAs with existing similar resources. Table 4 shows the updated employment and enrollment data resulting from Model Run 2.

To calculate the revised number of retail employees two key measures were considered: the overall ratio of retail to housing units, and a retail index variable to ensure that any increase in retail units aligns with the City's community plans. More detailed information about the retail index variable is available in the "Model Run Input Update_Draft Final Memo".

Table 4 Updated Employment and Enrollment Data for Model Run 2

	#/hs	Additional Amounts	New Total	Growth
Grade School K-8 enrollment	0.21	36,930	178,824	1.26
Grade School 9-12 enrollment	0.10	17,383	84,172	1.26
Major College enrollment	0.15	26,907	130,290	1.26
Other College enrollment	0.15	26,383	127,753	1.26
Adult School enrollment	0.04	7,991	38,696	1.26
Non-Retail Employees	1.32	236,466	1,145,022	1.26
Retail Employees	0.28	51,555	247,706	1.26

Acronyms & Glossary

ABM – Activity Based Model – type of travel demand model used by SANDAG

BP - Blueprint - an approach for the City of San Diego's General Plan and community planning that will align with climate and housing goals and promote sustainable growth

CPA - Community Planning Area

DU – Dwelling unit; Equivalent to Housing Structure

GP - General Plan – as referenced in this document refers to the zoning and land use provided by the City of San Diego to SANDAG for development of the SANDAG General Plan land use pattern.

HH – Household

HS – Housing Structure

LU – Land Use

LUDU - Land Use and Dwelling Unit Inventory – developed by SANDAG to be an inventory of existing conditions

MF – Multi-Family

MGRA – Master Geographic Reference Areas – Aggregations of parcels; smallest unit of geography in the SANDAG ABM; developed by SANDAG; aka Micro Analysis Zones (MAZ)

MH – Mobile Home

SCS - Sustainable Communities Strategy – as referenced in this document refers to the land use pattern developed by SANDAG for their SCS submittal to CARB

SF – Single Family

Attachment B - Analysis Methodology

Level of Service (LOS) Definition

Level of Service (LOS) is a quantitative measure describing operational conditions within a traffic stream, and the motorist's and/or passengers' perception of operations. A LOS definition generally describes these conditions in terms of such factors as delay, speed, travel time, freedom to maneuver, interruptions in traffic flow, queuing, comfort, and convenience. **Table 1** describes generalized definitions of the various LOS categories (A through F) as applied to roadway operations.

Table 1 - LOS Definitions

LOS	Definition of Operation
A	This LOS represents a completely free-flow condition, where the operation of vehicles is virtually unaffected by the presence of other vehicles and only constrained by the geometric features of the highway and by driver preferences.
B	This LOS represents a relatively free-flow condition, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver.
C	At this LOS, the influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles.
D	At this LOS, the ability to maneuver is notably restricted due to traffic congestion, and only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	This LOS represents operations at or near capacity. LOS E is an unstable level, with vehicles operating with minimum spacing for maintaining uniform flow. At LOS E, disruptions cannot be dissipated readily thus causing deterioration down to LOS F.
F	At this LOS, forced or breakdown of traffic flow occurs, although operations appear to be at capacity, queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages.

Roadway Segment LOS Standards and Thresholds

Roadway segment LOS standards and thresholds provide the basis for analysis of arterial roadway segment performance. The analysis of roadway segment LOS is based on the functional classification of the roadway, the maximum capacity, roadway geometrics, and existing or forecast average daily traffic (ADT) volumes. Table 2 displays the City of San Diego Roadway Capacity and LOS standards

Table 2 - City of San Diego Roadway Segment Daily Capacity and Level of Service Standards

Roadway Functional Classification	Lanes	Level of Service				
		A	B	C	D	E
Freeway	8	60,000	84,000	120,000	140,000	150,000
Freeway	6	45,000	63,000	90,000	110,000	120,000
Freeway	4	30,000	42,000	60,000	70,000	80,000
Expressway	6	30,000	42,000	60,000	70,000	80,000
Prime Arterial	8	35,000	50,000	70,000	75,000	80,000
Prime Arterial	6	25,000	35,000	50,000	55,000	60,000
Prime Arterial	4	17,500	24,500	35,000	40,000	45,000
Major Arterial	7	22,500	31,500	45,000	50,000	55,000
Major Arterial	6	20,000	28,000	40,000	45,000	50,000
Major Arterial	5	17,500	24,500	35,000	40,000	45,000
Major Arterial	4	15,000	21,000	30,000	35,000	40,000
Major Arterial	3	11,250	15,750	22,500	26,250	30,000
Major Arterial	2	7,500	10,500	15,000	17,500	20,000
Major Arterial (one-way)	3	12,500	16,500	22,500	25,000	27,500
Major Arterial (one-way)	2	10,000	13,000	17,500	20,000	22,500
Collector (w/ two-way left-turn lane)	4	10,000	14,000	20,000	25,000	30,000
Collector (w/ two-way left-turn lane)	3	7,500	10,500	15,000	18,750	22,500
Collector (w/ two-way left-turn lane)	2	5,000	7,000	10,000	13,000	15,000
Collector (w/o two-way left-turn lane)	4	5,000	7,000	10,000	13,000	15,000
Collector (w/o two-way left-turn lane)	3	4,000	5,000	7,500	10,000	11,000
Collector (w/o two-way left-turn lane)	2	2,500	3,500	5,000	6,500	8,000
Collector (w/o two-way left-turn lane) – no fronting property	2	4,000	5,500	7,500	9,000	10,000
Collector (one-way)	3	11,000	14,000	19,000	22,500	26,000
Collector (one-way)	2	7,500	9,500	12,500	15,500	17,500
Collector (one-way)	1	2,500	3,500	5,000	6,500	7,500
Sub-Collector (single-family)	2	-	-	2,200	-	-

Source: City of San Diego TSM

The signalized intersection analysis utilized in this study conforms to the operational analysis methodology outlined in the *2016 Highway Capacity Manual* (HCM 6). This method defines LOS in terms of delay, or more specifically, average control delay per vehicle (seconds/vehicle).

The HCM 6 methodology sets 1,900 passenger-cars per hour per land (pcphpl) as the ideal saturation flow rate at signalized intersections based upon the minimum headway that can be sustained between departing vehicles at a signalized intersection. The service saturation flow rate, which reflects the saturation flow rate specific to the study facility, is determined by adjusting the ideal saturation flow rate for lane width, on-street parking, bus stops, pedestrian volume, traffic composition (or percentage of heavy vehicles), and shared lane movements (e.g., through and right-turn movements sharing the same lane). The computerized analysis of intersection operations was performed utilizing Synchro 11 traffic analysis software by Trafficware.

The following assumptions were utilized in conducting all intersection LOS analyses:

- Each signalized intersection assumed 10 pedestrian crossing signal activations per leg/signal phase per hour, an estimate that is more conservative than the default Synchro 11 value of 5.
- A 3% heavy vehicle factor was applied for all study area intersections. 3% is a standard assumption in HCM methodologies.
- A Peak Hour Factor (PHF) of 0.95 was utilized for all study area intersections.
- Signal timings were optimized by adjusting cycle lengths and splits for uncoordinated signals and splits only (maintaining existing cycle lengths) for coordinated signals.

Table 3 presents the signalized intersection average control delay per vehicle thresholds and describes the operational characteristics of each LOS category.

Table 3 - Signalized Intersection Level of Service HCM Operational Analysis Method

Average Control Delay Per Vehicle (seconds)	Level of Service (LOS) Characteristics
<u><</u>10.0	*LOS A* occurs when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.
10.1 – 20.0	*LOS B* occurs when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.
20.1 – 35.0	*LOS C* occurs when progression is favorable or the cycle length is moderate. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.
35.1 – 55.0	*LOS D* occurs when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.
55.1 – 80.0	*LOS E* occurs when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.
>80.0	*LOS F* occurs when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Source: Highway Capacity Manual, Transportation Research Board (2010)

<u>Unsignalized Intersection Analysis</u>

Unsignalized intersections, including two-way and all-way stop controlled intersections, were analyzed using the HCM 6 unsignalized intersection analysis methodology, and utilizing the Synchro 11 traffic analysis software. The LOS for an all-way stop-controlled (AWSC) intersection is determined by the computed or measured average control delay of all movements. For side-street stop-controlled (SSSC) intersections, LOS is determined by the computed or measured control delay and is defined for each minor movement. Control delay and LOS for the "worst" movement are reported, as opposed to average intersection LOS and delay. **Table 4**presents the level of service operations thresholds for unsignalized intersections.

Table 4 - Level of Service Criteria for Stop Controlled Unsignalized Intersections

Average Control Delay (sec/veh)	Level of Service (LOS)
≤10.0	A
10.1 – 15.0	B
15.1 – 25.0	C
25.1 – 35.0	D
35.1 – 50.0	E
>50.0	F

Source: Highway Capacity Manual, Transportation Research Board (2010)

Bike Phase Crossing Times

Since the Hillcrest FPA Mobility Element network includes protected bike phases at all signalized study intersections, the protected bike phases would occur with the Lead Pedestrian Interval (LPI) and hold any conflicting movements. At locations where there are exclusive turn lanes, only the exclusive turn lane is held, whereas locations where there are shared turn lanes (shared through-right or shared through-left) both through and the-turning traffic is held.

Due to Synchro software limitations related to HCM 6, exclusive and protected bike phases are not coded directly into the signal timings of the intersections. Instead, bike phases are accounted for by applying reductions to the saturation flow rates (vehicles per lane per hour) of the affected movements based on how much time per hour is dedicated to the corresponding bike phases. Bike crossing times are calculated utilizing the following formula from the California Manual on Uniform Traffic Control Devices (CA MUTCD) Section 4D.105(CA):

$$Minimum\ Bike\ Crossing\ Time = 6\ seconds + \frac{6\ feet\ +\ Bike\ Crossing\ Distance}{14.7\ {}^{feet}/_{second}}$$

For example, if the bike crossing distance is approximately 77 feet, the minimum bike crossing time would be 12 seconds. Based on a cycle length of 80 seconds, and assuming the bike phase gets activated every cycle, the total amount of time dedicated to this bike phase during the peak hour would be 524 seconds, or 15% of the hour. Therefore, the saturation flow rate for the affected movements (the movements that receive the no-turn-on-red blank out sign) would be reduced by 15% from the standard rate of 1,900. Detailed equations and calculations for all study intersections are included below.

Bike Phasing Reductions

ID	Intersection	Movement	Peak Hour	Bike Clearing Distance (ft)	Bike Phase Time (sec)	Cycle Length (sec)	Cycles per Hour	TL (sec)	PC	Reduced Capacity (veh/hr/ln)	Notes
2	Fifth Avenue & Washington Street	NBL	AM	105	13.6	100	36	488	14%	1643	Exclusive bike phase for NBL bikes
			PM	105	13.6	110	33	443	12%	1666	
6	Normal St/Washington St & Campus Ave/Polk Ave	NB (Normal Street)	AM	100	13.2	115	31	414	11%	1682	Exclusive bike phase for NB bikes (Normal)
			PM	100	13.2	110	33	432	12%	1672	
7	Park Boulevard & Normal Street/El Cajon Blvd	SB	AM	235	22.4	115	31	701	19%	1531	Exclusive bike phase for SB bikes
			PM	235	22.4	125	29	645	18%	1560	
10	Sixth Avenue & University Avenue	WB	AM	90	12.5	116	31	389	11%	1695	Exclusive bike phase for the WBT bikes
			PM	90	12.5	112	32	403	11%	1688	

Lead Pedestrian Interval (and Bike) Capacity Reduction Calculations

ID	Intersection	Approach	Peak Hour	LPI (sec)	Cycle Length (sec)	Cycles per Hour	Phase Length (sec)	Total Phase Time (sec)	Time Loss per Hour (sec)	Capacity Percent Loss	Reduced Capacity (veh/hr/ln)	Notes	
2	Fifth Avenue & Washington Street	NBR	AM	10.0	100	36	32	1152	360	31%	1307	Existing NTOR (**B**) for NBR approach	Existing LPI on the East leg for a duration of 10 seconds.
			PM	10.0	110	33	34.4	1126	327	29%	1348		
3	Eight Avenue & Washington Street	WB	AM	5.0	110	33	35	1145	164	14%	1629	Existing NTOR for SWR, SB, WB approach	Existing LPI on the North leg for a duration of 5 seconds.
			PM	5.0	100	36	35	1260	180	14%	1629		
3	Eight Avenue & Washington Street	SB	AM	7.0	110	33	22	720	229	32%	1296		Existing LPI on the West leg leg for a duration of 7 seconds.
			PM	7.0	100	36	22	792	252	32%	1296		
6	Campus Ave/Polk Ave & Normal St/Washington St	NB	AM	8.0	115	31	41.5	1299	250	19%	1534	Existing LPI on the East leg for a duration of 8 seconds.	
			PM	8.0	110	33	40.9	1339	262	20%	1529		
8	Fourth Avenue & University Avenue	SB	AM	6.0	116	31	24	745	186	25%	1425	Existing NTOR for SBR (**B**) approach	Existing LPI on the West leg for a duration of 6 seconds.
			PM	6.0	112	32	23.9	768	193	25%	1424		
9	Fifth Avenue & University Avenue	WB	AM	6.0	116	31	52	1614	186	12%	1681	Proposed NTOR (**B**) for WBR approach during the LPI	Proposed LPI on the North leg leg for a duration of 6 seconds.
			PM	6.0	112	32	48.1	1546	193	12%	1663		

ID	Intersection	Approach	Peak Hour	LPI (sec)	Cycle Length (sec)	Cycles per Hour	Phase Length (sec)	Total Phase Time (sec)	Time Loss per Hour (sec)	Capacity Percent Loss	Reduced Capacity (veh/hr/ln)	Notes	
11	10th Avenue & University Avenue	WB	AM	7.0	116	31	59.9	1859	217	12%	1678	Proposed LPI on the North leg.	
			PM	7.0	112	32	49.1	1578	225	14%	1630		
11	10th Avenue & University Avenue	EB	AM	7.0	116	31	48	1490	217	15%	1623	Proposed NTOR (**B**) for EBR approach during the LPI	Proposed LPI on the South leg for a duration of 7 seconds
			PM	7.0	112	32	59	1896	225	12%	1675		
12	Normal Street & University Avenue	WB	AM	7.0	85	42	44.6	1889	296	16%	1602	Proposed NTOR (**B**) for SBR approach during the Bike Phase	Proposed LPI on the North leg for a duration of 7 seconds
			PM	7.0	85	42	43.6	1847	296	16%	1595		
15	Fourth Avenue & Robinson Avenue	EB	AM	5.0	58	62	20.2	1254	310	25%	1430	Proposed NTOR (**B**) for EB approach	Proposed LPI on the South leg for a duration of 5 seconds
			PM	5.0	56	64	22.6	1453	321	22%	1480		
16	Fifth Avenue & Robinson Avenue	NB	AM	5.0	58	62	27	1676	310	19%	1549	Proposed NTOR (**B**) for NB approach	Proposed LPI on the West leg for a duration of 5 seconds
			PM	5.0	56	64	29	1864	321	17%	1573		
17	Sixth Avenue & Robinson Avenue	NB	AM	5.0	116	31	56	1738	155	9%	1731	Proposed NTOR (**B**) for NB approach	Proposed LPI on the West leg for a duration of 5 seconds
			PM	5.0	112	32	58	1864	161	9%	1737		

Notes:
B = R3-1 (B.O)

Attachment C - Roadway Segment LOS Results – Without Mobility Element & Existing Conditions

Roadway Segment LOS Results - "without" Mobility Element Conditions

Roadway Segment	Segment	Cross-Section	Threshold (LOS E)	ADT	V/C	LOS
Montecito Way	Front Street to Fourth Avenue	1-Lane Collector (one-way)	7,500	7,400	0.987	E
Polk Avenue	Normal Street to Park Boulevard	2-Lane Collector w/o TWLTL	8,000	8,000	1.000	E
Lewis Street	Front Street to Fourth Avenue	1-Lane Collector (one-way)	7,500	8,900	1.187	F
Washington St	Dove Street to Fourth Avenue	4-Lane Major Arterial	40,000	33,500	0.838	D
Washington St	Fourth Avenue to Fifth Avenue	4-Lane Major Arterial	40,000	47,600	1.190	F
Washington St	Fifth Avenue to Eighth Avenue	4-Lane Major Arterial	40,000	49,300	1.233	F
Washington St	Eighth Avenue to Ninth Avenue	4-Lane Major Arterial	40,000	42,400	1.060	F
Washington St	Ninth Avenue to Lincoln Avenue	5-Lane Major Arterial	45,000	56,200	1.249	F
Washington St	Lincoln Avenue to Normal Street	6-Lane Major Arterial	50,000	39,800	0.796	C
Lincoln Ave	Washington Street to Normal Street	2-Lane Collector w/o TWLTL	8,000	16,800	2.100	F
Lincoln Ave	Normal Street to Park Boulevard	2-Lane Collector w/o TWLTL	8,000	13,800	1.725	F
University Avenue	Dove Street to First Avenue	2-Lane Collector w/o TWLTL	8,000	20,100	2.513	F
University Avenue	First Avenue to Fourth Avenue	2-Lane Collector w/o TWLTL	8,000	16,500	2.063	F
University Avenue	Fourth Avenue to Fifth Avenue	2-Lane Collector w/o TWLTL	8,000	19,100	2.388	F
University Avenue	Fifth Avenue to Sixth Avenue	4-Lane Collector w/o TWLTL	15,000	23,700	1.580	F
University Avenue	Sixth Avenue to Ninth Avenue	4-Lane Collector w/o TWLTL	15,000	32,700	2.180	F
University Avenue	Ninth Avenue to Tenth Avenue	4-Lane Collector w/o TWLTL	15,000	32,700	2.180	F
University Avenue	Tenth Avenue to Richmond Street	4-Lane Major Arterial	40,000	28,100	0.703	C
University Avenue	Richmond Street to Normal Street	4-Lane Major Arterial	40,000	23,700	0.593	C
University Avenue	Normal Street to Park Boulevard	4-Lane Collector w/o TWLTL	15,000	18,800	1.253	F
Robinson Avenue	First Avenue to Fourth Avenue	2-Lane Collector w/o TWLTL	8,000	8,200	1.025	F
Robinson Avenue	Fourth Avenue to Fifth Avenue	2-Lane Collector w/o TWLTL	8,000	10,800	1.350	F
Robinson Avenue	Fifth Avenue to Sixth Avenue	2-Lane Collector w/o TWLTL	8,000	11,700	1.463	F
Robinson Avenue	Sixth Avenue to Eighth Avenue	2-Lane Collector w/o TWLTL	8,000	14,400	1.800	F
Robinson Avenue	Eighth Avenue to Tenth Avenue	2-Lane Collector w/o TWLTL	8,000	12,300	1.538	F
Robinson Avenue	Tenth Avenue to Vermont Street	2-Lane Collector w/o TWLTL	8,000	17,000	2.125	F
Robinson Avenue	Vermont Street to Richmond Street	2-Lane Collector w/ TWLTL	15,000	15,500	1.033	F
Robinson Avenue	Richmond Street to Park Boulevard	2-Lane Collector w/ TWLTL	15,000	14,000	0.933	E
Front Street	Dickinson Street to Arbor Drive	2-Lane Collector w/o TWLTL	8,000	14,500	1.813	F
Front Street	Arbor Drive to Lewis Street	2-Lane Collector (one-way)	17,500	9,400	0.537	B
Front Street	Lewis Street to Washington Street	3-Lane Collector (one-way)	26,000	14,500	0.558	C
First Avenue	North of Arbor Drive to Arbor Drive	2-Lane Collector w/o TWLTL	8,000	19,700	2.463	F

Roadway Segment LOS Results - "without" Mobility Element Conditions

Roadway Segment	Segment	Cross-Section	Threshold (LOS E)	ADT	V/C	LOS
First Avenue	Arbor Drive to Washington Street	2-Lane Collector (one-way)	17,500	18,400	1.051	**F**
First Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	13,500	1.688	**F**
First Avenue	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	15,500	1.938	**F**
Fourth Avenue	Arbor Drive to Washington Street	2-Lane Collector w/ TWLTL	15,000	27,200	1.813	**F**
Fourth Avenue	Washington Street to University Avenue	2-Lane Collector (one-way)	17,500	10,600	0.606	C
Fourth Avenue	University Avenue to Robinson Avenue	2-Lane Collector (one-way)	17,500	11,200	0.640	C
Fourth Avenue	Robinson Avenue to Walnut Avenue	2-Lane Collector (one-way)	17,500	7,400	0.423	A
Fifth Avenue	Washington Street to University Avenue	2-Lane Collector (one-way)	17,500	12,400	0.709	C
Fifth Avenue	University Avenue to Robinson Avenue	2-Lane Collector (one-way)	17,500	17,100	0.977	**E**
Fifth Avenue	Robinson Avenue to Walnut Avenue	2-Lane Collector (one-way)	17,500	13,200	0.754	D
Sixth Avenue	University Avenue to Robinson Avenue	4-Lane Collector w/o TWLTL	15,000	27,300	1.820	**F**
Sixth Avenue	Robinson Avenue to Pennsylvania Avenue	4-Lane Collector w/o TWLTL	15,000	25,200	1.680	**F**
Eighth Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	10,200	1.275	**F**
Eighth Avenue	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	5,400	0.675	D
Ninth Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	13,200	1.650	**F**
Tenth Avenue	University Avenue to SR-163 NB On-Ramp	2-Lane Collector w/o TWLTL	8,000	15,600	1.950	**F**
Tenth Avenue	SR-163 NB On-Ramp to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	11,600	1.450	**F**
Richmond Street	Cleveland Avenue to University Avenue	2-Lane Collector w/ TWLTL	15,000	6,800	0.453	B
Richmond Street	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	12,800	1.600	**F**
Normal Street	El Cajon Boulevard to Washington Street	6-Lane Major Arterial	50,000	33,400	0.668	C
Normal Street	Washington Street to University Avenue	4-Lane Major Arterial	40,000	12,400	0.310	A
Park Boulevard	El Cajon Boulevard to University Avenue	4-Lane Major Arterial	40,000	13,900	0.348	A
Park Boulevard	University Avenue to Robinson Avenue	3-Lane Major Arterial	30,000	15,600	0.520	B

Roadway Segment LOS Results – Existing Conditions

Roadway	Segment	Cross-Section	Threshold (LOS E)	ADT	V/C	LOS
Montecito Way	Front Street to Fourth Avenue	1-Lane Collector (one-way)	7,500	N/A		
Polk Avenue	Normal Street to Park Boulevard	2-Lane Collector w/o TWLTL	8,000	N/A		
Lewis Street	Front Street to Fourth Avenue	1-Lane Collector (one-way)	7,500	N/A		
Washington St	Dove Street to Fourth Avenue	4-Lane Major Arterial	40,000	24,200	0.605	C
Washington St	Fourth Avenue to Fifth Avenue	4-Lane Major Arterial	40,000	32,100	0.803	D
Washington St	Fifth Avenue to Eighth Avenue	4-Lane Major Arterial	40,000	33,400	0.835	D
Washington St	Eighth Avenue to Ninth Avenue	4-Lane Major Arterial	40,000	25,200	0.630	C
Washington St	Ninth Avenue to Lincoln Avenue	5-Lane Major Arterial	45,000	41,000	0.911	**E**
Washington St	Lincoln Avenue to Normal Street	6-Lane Major Arterial	50,000	29,200	0.584	C
Lincoln Ave	Washington Street to Normal Street	2-Lane Collector w/o TWLTL	8,000	N/A		
Lincoln Ave	Normal Street to Park Boulevard	2-Lane Collector w/o TWLTL	8,000	N/A		
University Avenue	Dove Street to First Avenue	2-Lane Collector w/o TWLTL	8,000	15,000	1.875	**F**
University Avenue	First Avenue to Fourth Avenue	2-Lane Collector w/o TWLTL	8,000	15,000	1.875	**F**
University Avenue	Fourth Avenue to Fifth Avenue	2-Lane Collector w/o TWLTL	8,000	14,400	1.800	**F**
University Avenue	Fifth Avenue to Sixth Avenue	4-Lane Collector w/o TWLTL	15,000	22,800	1.520	**F**
University Avenue	Sixth Avenue to Ninth Avenue	4-Lane Collector w/o TWLTL	15,000	22,800	1.520	**F**
University Avenue	Ninth Avenue to Tenth Avenue	4-Lane Collector w/o TWLTL	15,000	22,800	1.520	**F**
University Avenue	Tenth Avenue to Richmond Street	4-Lane Major Arterial	40,000	21,100	0.528	C
University Avenue	Richmond Street to Normal Street	4-Lane Major Arterial	40,000	17,700	0.443	B
University Avenue	Normal Street to Park Boulevard	4-Lane Collector w/o TWLTL	15,000	15,200	1.013	**F**
Robinson Avenue	First Avenue to Fourth Avenue	2-Lane Collector w/o TWLTL	8,000	6,000	0.750	D
Robinson Avenue	Fourth Avenue to Fifth Avenue	2-Lane Collector w/o TWLTL	8,000	7,900	0.988	**E**
Robinson Avenue	Fifth Avenue to Sixth Avenue	2-Lane Collector w/o TWLTL	8,000	8,500	1.063	**F**
Robinson Avenue	Sixth Avenue to Eighth Avenue	2-Lane Collector w/o TWLTL	8,000	10,500	1.313	**F**
Robinson Avenue	Eighth Avenue to Tenth Avenue	2-Lane Collector w/o TWLTL	8,000	9,000	1.125	**F**
Robinson Avenue	Tenth Avenue to Vermont Street	2-Lane Collector w/o TWLTL	8,000	12,400	1.550	**F**

Roadway Segment LOS Results – Existing Conditions

Roadway	Segment	Cross-Section	Threshold (LOS E)	ADT	V/C	LOS
Robinson Avenue	Vermont Street to Richmond Street	2-Lane Collector w/ TWLTL	15,000	12,400	0.827	D
Robinson Avenue	Richmond Street to Park Boulevard	2-Lane Collector w/ TWLTL	15,000	12,400	0.827	D
Front Street	Dickinson Street to Arbor Drive	2-Lane Collector w/o TWLTL	8,000		N/A	
Front Street	Arbor Drive to Lewis Street	2-Lane Collector (one-way)	17,500		N/A	
Front Street	Lewis Street to Washington Street	3-Lane Collector (one-way)	26,000		N/A	
First Avenue	North of Arbor Drive to Arbor Drive	2-Lane Collector w/o TWLTL	8,000		N/A	
First Avenue	Arbor Drive to Washington Street	2-Lane Collector (one-way)	17,500		N/A	
First Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000		N/A	
First Avenue	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000		N/A	
Fourth Avenue	Arbor Drive to Washington Street	2-Lane Collector w/ TWLTL	15,000	11,100	0.740	D
Fourth Avenue	Washington Street to University Avenue	2-Lane Collector (one-way)	17,500	6,600	0.377	A
Fourth Avenue	University Avenue to Robinson Avenue	2-Lane Collector (one-way)	17,500	6,900	0.394	A
Fourth Avenue	Robinson Avenue to Walnut Avenue	2-Lane Collector (one-way)	17,500	5,200	0.297	A
Fifth Avenue	Washington Street to University Avenue	2-Lane Collector (one-way)	17,500	8,200	0.469	B
Fifth Avenue	University Avenue to Robinson Avenue	2-Lane Collector (one-way)	17,500	7,700	0.440	B
Fifth Avenue	Robinson Avenue to Walnut Avenue	2-Lane Collector (one-way)	17,500	7,900	0.451	B
Sixth Avenue	University Avenue to Robinson Avenue	4-Lane Collector w/o TWLTL	15,000	22,500	1.500	**F**
Sixth Avenue	Robinson Avenue to Pennsylvania Avenue	4-Lane Collector w/o TWLTL	15,000	21,400	1.427	**F**
Eighth Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000	3,500	0.438	B
Eighth Avenue	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	3,900	0.488	C
Ninth Avenue	Washington Street to University Avenue	2-Lane Collector w/o TWLTL	8,000		N/A	
Tenth Avenue	University Avenue to SR-163 NB On-Ramp	2-Lane Collector w/o TWLTL	8,000	9,100	1.138	**F**
Tenth Avenue	SR-163 NB On-Ramp to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	9,100	1.138	**F**
Richmond Street	Cleveland Avenue to University Avenue	2-Lane Collector w/ TWLTL	15,000	6,200	0.413	B
Richmond Street	University Avenue to Robinson Avenue	2-Lane Collector w/o TWLTL	8,000	6,200	0.775	D
Normal Street	El Cajon Boulevard to Washington Street	6-Lane Major Arterial	50,000	23,600	0.472	B

Roadway Segment LOS Results – Existing Conditions

Roadway	Segment	Cross-Section	Threshold (LOS E)	ADT	V/C	LOS
Normal Street	Washington Street to University Avenue	4-Lane Major Arterial	40,000	1,700	0.043	A
Park Boulevard	El Cajon Boulevard to University Avenue	4-Lane Major Arterial	40,000	10,900	0.273	A
Park Boulevard	University Avenue to Robinson Avenue	3-Lane Major Arterial	30,000	9,600	0.320	A

Attachment D - Peak Hour Intersection LOS Calculation Worksheets – Hilcrest FPA (Preferred) Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	300	810	180	500	1400	520	0	0	0	460	270	220
Future Volume (veh/h)	300	810	180	500	1400	520	0	0	0	460	270	220
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.82	1.00		0.92				1.00		0.82
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856				1856	1856	1856
Adj Flow Rate, veh/h	312	844	171	526	1474	507				484	284	105
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3				3	3	3
Cap, veh/h	205	987	200	367	1157	364				1036	544	378
Arrive On Green	0.12	0.35	0.35	0.14	0.30	0.30				0.29	0.29	0.29
Sat Flow, veh/h	1767	2805	568	1767	2578	812				3534	1856	1291
Grp Volume(v), veh/h	312	530	485	526	965	1016				484	284	105
Grp Sat Flow(s),veh/h/ln	1767	1763	1610	1767	1763	1627				1767	1856	1291
Q Serve(g_s), s	11.6	27.9	27.9	20.8	44.9	44.9				11.2	12.8	6.3
Cycle Q Clear(g_c), s	11.6	27.9	27.9	20.8	44.9	44.9				11.2	12.8	6.3
Prop In Lane	1.00		0.35	1.00		0.50				1.00		1.00
Lane Grp Cap(c), veh/h	205	620	567	367	791	730				1036	544	378
V/C Ratio(X)	1.52	0.85	0.86	1.43	1.22	1.39				0.47	0.52	0.28
Avail Cap(c_a), veh/h	205	620	567	367	791	730				1096	575	400
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67				1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	44.2	30.0	30.0	43.0	35.0	35.0				28.9	29.5	27.2
Incr Delay (d2), s/veh	258.2	14.1	15.2	209.4	110.2	184.5				0.1	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	19.7	13.7	12.7	30.7	43.9	55.6				4.8	5.7	5.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	302.4	44.1	45.2	252.5	145.2	219.5				29.1	29.8	27.3
LnGrp LOS	F	D	D	F	F	F				C	C	C
Approach Vol, veh/h		1327			2507						873	
Approach Delay, s/veh		105.2			197.8						29.1	
Approach LOS		F			F						C	

Timer - Assigned Phs	1	2		4	5	6
Phs Duration (G+Y+Rc), s	25.7	40.1		34.2	16.0	49.8
Change Period (Y+Rc), s	4.9	* 4.9		4.9	4.4	4.9
Max Green Setting (Gmax), s	19.6	* 35		31.0	11.6	43.2
Max Q Clear Time (g_c+I1), s	22.8	29.9		14.8	13.6	46.9
Green Ext Time (p_c), s	0.0	0.8		1.1	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	140.4
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

User approved volume balancing among the lanes for turning movement.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1270	0	0	2240	690	350
Future Volume (veh/h)	1270	0	0	2240	690	350
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1856	1605	1276
Adj Flow Rate, veh/h	1337	0	0	2358	726	354
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	0	0	3	3	3
Cap, veh/h	1994	0	0	1994	1044	369
Arrive On Green	0.19	0.00	0.00	0.57	0.34	0.34
Sat Flow, veh/h	3711	0	0	3711	3056	1082
Grp Volume(v), veh/h	1337	0	0	2358	726	354
Grp Sat Flow(s),veh/h/ln	1763	0	0	1763	1528	1082
Q Serve(g_s), s	35.3	0.0	0.0	56.5	20.5	32.0
Cycle Q Clear(g_c), s	35.3	0.0	0.0	56.5	20.5	32.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1994	0	0	1994	1044	369
V/C Ratio(X)	0.67	0.00	0.00	1.18	0.70	0.96
Avail Cap(c_a), veh/h	1994	0	0	1994	1057	374
HCM Platoon Ratio	0.33	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.09	0.09	0.09
Uniform Delay (d), s/veh	32.0	0.0	0.0	21.7	28.4	32.2
Incr Delay (d2), s/veh	1.8	0.0	0.0	82.8	0.1	6.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.0	0.0	0.0	43.5	7.5	8.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	33.8	0.0	0.0	104.5	28.6	38.9
LnGrp LOS	C	A	A	F	C	D
Approach Vol, veh/h	1337			2358	1080	
Approach Delay, s/veh	33.8			104.5	32.0	
Approach LOS	C			F	C	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	61.4	61.4	38.6
Change Period (Y+Rc), s	4.9	4.9	4.4
Max Green Setting (Gmax), s	56.1	56.1	34.6
Max Q Clear Time (g_c+I1), s	37.3	58.5	34.0
Green Ext Time (p_c), s	3.9	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	68.3
HCM 6th LOS	E

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR	SWR	SWR2
Lane Configurations												
Traffic Volume (vph)	1510	250	1200	80	100	120	170	130	120	40	750	120
Future Volume (vph)	1510	250	1200	80	100	120	170	130	120	40	750	120
Ideal Flow (vphpl)	1900	1900	1629	1629	1296	1296	1296	1296	1296	1296	1900	1900
Total Lost time (s)	5.5		5.5			5.0			5.0		4.5	
Lane Util. Factor	0.95		0.95			1.00			1.00		1.00	
Frpb, ped/bikes	0.98		1.00			1.00			1.00		1.00	
Flpb, ped/bikes	1.00		1.00			1.00			1.00		1.00	
Frt	0.98		0.99			0.94			0.98		0.86	
Flt Protected	1.00		1.00			0.99			0.98		1.00	
Satd. Flow (prot)	3370		2977			1169			1208		1596	
Flt Permitted	1.00		1.00			0.79			0.53		1.00	
Satd. Flow (perm)	3370		2977			936			657		1596	
Peak-hour factor, PHF	0.95	0.90	0.98	0.98	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.96
Adj. Flow (vph)	1589	278	1224	82	105	126	179	137	126	42	781	125
RTOR Reduction (vph)	9	0	0	0	0	37	0	0	0	0	0	0
Lane Group Flow (vph)	1858	0	1306	0	0	373	0	0	305	0	906	0
Confl. Peds. (#/hr)		28										
Confl. Bikes (#/hr)		3										
Turn Type	NA		NA		Perm	NA		Perm	NA		Prot	
Protected Phases	2		6			8			4		5	
Permitted Phases					8			4				
Actuated Green, G (s)	97.5		45.5			42.0			42.0		47.5	
Effective Green, g (s)	97.5		45.5			42.0			42.0		47.5	
Actuated g/C Ratio	0.65		0.30			0.28			0.28		0.32	
Clearance Time (s)	5.5		5.5			5.0			5.0		4.5	
Vehicle Extension (s)	2.0		2.0			2.0			2.0		3.0	
Lane Grp Cap (vph)	2190		903			262			183		505	
v/s Ratio Prot	0.55		c0.44								c0.57	
v/s Ratio Perm						0.40			c0.46			
v/c Ratio	0.85		1.45			1.42			1.67		1.79	
Uniform Delay, d1	20.5		52.2			54.0			54.0		51.2	
Progression Factor	1.00		1.01			1.00			1.00		1.00	
Incremental Delay, d2	4.3		206.6			211.9			322.8		365.2	
Delay (s)	24.8		259.5			265.9			376.8		416.5	
Level of Service	C		F			F			F		F	
Approach Delay (s)	24.8		259.5			265.9			376.8			
Approach LOS	C		F			F			F			

Intersection Summary			
HCM 2000 Control Delay	205.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.63		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	148.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1710	100	150	1190	90	720
Future Volume (veh/h)	1710	100	150	1190	90	720
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	1800	105	158	1253	95	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	2317	134	181	2879	218	
Arrive On Green	1.00	1.00	0.10	0.82	0.12	0.00
Sat Flow, veh/h	3480	196	1767	3618	1767	1572
Grp Volume(v), veh/h	929	976	158	1253	95	0
Grp Sat Flow(s),veh/h/ln	1763	1820	1767	1763	1767	1572
Q Serve(g_s), s	0.0	0.0	13.2	15.2	7.5	0.0
Cycle Q Clear(g_c), s	0.0	0.0	13.2	15.2	7.5	0.0
Prop In Lane		0.11	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1206	1245	181	2879	218	
V/C Ratio(X)	0.77	0.78	0.87	0.44	0.44	
Avail Cap(c_a), veh/h	1206	1245	253	2879	218	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.41	0.41	0.72	0.72	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	66.3	3.9	60.9	0.0
Incr Delay (d2), s/veh	2.0	2.1	15.6	0.3	6.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.7	6.7	4.5	3.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	2.0	2.1	82.0	4.3	67.1	0.0
LnGrp LOS	A	A	F	A	E	
Approach Vol, veh/h	1905			1411	95	
Approach Delay, s/veh	2.1			13.0	67.1	
Approach LOS	A			B	E	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	19.9	107.1		23.0		127.0
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	21.5	96.5		18.5		122.5
Max Q Clear Time (g_c+I1), s	15.2	2.0		9.5		17.2
Green Ext Time (p_c), s	0.2	31.4		0.1		13.3

Intersection Summary	
HCM 6th Ctrl Delay	8.4
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	680	1580	340	0	1340	2130	0	0	0	0	0	0
Future Volume (vph)	680	1580	340	0	1340	2130	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	4.0			4.5	4.5						
Lane Util. Factor	1.00	0.91			0.95	0.88						
Frpb, ped/bikes	1.00	1.00			1.00	0.97						
Flpb, ped/bikes	1.00	1.00			1.00	1.00						
Frt	1.00	0.97			1.00	0.85						
Flt Protected	0.95	1.00			1.00	1.00						
Satd. Flow (prot)	1752	4902			3505	2689						
Flt Permitted	0.95	1.00			1.00	1.00						
Satd. Flow (perm)	1752	4902			3505	2689						
Peak-hour factor, PHF	0.95	0.95	0.95	0.97	0.97	0.97	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	716	1663	358	0	1381	2196	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	716	2021	0	0	1381	2196	0	0	0	0	0	0
Confl. Bikes (#/hr)						9						
Turn Type	Prot	NA			NA	Perm						
Protected Phases	5	Free			6							
Permitted Phases						6						
Actuated Green, G (s)	34.6	115.0			70.5	70.5						
Effective Green, g (s)	34.6	115.0			70.5	70.5						
Actuated g/C Ratio	0.30	1.00			0.61	0.61						
Clearance Time (s)	5.4				4.5	4.5						
Vehicle Extension (s)	3.0				2.8	2.8						
Lane Grp Cap (vph)	527	4902			2148	1648						
v/s Ratio Prot	c0.41	0.41			0.39							
v/s Ratio Perm						c0.82						
v/c Ratio	1.36	0.41			0.64	1.33						
Uniform Delay, d1	40.2	0.0			14.2	22.2						
Progression Factor	1.00	1.00			0.99	1.02						
Incremental Delay, d2	173.4	0.3			0.4	150.6						
Delay (s)	213.6	0.3			14.5	173.3						
Level of Service	F	A			B	F						
Approach Delay (s)		56.1			112.0			0.0			0.0	
Approach LOS		E			F			A			A	

Intersection Summary			
HCM 2000 Control Delay	87.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	119.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	150	560	80	40	60	40	1800	100	140	30	40	40
Future Volume (vph)	150	560	80	40	60	40	1800	100	140	30	40	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1534	1534	1534	1900
Total Lost time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Lane Util. Factor	1.00	0.86		0.86		1.00	0.91			1.00		
Frpb, ped/bikes	1.00	1.00		0.97		1.00	0.99			0.99		
Flpb, ped/bikes	1.00	1.00		1.00		1.00	1.00			1.00		
Frt	1.00	0.98		0.85		1.00	0.99			0.97		
Flt Protected	0.95	1.00		1.00		0.95	1.00			0.97		
Satd. Flow (prot)	1752	4650		1313		1752	4969			1393		
Flt Permitted	0.95	1.00		1.00		0.10	1.00			0.49		
Satd. Flow (perm)	1752	4650		1313		175	4969			701		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	158	589	84	42	63	42	1895	105	147	32	42	42
RTOR Reduction (vph)	0	1	0	31	0	0	5	0	0	8	0	0
Lane Group Flow (vph)	158	676	0	7	0	105	1995	0	0	213	0	0
Confl. Peds. (#/hr)				9	9			27			30	21
Confl. Bikes (#/hr)								3			1	
Turn Type	Prot	NA		Perm	custom	Prot	NA		Perm	NA		Perm
Protected Phases	5!	2				1	6			8		
Permitted Phases				2	1				8			4
Actuated Green, G (s)	11.9	22.2		22.2		42.1	52.9			36.0		
Effective Green, g (s)	11.9	22.2		22.2		42.1	52.9			36.0		
Actuated g/C Ratio	0.10	0.19		0.19		0.37	0.46			0.31		
Clearance Time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Vehicle Extension (s)	3.0	4.0		4.0		3.0	3.0			3.0		
Lane Grp Cap (vph)	181	897		253		64	2285			219		
v/s Ratio Prot	0.09	0.15					c0.40					
v/s Ratio Perm				0.01		c0.60				c0.30		
v/c Ratio	0.87	0.75		0.03		1.64	0.87			0.97		
Uniform Delay, d1	50.8	43.8		37.7		36.5	28.0			39.0		
Progression Factor	1.27	0.49		1.00		1.00	1.00			1.00		
Incremental Delay, d2	32.7	5.6		0.2		348.0	5.0			53.1		
Delay (s)	97.0	26.9		37.9		384.4	33.0			92.2		
Level of Service	F	C		D		F	C			F		
Approach Delay (s)		40.1					50.5			92.2		
Approach LOS		D					D			F		

Intersection Summary			
HCM 2000 Control Delay	47.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		
! Phase conflict between lane groups.			
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	210	510	140	270	1300	250	280	130	140	100	200	430
Future Volume (veh/h)	210	510	140	270	1300	250	280	130	140	100	200	430
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.95	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1495	1495	1856
Adj Flow Rate, veh/h	221	537	0	284	1368	141	295	137	147	105	211	453
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	144	820		462	1595	678	74	781	348	60	331	613
Arrive On Green	0.04	0.23	0.00	0.26	0.45	0.45	0.04	0.22	0.22	0.04	0.22	0.22
Sat Flow, veh/h	3428	3526	1572	1767	3526	1497	1767	3526	1572	1424	1495	2768
Grp Volume(v), veh/h	221	537	0	284	1368	141	295	137	147	105	211	453
Grp Sat Flow(s),veh/h/ln	1714	1763	1572	1767	1763	1497	1767	1763	1572	1424	1495	1384
Q Serve(g_s), s	4.0	13.2	0.0	13.5	33.1	5.4	4.0	3.0	3.9	4.0	12.2	14.5
Cycle Q Clear(g_c), s	4.0	13.2	0.0	13.5	33.1	5.4	4.0	3.0	3.9	4.0	12.2	14.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	144	820		462	1595	678	74	781	348	60	331	613
V/C Ratio(X)	1.54	0.65		0.61	0.86	0.21	3.98	0.18	0.42	1.76	0.64	0.74
Avail Cap(c_a), veh/h	144	1714		462	1696	720	74	1404	626	60	595	1102
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.7	33.1	0.0	31.0	23.4	15.8	45.7	30.1	8.1	45.7	33.7	34.6
Incr Delay (d2), s/veh	273.7	1.7	0.0	1.8	4.6	0.2	1373.8	0.1	1.0	401.1	2.8	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.2	5.7	0.0	5.8	13.8	1.9	30.0	1.3	2.8	8.1	4.7	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	319.4	34.9	0.0	32.8	28.0	16.0	1419.5	30.2	9.1	446.8	36.4	37.0
LnGrp LOS	F	C		C	C	B	F	C	A	F	D	D
Approach Vol, veh/h		758			1793			579			769	
Approach Delay, s/veh		117.8			27.8			732.7			92.8	
Approach LOS		F			C			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.9	28.1	9.4	27.0	9.9	49.1	9.4	27.0
Change Period (Y+Rc), s	5.9	* 5.9	5.4	5.9	5.9	5.9	5.4	5.9
Max Green Setting (Gmax), s	4.0	* 46	4.0	38.0	4.0	45.9	4.0	38.0
Max Q Clear Time (g_c+I1), s	15.5	15.2	6.0	16.5	6.0	35.1	6.0	5.9
Green Ext Time (p_c), s	0.0	7.0	0.0	4.6	0.0	8.1	0.0	1.8

Intersection Summary	
HCM 6th Ctrl Delay	162.8
HCM 6th LOS	F

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	270	790	0	0	0	0	0	740	160
Future Volume (veh/h)	0	0	0	270	790	0	0	0	0	0	740	160
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.84
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach					No						No	
Adj Sat Flow, veh/h/ln				1856	1856	0				0	1392	1392
Adj Flow Rate, veh/h				278	814	0				0	779	140
Peak Hour Factor				0.97	0.97	0.97				0.95	0.95	0.95
Percent Heavy Veh, %				3	3	0				0	3	3
Cap, veh/h				940	987	0				0	831	149
Arrive On Green				0.18	0.18	0.00				0.00	0.38	0.38
Sat Flow, veh/h				1767	1856	0				0	2238	390
Grp Volume(v), veh/h				278	814	0				0	475	444
Grp Sat Flow(s),veh/h/ln				1767	1856	0				0	1322	1236
Q Serve(g_s), s				15.9	49.1	0.0				0.0	40.1	40.1
Cycle Q Clear(g_c), s				15.9	49.1	0.0				0.0	40.1	40.1
Prop In Lane				1.00		0.00				0.00		0.32
Lane Grp Cap(c), veh/h				940	987	0				0	507	474
V/C Ratio(X)				0.30	0.82	0.00				0.00	0.94	0.94
Avail Cap(c_a), veh/h				940	987	0				0	548	512
HCM Platoon Ratio				0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)				0.70	0.70	0.00				0.00	0.09	0.09
Uniform Delay (d), s/veh				28.9	42.6	0.0				0.0	34.4	34.4
Incr Delay (d2), s/veh				0.6	5.6	0.0				0.0	3.2	3.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				7.7	26.0	0.0				0.0	13.2	12.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				29.5	48.2	0.0				0.0	37.6	37.9
LnGrp LOS				C	D	A				A	D	D
Approach Vol, veh/h					1092						919	
Approach Delay, s/veh					43.4						37.8	
Approach LOS					D						D	
Timer - Assigned Phs				4		6						
Phs Duration (G+Y+Rc), s				49.4		66.6						
Change Period (Y+Rc), s				4.9		4.9						
Max Green Setting (Gmax), s				48.1		58.1						
Max Q Clear Time (g_c+I1), s				42.1		51.1						
Green Ext Time (p_c), s				2.3		2.8						
Intersection Summary												
HCM 6th Ctrl Delay			40.8									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	850	510	210	790	0	0	0	0
Future Volume (veh/h)	0	0	0	0	850	510	210	790	0	0	0	0
Initial Q (Qb), veh				0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00		0.83	1.00		1.00			
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach					No			No				
Adj Sat Flow, veh/h/ln				0	1642	1642	1856	1856	0			
Adj Flow Rate, veh/h				0	895	477	221	832	0			
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %				0	3	3	3	3	0			
Cap, veh/h				0	1272	471	0	821	0			
Arrive On Green				0.00	0.13	0.13	0.23	0.23	0.00			
Sat Flow, veh/h				0	3201	1156	0	3618	0			
Grp Volume(v), veh/h				0	895	477	0	832	0			
Grp Sat Flow(s),veh/h/ln				0	1560	1156	0	1763	0			
Q Serve(g_s), s				0.0	31.8	47.3	0.0	27.0	0.0			
Cycle Q Clear(g_c), s				0.0	31.8	47.3	0.0	27.0	0.0			
Prop In Lane				0.00		1.00	0.00		0.00			
Lane Grp Cap(c), veh/h				0	1272	471	0	821	0			
V/C Ratio(X)				0.00	0.70	1.01	0.00	1.01	0.00			
Avail Cap(c_a), veh/h				0	1272	471	0	821	0			
HCM Platoon Ratio				1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)				0.00	0.09	0.09	0.00	0.10	0.00			
Uniform Delay (d), s/veh				0.0	43.5	50.2	0.0	44.5	0.0			
Incr Delay (d2), s/veh				0.0	0.3	15.5	0.0	13.6	0.0			
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln				0.0	13.4	16.7	0.0	13.3	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				0.0	43.8	65.7	0.0	58.1	0.0			
LnGrp LOS				A	D	F	A	F	A			
Approach Vol, veh/h					1372			832				
Approach Delay, s/veh					51.4			58.1				
Approach LOS					D			E				
Timer - Assigned Phs						6		8				
Phs Duration (G+Y+Rc), s						52.2		31.9				
Change Period (Y+Rc), s						4.9		* 4.9				
Max Green Setting (Gmax), s						47.3		* 27				
Max Q Clear Time (g_c+I1), s						49.3		29.0				
Green Ext Time (p_c), s						0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			53.9									
HCM 6th LOS			D									
Notes												

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰↑	↱	↰	↑↑		↰	↑↑	↱
Traffic Volume (veh/h)	0	0	0	580	670	360	140	1250	0	0	1170	570
Future Volume (veh/h)	0	0	0	580	670	360	140	1250	0	0	1170	570
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.91	1.00		1.00	1.00		0.89
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1655	1655	1655	1856	1856	0	1856	1856	1856
Adj Flow Rate, veh/h				611	705	366	147	1316	0	0	1232	560
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				3	3	3	3	3	0	3	3	3
Cap, veh/h				701	700	512	131	1659	0	2	1264	503
Arrive On Green				0.44	0.44	0.44	0.10	0.63	0.00	0.00	0.36	0.36
Sat Flow, veh/h				1577	1573	1273	1767	3618	0	1767	3526	1403
Grp Volume(v), veh/h				611	705	366	147	1316	0	0	1232	560
Grp Sat Flow(s),veh/h/ln				1577	1573	1273	1767	1763	0	1767	1763	1403
Q Serve(g_s), s				40.8	51.6	32.9	8.6	32.2	0.0	0.0	40.0	41.6
Cycle Q Clear(g_c), s				40.8	51.6	32.9	8.6	32.2	0.0	0.0	40.0	41.6
Prop In Lane				1.00		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h				701	700	512	131	1659	0	2	1264	503
V/C Ratio(X)				0.87	1.01	0.72	1.12	0.79	0.00	0.00	0.97	1.11
Avail Cap(c_a), veh/h				701	700	512	131	1659	0	87	1264	503
HCM Platoon Ratio				1.00	1.00	1.00	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				0.64	0.64	0.64	0.09	0.09	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				29.2	32.2	39.6	52.3	17.5	0.0	0.0	36.7	37.2
Incr Delay (d2), s/veh				7.5	29.1	2.6	64.6	0.4	0.0	0.0	19.9	74.9
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				16.6	24.8	10.5	6.1	10.8	0.0	0.0	19.9	24.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				36.7	61.3	42.3	116.9	17.9	0.0	0.0	56.6	112.1
LnGrp LOS				D	F	D	F	B	A	A	E	F
Approach Vol, veh/h					1682			1463			1792	
Approach Delay, s/veh					48.2			27.8			73.9	
Approach LOS					D			C			E	

Timer - Assigned Phs			3	4		6	7	8
Phs Duration (G+Y+Rc), s			13.0	47.0		56.0	0.0	60.0
Change Period (Y+Rc), s			4.4	5.4		4.4	4.5	5.4
Max Green Setting (Gmax), s			8.6	41.6		51.6	5.7	44.4
Max Q Clear Time (g_c+I1), s			10.6	43.6		53.6	0.0	34.2
Green Ext Time (p_c), s			0.0	0.0		0.0	0.0	7.4

Intersection Summary	
HCM 6th Ctrl Delay	51.5
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	90	100	410	910	50	400	150	250	80	150	170
Future Volume (veh/h)	50	90	100	410	910	50	400	150	250	80	150	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.81	1.00		0.86	1.00		0.73	1.00		0.80
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1585	1585	1856	1856	1639	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	53	95	69	432	958	24	421	158	208	84	158	142
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	54	253	184	453	1028	658	331	147	193	77	155	139
Arrive On Green	0.01	0.11	0.11	0.26	0.55	0.55	0.10	0.25	0.25	0.04	0.19	0.19
Sat Flow, veh/h	1767	770	559	1767	1856	1188	3428	592	780	1767	800	719
Grp Volume(v), veh/h	53	0	164	432	958	24	421	0	366	84	0	300
Grp Sat Flow(s),veh/h/ln	1767	0	1330	1767	1856	1188	1714	0	1372	1767	0	1519
Q Serve(g_s), s	4.5	0.0	17.2	36.1	71.4	1.4	14.5	0.0	37.1	6.5	0.0	29.1
Cycle Q Clear(g_c), s	4.5	0.0	17.2	36.1	71.4	1.4	14.5	0.0	37.1	6.5	0.0	29.1
Prop In Lane	1.00		0.42	1.00		1.00	1.00		0.57	1.00		0.47
Lane Grp Cap(c), veh/h	54	0	436	453	1028	658	331	0	339	77	0	295
V/C Ratio(X)	0.98	0.00	0.38	0.95	0.93	0.04	1.27	0.00	1.08	1.10	0.00	1.02
Avail Cap(c_a), veh/h	54	0	436	514	1028	658	331	0	339	77	0	295
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.86	0.00	0.86	0.09	0.09	0.09	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	74.2	0.0	52.6	54.9	30.8	15.2	67.8	0.0	56.5	71.8	0.0	60.5
Incr Delay (d2), s/veh	105.0	0.0	2.1	4.2	2.0	0.0	143.3	0.0	71.3	131.7	0.0	57.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	6.5	16.7	32.1	0.4	13.0	0.0	19.7	5.8	0.0	16.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	179.2	0.0	54.7	59.1	32.9	15.2	211.1	0.0	127.7	203.5	0.0	117.6
LnGrp LOS	F	A	D	E	C	B	F	A	F	F	A	F
Approach Vol, veh/h		217			1414			787			384	
Approach Delay, s/veh		85.1			40.6			172.3			136.4	
Approach LOS		F			D			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	42.9	54.1	19.0	34.0	9.0	88.0	11.0	42.0
Change Period (Y+Rc), s	4.4	4.9	4.5	4.9	4.4	4.9	4.5	4.9
Max Green Setting (Gmax), s	43.6	44.1	14.5	29.1	4.6	83.1	6.5	37.1
Max Q Clear Time (g_c+I1), s	38.1	19.2	16.5	31.1	6.5	73.4	8.5	39.1
Green Ext Time (p_c), s	0.4	2.0	0.0	0.0	0.0	5.7	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	94.2
HCM 6th LOS	F

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	220	580	970	100	190	250
Future Volume (veh/h)	220	580	970	100	190	250
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.90	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1856	1856	1565	1565	1856	1856
Adj Flow Rate, veh/h	232	611	1021	103	200	232
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	120	1224	911	92	328	292
Arrive On Green	0.66	0.66	0.66	0.66	0.19	0.19
Sat Flow, veh/h	497	1856	1381	139	1767	1572
Grp Volume(v), veh/h	232	611	0	1124	200	232
Grp Sat Flow(s),veh/h/ln	497	1856	0	1520	1767	1572
Q Serve(g_s), s	0.0	10.1	0.0	39.7	6.3	8.5
Cycle Q Clear(g_c), s	39.7	10.1	0.0	39.7	6.3	8.5
Prop In Lane	1.00			0.09	1.00	1.00
Lane Grp Cap(c), veh/h	120	1224	0	1003	328	292
V/C Ratio(X)	1.94	0.50	0.00	1.12	0.61	0.79
Avail Cap(c_a), veh/h	120	1224	0	1003	1057	941
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.1	5.2	0.0	10.2	22.5	23.4
Incr Delay (d2), s/veh	451.8	0.6	0.0	67.8	0.7	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.7	3.0	0.0	27.8	2.5	3.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	481.9	5.8	0.0	78.0	23.2	25.3
LnGrp LOS	F	A	A	F	C	C
Approach Vol, veh/h		843	1124		432	
Approach Delay, s/veh		136.8	78.0		24.3	
Approach LOS		F	E		C	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		44.6		15.6		44.6
Change Period (Y+Rc), s		4.9		4.4		4.9
Max Green Setting (Gmax), s		39.7		36.0		39.7
Max Q Clear Time (g_c+I1), s		41.7		10.5		41.7
Green Ext Time (p_c), s		0.0		0.7		0.0
Intersection Summary						
HCM 6th Ctrl Delay			89.0			
HCM 6th LOS			F			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	490	80	160	840	170	150	220	90	110	360	110
Future Volume (veh/h)	70	490	80	160	840	170	150	220	90	110	360	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.79	1.00		0.87	1.00		0.79	1.00		0.68
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	73	510	68	168	884	173	158	232	26	116	379	24
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	71	638	85	71	604	118	71	598	403	71	598	342
Arrive On Green	0.04	0.41	0.41	0.04	0.41	0.41	0.04	0.32	0.32	0.04	0.32	0.32
Sat Flow, veh/h	1767	1548	206	1767	1466	287	1767	1856	1249	1767	1856	1062
Grp Volume(v), veh/h	73	0	578	168	0	1057	158	232	26	116	379	24
Grp Sat Flow(s),veh/h/ln	1767	0	1755	1767	0	1752	1767	1856	1249	1767	1856	1062
Q Serve(g_s), s	4.0	0.0	28.9	4.0	0.0	41.3	4.0	9.7	1.4	4.0	17.4	1.6
Cycle Q Clear(g_c), s	4.0	0.0	28.9	4.0	0.0	41.3	4.0	9.7	1.4	4.0	17.4	1.6
Prop In Lane	1.00		0.12	1.00		0.16	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	71	0	723	71	0	722	71	598	403	71	598	342
V/C Ratio(X)	1.03	0.00	0.80	2.38	0.00	1.46	2.24	0.39	0.06	1.64	0.63	0.07
Avail Cap(c_a), veh/h	71	0	723	71	0	722	71	687	463	71	687	393
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.1	0.0	25.8	48.1	0.0	29.5	48.1	26.3	23.5	48.1	28.9	23.5
Incr Delay (d2), s/veh	117.1	0.0	5.9	663.0	0.0	216.2	600.7	0.5	0.1	344.8	1.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	0.0	13.0	14.7	0.0	59.9	13.5	4.3	0.4	8.5	7.7	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	165.2	0.0	31.7	711.1	0.0	245.7	648.8	26.8	23.6	392.9	30.4	23.6
LnGrp LOS	F	A	C	F	A	F	F	C	C	F	C	C
Approach Vol, veh/h		651			1225			416			519	
Approach Delay, s/veh		46.7			309.5			262.8			111.1	
Approach LOS		D			F			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	46.2	8.4	37.2	8.4	46.2	8.4	37.2
Change Period (Y+Rc), s	4.4	4.9	4.4	4.9	4.4	4.9	4.4	4.9
Max Green Setting (Gmax), s	4.0	41.3	4.0	37.1	4.0	41.3	4.0	37.1
Max Q Clear Time (g_c+I1), s	6.0	30.9	6.0	19.4	6.0	43.3	6.0	11.7
Green Ext Time (p_c), s	0.0	2.1	0.0	2.1	0.0	0.0	0.0	1.6

Intersection Summary	
HCM 6th Ctrl Delay	205.1
HCM 6th LOS	F

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	0	770	800	20	20	60	580
Future Vol, veh/h	0	0	0	0	0	0	770	800	20	20	60	580
Conflicting Peds, #/hr	0	0	0	33	0	36	10	0	33	36	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	0	0	0	811	842	21	21	63	611

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	2649	2626	925	73	0	0	899	0	0
Stage 1	2511	2511	-	-	-	-	-	-	-
Stage 2	138	115	-	-	-	-	-	-	-
Critical Hdwy	6.43	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	25	24	325	1520	-	-	751	-	0
Stage 1	62	56	-	-	-	-	-	-	0
Stage 2	886	798	-	-	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	0	0	303	1520	-	-	725	-	-
Mov Cap-2 Maneuver	0	0	-	-	-	-	-	-	-
Stage 1	0	0	-	-	-	-	-	-	-
Stage 2	833	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	4.9	2.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	1520	-	-	-	725	-
HCM Lane V/C Ratio	0.533	-	-	-	0.029	-
HCM Control Delay (s)	10	0	-	0	10.1	0
HCM Lane LOS	B	A	-	A	B	A
HCM 95th %tile Q(veh)	3.3	-	-	-	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↱								↰	↑↑	
Traffic Volume (veh/h)	0	670	140	0	0	0	0	0	0	370	640	0
Future Volume (veh/h)	0	670	140	0	0	0	0	0	0	370	640	0
Initial Q (Qb), veh	0	0	0							0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93							1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00							1.00	1.00	1.00
Work Zone On Approach		No									No	
Adj Sat Flow, veh/h/ln	0	1397	1397							1856	1856	0
Adj Flow Rate, veh/h	0	705	118							389	674	0
Peak Hour Factor	0.95	0.95	0.95							0.95	0.95	0.95
Percent Heavy Veh, %	0	3	3							3	3	0
Cap, veh/h	0	1409	236							0	856	0
Arrive On Green	0.00	0.63	0.63							0.24	0.24	0.00
Sat Flow, veh/h	0	2318	376							0	3618	0
Grp Volume(v), veh/h	0	416	407							0	674	0
Grp Sat Flow(s),veh/h/ln	0	1327	1298							0	1763	0
Q Serve(g_s), s	0.0	12.8	12.8							0.0	13.4	0.0
Cycle Q Clear(g_c), s	0.0	12.8	12.8							0.0	13.4	0.0
Prop In Lane	0.00		0.29							0.00		0.00
Lane Grp Cap(c), veh/h	0	831	813							0	856	0
V/C Ratio(X)	0.00	0.50	0.50							0.00	0.79	0.00
Avail Cap(c_a), veh/h	0	831	813							0	987	0
HCM Platoon Ratio	1.00	1.00	1.00							1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00							0.00	0.49	0.00
Uniform Delay (d), s/veh	0.0	7.6	7.6							0.0	26.6	0.0
Incr Delay (d2), s/veh	0.0	2.1	2.2							0.0	1.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0							0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	3.6	3.5							0.0	5.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	9.8	9.8							0.0	28.2	0.0
LnGrp LOS	A	A	A							A	C	A
Approach Vol, veh/h		823									674	
Approach Delay, s/veh		9.8									28.2	
Approach LOS		A									C	

Timer - Assigned Phs		2		4
Phs Duration (G+Y+Rc), s		51.9		23.1
Change Period (Y+Rc), s		4.9		4.9
Max Green Setting (Gmax), s		18.3		21.0
Max Q Clear Time (g_c+I1), s		14.8		15.4
Green Ext Time (p_c), s		0.9		1.2

Intersection Summary			
HCM 6th Ctrl Delay			18.1
HCM 6th LOS			B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	220	820	0	0	0	0	0	810	450	0	0	0
Future Volume (veh/h)	220	820	0	0	0	0	0	810	450	0	0	0
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.83			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Work Zone On Approach		No						No				
Adj Sat Flow, veh/h/ln	1856	1856	0				0	1513	1513			
Adj Flow Rate, veh/h	232	863	0				0	853	429			
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95			
Percent Heavy Veh, %	3	3	0				0	3	3			
Cap, veh/h	301	895	0				0	905	446			
Arrive On Green	0.11	0.11	0.00				0.00	0.52	0.52			
Sat Flow, veh/h	671	2658	0				0	1811	855			
Grp Volume(v), veh/h	567	528	0				0	704	578			
Grp Sat Flow(s),veh/h/ln	1641	1604	0				0	1437	1153			
Q Serve(g_s), s	25.9	24.5	0.0				0.0	34.4	36.1			
Cycle Q Clear(g_c), s	25.9	24.5	0.0				0.0	34.4	36.1			
Prop In Lane	0.41		0.00				0.00		0.74			
Lane Grp Cap(c), veh/h	638	557	0				0	750	602			
V/C Ratio(X)	0.89	0.95	0.00				0.00	0.94	0.96			
Avail Cap(c_a), veh/h	638	557	0				0	768	617			
HCM Platoon Ratio	0.33	0.33	1.00				1.00	1.00	1.00			
Upstream Filter(I)	0.40	0.40	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	33.1	32.5	0.0				0.0	16.8	17.2			
Incr Delay (d2), s/veh	7.8	14.4	0.0				0.0	18.5	26.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	12.6	12.6	0.0				0.0	13.9	12.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.9	46.9	0.0				0.0	35.3	43.5			
LnGrp LOS	D	D	A				A	D	D			
Approach Vol, veh/h		1095						1282				
Approach Delay, s/veh		43.8						39.0				
Approach LOS		D						D				

Timer - Assigned Phs		2		4					
Phs Duration (G+Y+Rc), s		31.0		44.0					
Change Period (Y+Rc), s		4.9		4.9					
Max Green Setting (Gmax), s		25.1		40.1					
Max Q Clear Time (g_c+I1), s		27.9		38.1					
Green Ext Time (p_c), s		0.0		1.0					

Intersection Summary		
HCM 6th Ctrl Delay		41.2
HCM 6th LOS		D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	640	520	110	0	0	0	0	730	270	470	1270	0
Future Volume (veh/h)	640	520	110	0	0	0	0	730	270	470	1270	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95				1.00		0.94	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1690	1690	1856	1856	0
Adj Flow Rate, veh/h	674	547	109				0	768	262	495	1337	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	573	482	96				0	738	252	419	2100	0
Arrive On Green	0.32	0.32	0.32				0.00	0.32	0.32	0.47	1.00	0.00
Sat Flow, veh/h	1767	1488	297				0	2393	787	1767	3618	0
Grp Volume(v), veh/h	674	0	656				0	534	496	495	1337	0
Grp Sat Flow(s),veh/h/ln	1767	0	1785				0	1606	1490	1767	1763	0
Q Serve(g_s), s	37.6	0.0	37.6				0.0	37.1	37.1	27.5	0.0	0.0
Cycle Q Clear(g_c), s	37.6	0.0	37.6				0.0	37.1	37.1	27.5	0.0	0.0
Prop In Lane	1.00		0.17				0.00		0.53	1.00		0.00
Lane Grp Cap(c), veh/h	573	0	579				0	514	477	419	2100	0
V/C Ratio(X)	1.18	0.00	1.13				0.00	1.04	1.04	1.18	0.64	0.00
Avail Cap(c_a), veh/h	573	0	579				0	514	477	419	2100	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	0.23	0.00	0.23				0.00	1.00	1.00	0.14	0.14	0.00
Uniform Delay (d), s/veh	39.2	0.0	39.2				0.0	39.5	39.5	30.5	0.0	0.0
Incr Delay (d2), s/veh	84.0	0.0	65.7				0.0	50.5	52.1	85.4	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	29.6	0.0	26.9				0.0	21.6	20.2	18.8	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	123.2	0.0	104.9				0.0	90.0	91.6	115.9	0.2	0.0
LnGrp LOS	F	A	F				A	F	F	F	A	A
Approach Vol, veh/h		1330						1030			1832	
Approach Delay, s/veh		114.2						90.7			31.5	
Approach LOS		F						F			C	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	32.0	42.0		42.0		74.0
Change Period (Y+Rc), s	4.5	4.9		4.4		4.9
Max Green Setting (Gmax), s	27.5	37.1		37.6		69.1
Max Q Clear Time (g_c+I1), s	29.5	39.1		39.6		2.0
Green Ext Time (p_c), s	0.0	0.0		0.0		4.6

Intersection Summary			
HCM 6th Ctrl Delay			72.3
HCM 6th LOS			E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	1300	40	0	0	0	0	30	20	300	40	0
Future Volume (veh/h)	120	1300	40	0	0	0	0	30	20	300	40	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93				1.00		0.95	0.98		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1856	1856	1856	1856	0
Adj Flow Rate, veh/h	126	1368	37				0	32	6	316	42	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	188	2143	61				0	412	77	403	508	0
Arrive On Green	0.65	0.65	0.65				0.00	0.27	0.27	0.27	0.27	0.00
Sat Flow, veh/h	289	3290	93				0	1505	282	1329	1856	0
Grp Volume(v), veh/h	803	0	728				0	0	38	316	42	0
Grp Sat Flow(s),veh/h/ln	1841	0	1831				0	0	1787	1329	1856	0
Q Serve(g_s), s	32.4	0.0	27.6				0.0	0.0	1.9	27.8	2.0	0.0
Cycle Q Clear(g_c), s	32.4	0.0	27.6				0.0	0.0	1.9	29.7	2.0	0.0
Prop In Lane	0.16		0.05				0.00		0.16	1.00		0.00
Lane Grp Cap(c), veh/h	1199	0	1193				0	0	489	403	508	0
V/C Ratio(X)	0.67	0.00	0.61				0.00	0.00	0.08	0.78	0.08	0.00
Avail Cap(c_a), veh/h	1199	0	1193				0	0	707	565	734	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.00	0.09				0.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.9	0.0	12.1				0.0	0.0	32.4	43.4	32.4	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.2				0.0	0.0	0.1	4.8	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.9	0.0	10.9				0.0	0.0	0.8	9.7	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.2	0.0	12.3				0.0	0.0	32.4	48.2	32.5	0.0
LnGrp LOS	B	A	B				A	A	C	D	C	A
Approach Vol, veh/h		1531						38			358	
Approach Delay, s/veh		12.8						32.4			46.3	
Approach LOS		B						C			D	
Timer - Assigned Phs		2		4				8				
Phs Duration (G+Y+Rc), s		82.7		37.3				37.3				
Change Period (Y+Rc), s		4.5		4.5				4.5				
Max Green Setting (Gmax), s		63.5		47.5				47.5				
Max Q Clear Time (g_c+I1), s		34.4		3.9				31.7				
Green Ext Time (p_c), s		14.8		0.2				1.2				
Intersection Summary												
HCM 6th Ctrl Delay			19.4									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	660	600	30	20	0	570	0	80	20	80	20	0
Future Volume (veh/h)	660	600	30	20	0	570	0	80	20	80	20	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.95	1.00		0.90	1.00		0.89	0.95		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	0	1856	1856	1856	1856	0
Adj Flow Rate, veh/h	695	632	30	21	0	428	0	84	21	84	21	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	0	3	3	3	3	0
Cap, veh/h	685	1259	60	37	653	500	0	207	52	151	32	0
Arrive On Green	0.39	0.72	0.72	0.02	0.00	0.35	0.00	0.15	0.15	0.15	0.15	0.00
Sat Flow, veh/h	1767	1752	83	1767	1856	1421	0	1395	349	657	216	0
Grp Volume(v), veh/h	695	0	662	21	0	428	0	0	105	105	0	0
Grp Sat Flow(s),veh/h/ln	1767	0	1835	1767	1856	1421	0	0	1744	873	0	0
Q Serve(g_s), s	46.5	0.0	19.1	1.4	0.0	33.5	0.0	0.0	6.5	8.8	0.0	0.0
Cycle Q Clear(g_c), s	46.5	0.0	19.1	1.4	0.0	33.5	0.0	0.0	6.5	15.3	0.0	0.0
Prop In Lane	1.00		0.05	1.00		1.00	0.00		0.20	0.80		0.00
Lane Grp Cap(c), veh/h	685	0	1318	37	653	500	0	0	259	183	0	0
V/C Ratio(X)	1.01	0.00	0.50	0.57	0.00	0.86	0.00	0.00	0.41	0.57	0.00	0.00
Avail Cap(c_a), veh/h	685	0	1318	84	653	500	0	0	262	186	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	36.8	0.0	7.4	58.2	0.0	36.1	0.0	0.0	46.3	52.5	0.0	0.0
Incr Delay (d2), s/veh	38.2	0.0	1.4	12.9	0.0	17.0	0.0	0.0	1.0	4.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	27.1	0.0	7.5	0.8	0.0	14.0	0.0	0.0	2.9	3.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.9	0.0	8.8	71.1	0.0	53.1	0.0	0.0	47.3	56.6	0.0	0.0
LnGrp LOS	F	A	A	E	A	D	A	A	D	E	A	A
Approach Vol, veh/h		1357			449			105			105	
Approach Delay, s/veh		42.7			53.9			47.3			56.6	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.0	90.7		22.3	51.0	46.7		22.3
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.7	82.8		18.0	46.5	42.0		18.0
Max Q Clear Time (g_c+I1), s	3.4	21.1		8.5	48.5	35.5		17.3
Green Ext Time (p_c), s	0.0	6.0		0.3	0.0	1.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	46.1
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	220	1340	130	530	910	300	0	0	0	1150	630	620
Future Volume (veh/h)	220	1340	130	530	910	300	0	0	0	1150	630	620
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.77	1.00		0.91				1.00		0.75
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856				1856	1856	1856
Adj Flow Rate, veh/h	229	1396	128	558	958	285				1211	663	531
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3				3	3	3
Cap, veh/h	190	1014	92	612	1473	435				1256	660	418
Arrive On Green	0.11	0.32	0.32	0.11	0.19	0.19				0.36	0.36	0.36
Sat Flow, veh/h	1767	3178	287	1767	2617	774				3534	1856	1177
Grp Volume(v), veh/h	229	765	759	558	643	600				1211	663	531
Grp Sat Flow(s),veh/h/ln	1767	1763	1702	1767	1763	1628				1767	1856	1177
Q Serve(g_s), s	11.8	35.1	35.1	34.3	37.2	37.6				37.0	39.1	39.1
Cycle Q Clear(g_c), s	11.8	35.1	35.1	34.3	37.2	37.6				37.0	39.1	39.1
Prop In Lane	1.00		0.17	1.00		0.48				1.00		1.00
Lane Grp Cap(c), veh/h	190	562	543	612	992	916				1256	660	418
V/C Ratio(X)	1.21	1.36	1.40	0.91	0.65	0.65				0.96	1.01	1.27
Avail Cap(c_a), veh/h	190	562	543	612	992	916				1256	660	418
HCM Platoon Ratio	1.00	1.00	1.00	0.33	0.33	0.33				1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	49.1	37.4	37.5	47.0	34.7	34.9				34.8	35.5	35.5
Incr Delay (d2), s/veh	132.5	173.4	189.7	17.6	3.3	3.6				17.3	36.3	138.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.1	41.7	42.7	19.2	18.3	17.2				18.7	24.1	37.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	181.6	210.8	227.1	64.7	38.0	38.5				52.1	71.8	174.2
LnGrp LOS	F	F	F	E	D	D				D	F	F
Approach Vol, veh/h		1753			1801						2405	
Approach Delay, s/veh		214.1			46.4						84.5	
Approach LOS		F			D						F	

Timer - Assigned Phs	1	2		4	5	6
Phs Duration (G+Y+Rc), s	43.5	40.0		44.0	16.2	67.3
Change Period (Y+Rc), s	4.9	* 4.9		4.9	4.4	4.9
Max Green Setting (Gmax), s	21.6	* 35		39.1	11.8	44.9
Max Q Clear Time (g_c+I1), s	36.3	37.1		41.1	13.8	39.6
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	1.0

Intersection Summary	
HCM 6th Ctrl Delay	111.1
HCM 6th LOS	F

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2490	0	0	1280	600	540
Future Volume (veh/h)	2490	0	0	1280	600	540
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1856	1627	1316
Adj Flow Rate, veh/h	2621	0	0	1347	788	400
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	0	0	3	3	3
Cap, veh/h	1909	0	0	1909	1159	417
Arrive On Green	0.36	0.00	0.00	0.54	0.37	0.37
Sat Flow, veh/h	3711	0	0	3711	3099	1116
Grp Volume(v), veh/h	2621	0	0	1347	788	400
Grp Sat Flow(s),veh/h/ln	1763	0	0	1763	1550	1116
Q Serve(g_s), s	59.6	0.0	0.0	31.2	23.5	38.5
Cycle Q Clear(g_c), s	59.6	0.0	0.0	31.2	23.5	38.5
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1909	0	0	1909	1159	417
V/C Ratio(X)	1.37	0.00	0.00	0.71	0.68	0.96
Avail Cap(c_a), veh/h	1909	0	0	1909	1257	452
HCM Platoon Ratio	0.67	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.09	0.09	0.09
Uniform Delay (d), s/veh	35.0	0.0	0.0	18.7	28.9	33.6
Incr Delay (d2), s/veh	171.2	0.0	0.0	0.2	0.1	5.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	71.5	0.0	0.0	11.9	8.7	10.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	206.2	0.0	0.0	18.9	29.0	39.1
LnGrp LOS	F	A	A	B	C	D
Approach Vol, veh/h	2621			1347	1188	
Approach Delay, s/veh	206.2			18.9	32.4	
Approach LOS	F			B	C	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	64.5	64.5	45.5
Change Period (Y+Rc), s	4.9	4.9	4.4
Max Green Setting (Gmax), s	56.1	56.1	44.6
Max Q Clear Time (g_c+I1), s	61.6	33.2	40.5
Green Ext Time (p_c), s	0.0	4.1	0.6

Intersection Summary	
HCM 6th Ctrl Delay	117.2
HCM 6th LOS	F

Notes
User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR2	SBL	SBT	SBR	SWR	SWR2
Lane Configurations												
Traffic Volume (vph)	2560	470	700	40	90	100	170	90	140	60	700	70
Future Volume (vph)	2560	470	700	40	90	100	170	90	140	60	700	70
Ideal Flow (vphpl)	1900	1900	1629	1629	1296	1296	1900	1296	1296	1296	1900	1900
Total Lost time (s)	5.5		5.5			5.0			5.0		4.5	
Lane Util. Factor	0.95		0.95			1.00			1.00		1.00	
Frpb, ped/bikes	0.97		1.00			1.00			1.00		1.00	
Flpb, ped/bikes	1.00		1.00			1.00			1.00		1.00	
Frt	0.98		0.99			0.94			0.97		0.86	
Flt Protected	1.00		1.00			0.99			0.98		1.00	
Satd. Flow (prot)	3324		2980			1163			1204		1596	
Flt Permitted	1.00		1.00			0.74			0.63		1.00	
Satd. Flow (perm)	3324		2980			874			768		1596	
Peak-hour factor, PHF	0.95	0.95	0.98	0.98	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.96
Adj. Flow (vph)	2695	495	714	41	95	105	179	95	147	63	729	73
RTOR Reduction (vph)	10	0	0	0	0	42	0	0	0	0	0	0
Lane Group Flow (vph)	3180	0	755	0	0	337	0	0	305	0	802	0
Confl. Peds. (#/hr)		52										
Confl. Bikes (#/hr)		3										
Turn Type	NA		NA		Perm	NA		Perm	NA		Prot	
Protected Phases	2		6			8			4		5	
Permitted Phases					8			4				
Actuated Green, G (s)	98.5		42.8			41.0			41.0		51.2	
Effective Green, g (s)	98.5		42.8			41.0			41.0		51.2	
Actuated g/C Ratio	0.66		0.29			0.27			0.27		0.34	
Clearance Time (s)	5.5		5.5			5.0			5.0		4.5	
Vehicle Extension (s)	3.0		3.0			3.0			3.0		3.0	
Lane Grp Cap (vph)	2182		850			238			209		544	
v/s Ratio Prot	c0.96		0.25								0.50	
v/s Ratio Perm						0.39			c0.40			
v/c Ratio	1.46		0.89			1.42			1.46		1.47	
Uniform Delay, d1	25.8		51.3			54.5			54.5		49.4	
Progression Factor	1.00		0.92			1.00			1.00		1.00	
Incremental Delay, d2	208.4		10.9			209.9			231.2		223.3	
Delay (s)	234.2		58.4			264.4			285.7		272.7	
Level of Service	F		E			F			F		F	
Approach Delay (s)	234.2		58.4			264.4			285.7			
Approach LOS	F		E			F			F			

Intersection Summary			
HCM 2000 Control Delay	220.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.50		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	133.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2670	150	60	650	90	1280
Future Volume (veh/h)	2670	150	60	650	90	1280
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		0.97	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	2811	158	63	684	95	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	2553	142	65	2891	212	
Arrive On Green	1.00	1.00	0.04	0.82	0.12	0.00
Sat Flow, veh/h	3482	188	1767	3618	1767	1572
Grp Volume(v), veh/h	1446	1523	63	684	95	0
Grp Sat Flow(s),veh/h/ln	1763	1814	1767	1763	1767	1572
Q Serve(g_s), s	0.0	113.0	5.3	6.5	7.5	0.0
Cycle Q Clear(g_c), s	0.0	113.0	5.3	6.5	7.5	0.0
Prop In Lane		0.10	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1328	1367	65	2891	212	
V/C Ratio(X)	1.09	1.11	0.97	0.24	0.45	
Avail Cap(c_a), veh/h	1328	1367	65	2891	212	
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.09	0.85	0.85	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	72.2	3.0	61.4	0.0
Incr Delay (d2), s/veh	41.6	52.4	93.4	0.2	6.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.3	19.9	4.1	1.9	3.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	41.6	52.4	165.5	3.2	68.1	0.0
LnGrp LOS	F	F	F	A	E	
Approach Vol, veh/h	2969			747	95	
Approach Delay, s/veh	47.1			16.9	68.1	
Approach LOS	D			B	E	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	10.0	117.5		22.5		127.5
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.5	113.0		18.0		123.0
Max Q Clear Time (g_c+I1), s	7.3	115.0		9.5		8.5
Green Ext Time (p_c), s	0.0	0.0		0.1		5.4

Intersection Summary		
HCM 6th Ctrl Delay		41.7
HCM 6th LOS		D

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	880	2510	600	0	580	730	0	0	0	0	0	0
Future Volume (vph)	880	2510	600	0	580	730	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	4.0			4.5	4.5						
Lane Util. Factor	1.00	0.91			0.95	0.88						
Frpb, ped/bikes	1.00	1.00			1.00	0.98						
Flpb, ped/bikes	1.00	1.00			1.00	1.00						
Frt	1.00	0.97			1.00	0.85						
Flt Protected	0.95	1.00			1.00	1.00						
Satd. Flow (prot)	1752	4890			3505	2693						
Flt Permitted	0.95	1.00			1.00	1.00						
Satd. Flow (perm)	1752	4890			3505	2693						
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	926	2642	632	0	611	768	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	926	3274	0	0	611	768	0	0	0	0	0	0
Confl. Bikes (#/hr)						4						
Turn Type	Prot	NA			NA	Perm						
Protected Phases	5	Free			6							
Permitted Phases						6						
Actuated Green, G (s)	62.1	110.0			38.0	38.0						
Effective Green, g (s)	62.1	110.0			38.0	38.0						
Actuated g/C Ratio	0.56	1.00			0.35	0.35						
Clearance Time (s)	5.4				4.5	4.5						
Vehicle Extension (s)	3.0				2.8	2.8						
Lane Grp Cap (vph)	989	4890			1210	930						
v/s Ratio Prot	c0.53	0.67			0.17							
v/s Ratio Perm						c0.29						
v/c Ratio	0.94	0.67			0.50	0.83						
Uniform Delay, d1	22.1	0.0			28.5	33.0						
Progression Factor	1.00	1.00			1.35	1.34						
Incremental Delay, d2	15.4	0.7			1.4	8.0						
Delay (s)	37.6	0.7			39.9	52.1						
Level of Service	D	A			D	D						
Approach Delay (s)		8.9			46.7			0.0			0.0	
Approach LOS		A			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	190	1830	190	20	50	10	710	40	60	30	50	60
Future Volume (vph)	190	1830	190	20	50	10	710	40	60	30	50	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1529	1529	1529	1900
Total Lost time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Lane Util. Factor	1.00	0.86		0.86		1.00	0.91			1.00		
Frpb, ped/bikes	1.00	1.00		0.96		1.00	0.99			0.97		
Flpb, ped/bikes	1.00	1.00		1.00		1.00	1.00			1.00		
Frt	1.00	0.99		0.85		1.00	0.99			0.95		
Flt Protected	0.95	1.00		1.00		0.95	1.00			0.98		
Satd. Flow (prot)	1752	4676		1301		1752	4964			1348		
Flt Permitted	0.95	1.00		1.00		0.17	1.00			0.63		
Satd. Flow (perm)	1752	4676		1301		307	4964			864		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	1926	200	21	53	11	747	42	63	32	53	63
RTOR Reduction (vph)	0	0	0	11	0	0	5	0	0	21	0	0
Lane Group Flow (vph)	200	2128	0	8	0	64	784	0	0	127	0	0
Confl. Peds. (#/hr)				15	15			34			44	29
Confl. Bikes (#/hr)								3			1	
Turn Type	Prot	NA		Perm	custom	Prot	NA		Perm	NA		Perm
Protected Phases	5!	2				1	6			8		
Permitted Phases				2	1				8			4
Actuated Green, G (s)	17.2	46.9		46.9		24.0	54.2			24.4		
Effective Green, g (s)	17.2	46.9		46.9		24.0	54.2			24.4		
Actuated g/C Ratio	0.16	0.43		0.43		0.22	0.49			0.22		
Clearance Time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Vehicle Extension (s)	3.0	4.0		4.0		3.0	3.0			3.0		
Lane Grp Cap (vph)	273	1993		554		66	2445			191		
v/s Ratio Prot	0.11	c0.46					0.16					
v/s Ratio Perm				0.01		c0.21				0.15		
v/c Ratio	0.73	1.07		0.01		0.97	0.32			0.66		
Uniform Delay, d1	44.2	31.6		18.2		42.6	16.8			39.1		
Progression Factor	1.05	0.89		1.00		1.00	1.00			1.00		
Incremental Delay, d2	9.3	40.6		0.0		98.9	0.3			8.4		
Delay (s)	55.7	68.9		18.3		141.6	17.2			47.5		
Level of Service	E	E		B		F	B			D		
Approach Delay (s)		67.3					26.5			47.5		
Approach LOS		E					C			D		

Intersection Summary			
HCM 2000 Control Delay	54.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	91.1%	ICU Level of Service	F
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	1400	60	210	480	140	150	270	170	130	170	240
Future Volume (veh/h)	550	1400	60	210	480	140	150	270	170	130	170	240
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.88	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1524	1524	1856
Adj Flow Rate, veh/h	579	1474	0	221	505	50	158	284	179	137	179	253
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	473	1467		197	1374	537	187	704	314	89	237	430
Arrive On Green	0.14	0.42	0.00	0.11	0.39	0.39	0.11	0.20	0.20	0.06	0.16	0.16
Sat Flow, veh/h	3428	3526	1572	1767	3526	1379	1767	3526	1572	1451	1524	2768
Grp Volume(v), veh/h	579	1474	0	221	505	50	158	284	179	137	179	253
Grp Sat Flow(s),veh/h/ln	1714	1763	1572	1767	1763	1379	1767	1763	1572	1451	1524	1384
Q Serve(g_s), s	15.1	45.5	0.0	12.2	11.2	2.5	9.6	7.7	8.2	6.7	12.3	9.3
Cycle Q Clear(g_c), s	15.1	45.5	0.0	12.2	11.2	2.5	9.6	7.7	8.2	6.7	12.3	9.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	473	1467		197	1374	537	187	704	314	89	237	430
V/C Ratio(X)	1.22	1.00		1.12	0.37	0.09	0.85	0.40	0.57	1.54	0.76	0.59
Avail Cap(c_a), veh/h	473	1467		197	1374	537	218	1225	547	89	435	790
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	47.1	31.9	0.0	48.6	23.8	21.1	48.0	38.1	20.8	51.3	44.2	42.9
Incr Delay (d2), s/veh	118.0	24.6	0.0	100.2	0.2	0.1	20.3	0.5	2.0	291.5	6.6	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.2	23.7	0.0	10.8	4.7	0.8	5.3	3.4	3.2	9.6	5.1	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	165.1	56.5	0.0	148.8	24.0	21.2	68.3	38.5	22.8	342.8	50.8	44.7
LnGrp LOS	F	F		F	C	C	E	D	C	F	D	D
Approach Vol, veh/h		2053			776			621			569	
Approach Delay, s/veh		87.2			59.4			41.6			118.4	
Approach LOS		F			E			D			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.1	51.4	16.9	22.9	21.0	48.5	12.1	27.7
Change Period (Y+Rc), s	5.9	* 5.9	5.4	5.9	5.9	5.9	5.4	5.9
Max Green Setting (Gmax), s	12.2	* 46	13.5	31.2	15.1	42.1	6.7	38.0
Max Q Clear Time (g_c+I1), s	14.2	47.5	11.6	14.3	17.1	13.2	8.7	10.2
Green Ext Time (p_c), s	0.0	0.0	0.0	2.7	0.0	5.1	0.0	3.2

Intersection Summary	
HCM 6th Ctrl Delay	79.2
HCM 6th LOS	E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	330	890	0	0	0	0	0	900	160
Future Volume (veh/h)	0	0	0	330	890	0	0	0	0	0	900	160
Initial Q (Qb), veh				0	0	0				0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00				1.00		0.83
Parking Bus, Adj				1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach					No						No	
Adj Sat Flow, veh/h/ln				1391	1856	0				0	1391	1391
Adj Flow Rate, veh/h				340	918	0				0	947	150
Peak Hour Factor				0.97	0.97	0.97				0.95	0.95	0.95
Percent Heavy Veh, %				3	3	0				0	3	3
Cap, veh/h				640	896	0				0	952	151
Arrive On Green				0.16	0.16	0.00				0.00	0.43	0.43
Sat Flow, veh/h				1324	1856	0				0	2286	351
Grp Volume(v), veh/h				340	918	0				0	564	533
Grp Sat Flow(s),veh/h/ln				1324	1856	0				0	1321	1245
Q Serve(g_s), s				26.4	54.1	0.0				0.0	47.6	47.8
Cycle Q Clear(g_c), s				26.4	54.1	0.0				0.0	47.6	47.8
Prop In Lane				1.00		0.00				0.00		0.28
Lane Grp Cap(c), veh/h				640	896	0				0	567	535
V/C Ratio(X)				0.53	1.02	0.00				0.00	0.99	1.00
Avail Cap(c_a), veh/h				640	896	0				0	567	535
HCM Platoon Ratio				0.33	0.33	1.00				1.00	1.00	1.00
Upstream Filter(I)				0.51	0.51	0.00				0.00	0.09	0.09
Uniform Delay (d), s/veh				35.4	47.1	0.0				0.0	31.8	31.9
Incr Delay (d2), s/veh				1.6	27.8	0.0				0.0	10.1	10.8
Initial Q Delay(d3),s/veh				0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.6	33.8	0.0				0.0	16.4	15.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				37.0	74.9	0.0				0.0	41.9	42.6
LnGrp LOS				D	F	A				A	D	D
Approach Vol, veh/h					1258						1097	
Approach Delay, s/veh					64.7						42.2	
Approach LOS					E						D	

Timer - Assigned Phs				4		6						
Phs Duration (G+Y+Rc), s				53.0		59.0						
Change Period (Y+Rc), s				4.9		4.9						
Max Green Setting (Gmax), s				48.1		54.1						
Max Q Clear Time (g_c+I1), s				49.8		56.1						
Green Ext Time (p_c), s				0.0		0.0						

Intersection Summary			
HCM 6th Ctrl Delay			54.2
HCM 6th LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	0	960	520	270	580	0	0	0	0
Future Volume (veh/h)	0	0	0	0	960	520	270	580	0	0	0	0
Initial Q (Qb), veh				0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00		0.80	1.00		1.00			
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach					No			No				
Adj Sat Flow, veh/h/ln				0	1624	1624	1856	1856	0			
Adj Flow Rate, veh/h				0	1011	478	284	611	0			
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95			
Percent Heavy Veh, %				0	3	3	3	3	0			
Cap, veh/h				0	1193	426	0	850	0			
Arrive On Green				0.00	0.39	0.39	0.24	0.24	0.00			
Sat Flow, veh/h				0	3167	1103	0	3618	0			
Grp Volume(v), veh/h				0	1011	478	0	611	0			
Grp Sat Flow(s),veh/h/ln				0	1543	1103	0	1763	0			
Q Serve(g_s), s				0.0	33.5	43.3	0.0	17.8	0.0			
Cycle Q Clear(g_c), s				0.0	33.5	43.3	0.0	17.8	0.0			
Prop In Lane				0.00		1.00	0.00		0.00			
Lane Grp Cap(c), veh/h				0	1193	426	0	850	0			
V/C Ratio(X)				0.00	0.85	1.12	0.00	0.72	0.00			
Avail Cap(c_a), veh/h				0	1193	426	0	850	0			
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)				0.00	0.09	0.09	0.00	0.09	0.00			
Uniform Delay (d), s/veh				0.0	31.3	34.4	0.0	39.0	0.0			
Incr Delay (d2), s/veh				0.0	0.7	57.9	0.0	0.2	0.0			
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln				0.0	12.3	18.1	0.0	7.8	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				0.0	32.1	92.2	0.0	39.3	0.0			
LnGrp LOS				A	C	F	A	D	A			
Approach Vol, veh/h					1489			611				
Approach Delay, s/veh					51.4			39.3				
Approach LOS					D			D				
Timer - Assigned Phs						6		8				
Phs Duration (G+Y+Rc), s						48.2		31.9				
Change Period (Y+Rc), s						4.9		* 4.9				
Max Green Setting (Gmax), s						43.3		* 27				
Max Q Clear Time (g_c+I1), s						45.3		19.8				
Green Ext Time (p_c), s						0.0		1.2				

Intersection Summary		
HCM 6th Ctrl Delay		47.9
HCM 6th LOS		D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	290	660	340	110	1400	0	0	1030	700
Future Volume (veh/h)	0	0	0	290	660	340	110	1400	0	0	1030	700
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.80	1.00		1.00	1.00		0.86
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1648	1648	1648	1856	1856	0	1856	1856	1856
Adj Flow Rate, veh/h				305	695	343	116	1474	0	0	1084	704
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				3	3	3	3	3	0	3	3	3
Cap, veh/h				299	728	319	101	2153	0	1	1847	713
Arrive On Green				0.32	0.32	0.32	0.11	1.00	0.00	0.00	0.52	0.52
Sat Flow, veh/h				922	2247	1112	1767	3618	0	1767	3526	1360
Grp Volume(v), veh/h				530	470	343	116	1474	0	0	1084	704
Grp Sat Flow(s),veh/h/ln				1602	1566	1112	1767	1763	0	1767	1763	1360
Q Serve(g_s), s				48.6	43.4	48.6	8.6	0.0	0.0	0.0	31.7	76.6
Cycle Q Clear(g_c), s				48.6	43.4	48.6	8.6	0.0	0.0	0.0	31.7	76.6
Prop In Lane				0.58		1.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h				519	507	319	101	2153	0	1	1847	713
V/C Ratio(X)				1.02	0.93	1.08	1.14	0.68	0.00	0.00	0.59	0.99
Avail Cap(c_a), veh/h				519	507	319	101	2153	0	168	1847	713
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				0.70	0.70	0.70	0.09	0.09	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				50.7	49.0	67.8	66.4	0.0	0.0	0.0	24.5	35.2
Incr Delay (d2), s/veh				38.6	17.5	64.4	76.0	0.2	0.0	0.0	1.4	30.9
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				25.1	19.6	5.7	5.8	0.0	0.0	0.0	13.2	30.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				89.3	66.5	132.1	142.4	0.2	0.0	0.0	25.9	66.1
LnGrp LOS				F	E	F	F	A	A	A	C	E
Approach Vol, veh/h					1343			1590			1788	
Approach Delay, s/veh					92.2			10.5			41.7	
Approach LOS					F			B			D	
Timer - Assigned Phs			3	4		6	7	8				
Phs Duration (G+Y+Rc), s			13.0	84.0		53.0	0.0	97.0				
Change Period (Y+Rc), s			4.4	5.4		4.4	4.5	5.4				
Max Green Setting (Gmax), s			8.6	78.6		48.6	14.3	72.8				
Max Q Clear Time (g_c+I1), s			10.6	78.6		50.6	0.0	2.0				
Green Ext Time (p_c), s			0.0	0.0		0.0	0.0	26.9				
Intersection Summary												
HCM 6th Ctrl Delay			45.6									
HCM 6th LOS			D									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	90	180	220	840	40	430	160	290	60	160	110
Future Volume (veh/h)	50	90	180	220	840	40	430	160	290	60	160	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.72	1.00		0.82	1.00		0.57	1.00		0.69
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1636	1636	1856	1856	1592	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	53	95	157	232	884	17	453	168	222	63	168	93
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	50	168	278	254	924	549	475	153	202	58	193	107
Arrive On Green	0.03	0.38	0.38	0.14	0.50	0.50	0.14	0.31	0.31	0.03	0.20	0.20
Sat Flow, veh/h	1767	439	726	1767	1856	1103	3428	497	657	1767	952	527
Grp Volume(v), veh/h	53	0	252	232	884	17	453	0	390	63	0	261
Grp Sat Flow(s),veh/h/ln	1767	0	1165	1767	1856	1103	1714	0	1154	1767	0	1480
Q Serve(g_s), s	4.0	0.0	23.9	18.1	64.0	1.1	18.4	0.0	43.1	4.6	0.0	23.9
Cycle Q Clear(g_c), s	4.0	0.0	23.9	18.1	64.0	1.1	18.4	0.0	43.1	4.6	0.0	23.9
Prop In Lane	1.00		0.62	1.00		1.00	1.00		0.57	1.00		0.36
Lane Grp Cap(c), veh/h	50	0	446	254	924	549	475	0	355	58	0	299
V/C Ratio(X)	1.05	0.00	0.57	0.91	0.96	0.03	0.95	0.00	1.10	1.08	0.00	0.87
Avail Cap(c_a), veh/h	50	0	446	255	924	549	475	0	355	58	0	299
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.67	0.00	0.67	0.65	0.65	0.65	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	68.0	0.0	34.0	59.1	33.7	17.9	59.9	0.0	48.5	67.7	0.0	54.1
Incr Delay (d2), s/veh	118.0	0.0	3.5	24.8	15.6	0.1	29.5	0.0	76.6	143.6	0.0	22.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	7.3	9.9	32.5	0.3	10.0	0.0	20.0	4.4	0.0	10.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	186.0	0.0	37.5	83.9	49.3	18.0	89.4	0.0	125.1	211.3	0.0	76.7
LnGrp LOS	F	A	D	F	D	B	F	A	F	F	A	E
Approach Vol, veh/h		305			1133			843			324	
Approach Delay, s/veh		63.3			55.9			105.9			102.9	
Approach LOS		E			E			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.5	58.5	23.8	33.2	8.4	74.6	9.0	48.0
Change Period (Y+Rc), s	4.4	4.9	4.4	4.9	4.4	4.9	4.4	4.9
Max Green Setting (Gmax), s	20.2	53.5	19.4	28.3	4.0	69.7	4.6	43.1
Max Q Clear Time (g_c+I1), s	20.1	25.9	20.4	25.9	6.0	66.0	6.6	45.1
Green Ext Time (p_c), s	0.0	3.9	0.0	0.3	0.0	2.4	0.0	0.0

Intersection Summary		
HCM 6th Ctrl Delay		78.8
HCM 6th LOS		E

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	310	820	530	90	260	190
Future Volume (veh/h)	310	820	530	90	260	190
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96			0.83	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1856	1856	1558	1558	1856	1856
Adj Flow Rate, veh/h	326	863	558	90	274	102
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	402	1209	826	133	339	301
Arrive On Green	0.65	0.65	0.65	0.65	0.19	0.19
Sat Flow, veh/h	743	1856	1268	204	1767	1572
Grp Volume(v), veh/h	326	863	0	648	274	102
Grp Sat Flow(s),veh/h/ln	743	1856	0	1472	1767	1572
Q Serve(g_s), s	22.4	18.0	0.0	16.3	8.8	3.3
Cycle Q Clear(g_c), s	38.7	18.0	0.0	16.3	8.8	3.3
Prop In Lane	1.00			0.14	1.00	1.00
Lane Grp Cap(c), veh/h	402	1209	0	959	339	301
V/C Ratio(X)	0.81	0.71	0.00	0.68	0.81	0.34
Avail Cap(c_a), veh/h	402	1209	0	959	1101	980
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.0	6.7	0.0	6.4	23.0	20.7
Incr Delay (d2), s/veh	13.0	2.4	0.0	2.1	1.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.9	5.8	0.0	4.1	3.6	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	33.1	9.2	0.0	8.5	24.7	21.0
LnGrp LOS	C	A	A	A	C	C
Approach Vol, veh/h		1189	648		376	
Approach Delay, s/veh		15.7	8.5		23.7	
Approach LOS		B	A		C	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		43.6		15.8		43.6
Change Period (Y+Rc), s		4.9		4.4		4.9
Max Green Setting (Gmax), s		38.7		37.0		38.7
Max Q Clear Time (g_c+I1), s		40.7		10.8		18.3
Green Ext Time (p_c), s		0.0		0.6		6.5

Intersection Summary						
HCM 6th Ctrl Delay			15.0			
HCM 6th LOS			B			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	760	110	100	420	140	110	410	140	220	280	90
Future Volume (veh/h)	160	760	110	100	420	140	110	410	140	220	280	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.69	1.00		0.82	1.00		0.71	1.00		0.60
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	167	792	110	105	442	135	116	432	64	232	295	17
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	68	595	83	68	511	156	68	643	386	68	643	325
Arrive On Green	0.04	0.40	0.40	0.04	0.40	0.40	0.04	0.35	0.35	0.04	0.35	0.35
Sat Flow, veh/h	1767	1498	208	1767	1287	393	1767	1856	1112	1767	1856	938
Grp Volume(v), veh/h	167	0	902	105	0	577	116	432	64	232	295	17
Grp Sat Flow(s),veh/h/ln	1767	0	1706	1767	0	1680	1767	1856	1112	1767	1856	938
Q Serve(g_s), s	4.0	0.0	41.3	4.0	0.0	32.8	4.0	20.6	4.1	4.0	12.8	1.3
Cycle Q Clear(g_c), s	4.0	0.0	41.3	4.0	0.0	32.8	4.0	20.6	4.1	4.0	12.8	1.3
Prop In Lane	1.00		0.12	1.00		0.23	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	68	0	678	68	0	668	68	643	386	68	643	325
V/C Ratio(X)	2.46	0.00	1.33	1.54	0.00	0.86	1.71	0.67	0.17	3.41	0.46	0.05
Avail Cap(c_a), veh/h	68	0	678	68	0	668	68	662	397	68	662	335
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.0	0.0	31.3	50.0	0.0	28.7	50.0	28.9	23.5	50.0	26.4	22.6
Incr Delay (d2), s/veh	696.7	0.0	158.6	304.9	0.0	10.9	372.0	2.7	0.2	1121.0	0.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.9	0.0	46.5	7.5	0.0	14.8	8.8	9.5	1.1	22.9	5.6	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	746.7	0.0	189.9	354.9	0.0	39.7	421.9	31.6	23.8	1171.0	26.9	22.7
LnGrp LOS	F	A	F	F	A	D	F	C	C	F	C	C
Approach Vol, veh/h		1069			682			612			544	
Approach Delay, s/veh		276.9			88.2			104.8			514.7	
Approach LOS		F			F			F			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	46.2	8.4	40.9	8.4	46.2	8.4	40.9
Change Period (Y+Rc), s	4.4	4.9	4.4	4.9	4.4	4.9	4.4	4.9
Max Green Setting (Gmax), s	4.0	41.3	4.0	37.1	4.0	41.3	4.0	37.1
Max Q Clear Time (g_c+I1), s	6.0	43.3	6.0	14.8	6.0	34.8	6.0	22.6
Green Ext Time (p_c), s	0.0	0.0	0.0	1.7	0.0	1.6	0.0	2.9

Intersection Summary	
HCM 6th Ctrl Delay	240.9
HCM 6th LOS	F

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					✥			✥			✥	
Traffic Vol, veh/h	0	0	0	0	0	0	470	880	10	20	200	340
Future Vol, veh/h	0	0	0	0	0	0	470	880	10	20	200	340
Conflicting Peds, #/hr	0	0	0	33	0	36	10	0	33	36	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Free
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	0	0	0	495	926	11	21	211	358

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	2244	2221	1004	221	0	0	973	0	0
Stage 1	1958	1958	-	-	-	-	-	-	-
Stage 2	286	263	-	-	-	-	-	-	-
Critical Hdwy	6.43	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	46	43	292	1342	-	-	705	-	0
Stage 1	120	109	-	-	-	-	-	-	0
Stage 2	760	689	-	-	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	10	0	272	1342	-	-	681	-	-
Mov Cap-2 Maneuver	10	0	-	-	-	-	-	-	-
Stage 1	27	0	-	-	-	-	-	-	-
Stage 2	711	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	3.2	1
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	1342	-	-	-	681	-
HCM Lane V/C Ratio	0.369	-	-	-	0.031	-
HCM Control Delay (s)	9.2	0	-	0	10.5	0
HCM Lane LOS	A	A	-	A	B	A
HCM 95th %tile Q(veh)	1.7	-	-	-	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	910	130	0	0	0	0	0	0	520	710	0
Future Volume (veh/h)	0	910	130	0	0	0	0	0	0	520	710	0
Initial Q (Qb), veh	0	0	0							0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.88							1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00							1.00	1.00	1.00
Work Zone On Approach		No									No	
Adj Sat Flow, veh/h/ln	0	1281	1281							1856	1856	0
Adj Flow Rate, veh/h	0	958	119							547	747	0
Peak Hour Factor	0.83	0.95	0.95							0.95	0.95	0.95
Percent Heavy Veh, %	0	3	3							3	3	0
Cap, veh/h	0	1234	153							0	1034	0
Arrive On Green	0.00	0.58	0.58							0.29	0.29	0.00
Sat Flow, veh/h	0	2206	266							0	3618	0
Grp Volume(v), veh/h	0	544	533							0	747	0
Grp Sat Flow(s),veh/h/ln	0	1217	1190							0	1763	0
Q Serve(g_s), s	0.0	25.7	25.7							0.0	14.3	0.0
Cycle Q Clear(g_c), s	0.0	25.7	25.7							0.0	14.3	0.0
Prop In Lane	0.00		0.22							0.00		0.00
Lane Grp Cap(c), veh/h	0	701	686							0	1034	0
V/C Ratio(X)	0.00	0.78	0.78							0.00	0.72	0.00
Avail Cap(c_a), veh/h	0	701	686							0	1175	0
HCM Platoon Ratio	1.00	1.00	1.00							1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00							0.00	0.24	0.00
Uniform Delay (d), s/veh	0.0	12.2	12.2							0.0	23.8	0.0
Incr Delay (d2), s/veh	0.0	8.2	8.4							0.0	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0							0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	7.7	7.5							0.0	5.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	20.4	20.6							0.0	24.1	0.0
LnGrp LOS	A	C	C							A	C	A
Approach Vol, veh/h		1077									747	
Approach Delay, s/veh		20.5									24.1	
Approach LOS		C									C	

Timer - Assigned Phs		2		4
Phs Duration (G+Y+Rc), s		48.1		26.9
Change Period (Y+Rc), s		4.9		4.9
Max Green Setting (Gmax), s		27.2		25.0
Max Q Clear Time (g_c+I1), s		27.7		16.3
Green Ext Time (p_c), s		0.0		1.7

Intersection Summary	
HCM 6th Ctrl Delay	22.0
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	1210	0	0	0	0	0	650	710	0	0	0
Future Volume (veh/h)	200	1210	0	0	0	0	0	650	710	0	0	0
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		0.76			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Work Zone On Approach		No						No				
Adj Sat Flow, veh/h/ln	1856	1856	0				0	1408	1408			
Adj Flow Rate, veh/h	211	1274	0				0	684	740			
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95			
Percent Heavy Veh, %	3	3	0				0	3	3			
Cap, veh/h	232	1070	0				0	662	449			
Arrive On Green	0.12	0.12	0.00				0.00	0.49	0.49			
Sat Flow, veh/h	457	2941	0				0	1408	908			
Grp Volume(v), veh/h	783	702	0				0	684	740			
Grp Sat Flow(s),veh/h/ln	1710	1604	0				0	1338	908			
Q Serve(g_s), s	27.9	28.1	0.0				0.0	37.1	37.1			
Cycle Q Clear(g_c), s	28.1	28.1	0.0				0.0	37.1	37.1			
Prop In Lane	0.27		0.00				0.00		1.00			
Lane Grp Cap(c), veh/h	701	601	0				0	662	449			
V/C Ratio(X)	1.12	1.17	0.00				0.00	1.03	1.65			
Avail Cap(c_a), veh/h	701	601	0				0	662	449			
HCM Platoon Ratio	0.33	0.33	1.00				1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	34.1	32.9	0.0				0.0	18.9	19.0			
Incr Delay (d2), s/veh	54.7	77.1	0.0				0.0	43.9	301.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	24.7	24.8	0.0				0.0	18.4	44.6			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	88.8	110.0	0.0				0.0	62.9	320.2			
LnGrp LOS	F	F	A				A	F	F			
Approach Vol, veh/h		1485						1424				
Approach Delay, s/veh		98.8						196.6				
Approach LOS		F						F				

Timer - Assigned Phs		2		4
Phs Duration (G+Y+Rc), s		33.0		42.0
Change Period (Y+Rc), s		4.9		4.9
Max Green Setting (Gmax), s		28.1		37.1
Max Q Clear Time (g_c+I1), s		30.1		39.1
Green Ext Time (p_c), s		0.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	146.7
HCM 6th LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	760	1020	150	0	0	0	0	750	470	420	870	0
Future Volume (veh/h)	760	1020	150	0	0	0	0	750	470	420	870	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90				1.00		0.88	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1632	1632	1856	1856	0
Adj Flow Rate, veh/h	800	1074	155				0	789	482	442	916	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	773	683	99				0	565	339	265	1765	0
Arrive On Green	0.14	0.14	0.14				0.00	0.32	0.32	0.30	1.00	0.00
Sat Flow, veh/h	1767	1561	225				0	1843	1056	1767	3618	0
Grp Volume(v), veh/h	800	0	1229				0	693	578	442	916	0
Grp Sat Flow(s),veh/h/ln	1767	0	1786				0	1550	1267	1767	1763	0
Q Serve(g_s), s	65.6	0.0	65.6				0.0	48.1	48.1	22.5	0.0	0.0
Cycle Q Clear(g_c), s	65.6	0.0	65.6				0.0	48.1	48.1	22.5	0.0	0.0
Prop In Lane	1.00		0.13				0.00		0.83	1.00		0.00
Lane Grp Cap(c), veh/h	773	0	781				0	497	406	265	1765	0
V/C Ratio(X)	1.04	0.00	1.57				0.00	1.39	1.42	1.67	0.52	0.00
Avail Cap(c_a), veh/h	773	0	781				0	497	406	265	1765	0
HCM Platoon Ratio	0.33	0.33	0.33				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	0.09	0.00	0.09				0.00	1.00	1.00	0.78	0.78	0.00
Uniform Delay (d), s/veh	64.2	0.0	64.2				0.0	51.0	51.0	52.5	0.0	0.0
Incr Delay (d2), s/veh	20.6	0.0	258.5				0.0	189.1	204.5	313.0	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	35.8	0.0	87.8				0.0	44.7	38.3	31.9	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	84.7	0.0	322.7				0.0	240.1	255.4	365.5	0.9	0.0
LnGrp LOS	F	A	F				A	F	F	F	A	A
Approach Vol, veh/h		2029						1271			1358	
Approach Delay, s/veh		228.9						247.1			119.6	
Approach LOS		F						F			F	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	27.0	53.0		70.0		80.0						
Change Period (Y+Rc), s	4.5	4.9		4.4		4.9						
Max Green Setting (Gmax), s	22.5	48.1		65.6		75.1						
Max Q Clear Time (g_c+I1), s	24.5	50.1		67.6		2.0						
Green Ext Time (p_c), s	0.0	0.0		0.0		2.8						
Intersection Summary												
HCM 6th Ctrl Delay			202.0									
HCM 6th LOS			F									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	210	1850	50	0	0	0	0	30	30	410	40	0
Future Volume (veh/h)	210	1850	50	0	0	0	0	30	30	410	40	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90				1.00		0.93	0.98		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1856	1856	1856	1856	0
Adj Flow Rate, veh/h	221	1947	52				0	32	27	432	42	0
Peak Hour Factor	0.95	0.95	0.95				0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	208	1922	54				0	295	249	456	611	0
Arrive On Green	0.60	0.60	0.60				0.00	0.33	0.33	0.33	0.33	0.00
Sat Flow, veh/h	349	3226	90				0	897	757	1301	1856	0
Grp Volume(v), veh/h	1162	0	1058				0	0	59	432	42	0
Grp Sat Flow(s),veh/h/ln	1838	0	1827				0	0	1653	1301	1856	0
Q Serve(g_s), s	71.5	0.0	66.7				0.0	0.0	3.0	36.5	1.9	0.0
Cycle Q Clear(g_c), s	71.5	0.0	66.7				0.0	0.0	3.0	39.5	1.9	0.0
Prop In Lane	0.19		0.05				0.00		0.46	1.00		0.00
Lane Grp Cap(c), veh/h	1095	0	1089				0	0	544	456	611	0
V/C Ratio(X)	1.06	0.00	0.97				0.00	0.00	0.11	0.95	0.07	0.00
Avail Cap(c_a), veh/h	1095	0	1089				0	0	544	456	611	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.09	0.00	0.09				0.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	24.3	0.0	23.3				0.0	0.0	28.0	43.3	27.6	0.0
Incr Delay (d2), s/veh	29.9	0.0	3.9				0.0	0.0	0.1	29.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	38.4	0.0	28.3				0.0	0.0	1.2	16.9	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.2	0.0	27.2				0.0	0.0	28.1	72.5	27.7	0.0
LnGrp LOS	F	A	C				A	A	C	E	C	A
Approach Vol, veh/h		2220						59			474	
Approach Delay, s/veh		41.3						28.1			68.5	
Approach LOS		D						C			E	

Timer - Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		76.0		44.0				44.0
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		71.5		39.5				39.5
Max Q Clear Time (g_c+I1), s		73.5		5.0				41.5
Green Ext Time (p_c), s		0.0		0.3				0.0

Intersection Summary	
HCM 6th Ctrl Delay	45.7
HCM 6th LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	840	1250	50	20	0	380	0	50	20	130	40	0
Future Volume (veh/h)	840	1250	50	20	0	380	0	50	20	130	40	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		0.84	1.00		0.78	0.87		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	0	1856	1856	1856	1856	0
Adj Flow Rate, veh/h	884	1316	52	21	0	324	0	53	8	137	42	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3	0	3	3	3	3	0
Cap, veh/h	869	1265	50	37	455	322	0	228	34	170	36	0
Arrive On Green	0.49	0.72	0.72	0.02	0.00	0.25	0.00	0.15	0.15	0.15	0.15	0.00
Sat Flow, veh/h	1767	1767	70	1767	1856	1314	0	1510	228	774	237	0
Grp Volume(v), veh/h	884	0	1368	21	0	324	0	0	61	179	0	0
Grp Sat Flow(s),veh/h/ln	1767	0	1837	1767	1856	1314	0	0	1738	1012	0	0
Q Serve(g_s), s	59.0	0.0	85.9	1.4	0.0	29.4	0.0	0.0	3.7	14.4	0.0	0.0
Cycle Q Clear(g_c), s	59.0	0.0	85.9	1.4	0.0	29.4	0.0	0.0	3.7	18.1	0.0	0.0
Prop In Lane	1.00		0.04	1.00		1.00	0.00		0.13	0.77		0.00
Lane Grp Cap(c), veh/h	869	0	1315	37	455	322	0	0	262	206	0	0
V/C Ratio(X)	1.02	0.00	1.04	0.57	0.00	1.01	0.00	0.00	0.23	0.87	0.00	0.00
Avail Cap(c_a), veh/h	869	0	1315	75	455	322	0	0	262	206	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	30.5	0.0	17.1	58.2	0.0	45.3	0.0	0.0	44.8	53.9	0.0	0.0
Incr Delay (d2), s/veh	35.0	0.0	36.1	12.9	0.0	51.8	0.0	0.0	0.4	30.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	32.8	0.0	44.8	0.8	0.0	14.2	0.0	0.0	1.7	7.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.5	0.0	53.1	71.1	0.0	97.1	0.0	0.0	45.3	84.6	0.0	0.0
LnGrp LOS	F	A	F	E	A	F	A	A	D	F	A	A
Approach Vol, veh/h		2252			345			61			179	
Approach Delay, s/veh		58.0			95.5			45.3			84.6	
Approach LOS		E			F			D			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.0	90.4		22.6	63.5	33.9		22.6				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	83.3		18.1	59.0	29.4		18.1				
Max Q Clear Time (g_c+I1), s	3.4	87.9		5.7	61.0	31.4		20.1				
Green Ext Time (p_c), s	0.0	0.0		0.2	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			64.0									
HCM 6th LOS			E									

Attachment E - Intersection LOS Results and Synchro Worksheets – Existing Conditions

Intersection LOS Results – Existing Conditions

Int #	Intersection	Peak Hour	Control	Delay	LOS
1	4th Ave & Washington St	AM	Signal	29.0	C
		PM		30.5	C
2	5th Ave & Washington St	AM	Signal	12.0	B
		PM		14.2	B
3	8th Ave & Washington St	AM	Signal	111.2	**F**
		PM		91.9	**F**
4	9th Ave & Washington St	AM	SSSC	47.8	**E**
		PM		1519.5	**F**
5	SR 163 On Ramps/Richmond St & Washington St	AM	Signal	47.7	D
		PM		10.5	B
6	Normal St/Washington St & Campus Ave/Polk Ave	AM	Signal	26.6	C
		PM		16.3	B
7	Park Blvd & Normal St/El Cajon Ave	AM	Signal	67.0	**E**
		PM		30.8	C
8	4th Ave & University Ave	AM	Signal	19.0	B
		PM		20.4	C
9	5th Ave & University Ave	AM	Signal	12.6	B
		PM		19.4	B
10	6th Ave & University Ave	AM	Signal	32.7	C
		PM		42.4	D
11	10th Ave & University Ave	AM	Signal	48.3	D
		PM		28.8	C
12	Normal St & University Ave	AM	Signal	3.5	A
		PM		5.0	A
13	Park Blvd & University Ave	AM	Signal	47.3	D
		PM		100.9	**F**
14	10th Ave & SR 163 NB On Ramp	AM	No Control	N/A	
		PM		N/A	
15	4th Ave & Robinson Ave	AM	Signal	15.1	B
		PM		14.8	B
16	5th Ave & Robinson Ave	AM	Signal	13.4	B
		PM		18.9	B
17	6th Ave & Robinson Ave	AM	Signal	15.3	B
		PM		18.9	B
18	8th Ave & Robinson Ave	AM	AWSC	10.8	B
		PM		38.0	**E**
19	10th Ave & Robinson Ave	AM	AWSC	21.4	C
		PM		19.7	C

Synchro Worksheets –Existing Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	78	455	95	181	950	177	0	0	0	197	100	84
Future Volume (veh/h)	78	455	95	181	950	177	0	0	0	197	100	84
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.85	1.00		0.93				1.00		0.82
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856				1856	1856	1856
Adj Flow Rate, veh/h	81	474	99	191	1000	186				190	215	108
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95				0.78	0.78	0.78
Percent Heavy Veh, %	3	3	3	3	3	3				3	3	3
Cap, veh/h	104	1214	250	469	1505	279				504	529	366
Arrive On Green	0.06	0.43	0.43	0.09	0.34	0.34				0.29	0.29	0.29
Sat Flow, veh/h	1767	2816	581	3428	2927	543				1767	1856	1284
Grp Volume(v), veh/h	81	294	279	191	601	585				190	215	108
Grp Sat Flow(s),veh/h/ln	1767	1763	1634	1714	1763	1708				1767	1856	1284
Q Serve(g_s), s	4.5	11.4	11.7	5.3	29.0	29.1				8.6	9.4	6.6
Cycle Q Clear(g_c), s	4.5	11.4	11.7	5.3	29.0	29.1				8.6	9.4	6.6
Prop In Lane	1.00		0.36	1.00		0.32				1.00		1.00
Lane Grp Cap(c), veh/h	104	760	704	469	906	878				504	529	366
V/C Ratio(X)	0.78	0.39	0.40	0.41	0.66	0.67				0.38	0.41	0.29
Avail Cap(c_a), veh/h	196	760	704	469	906	878				541	568	393
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67				1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	46.4	19.4	19.5	41.6	25.4	25.5				28.6	28.9	27.9
Incr Delay (d2), s/veh	4.8	1.5	1.7	0.2	3.8	4.0				0.2	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	4.8	4.6	2.2	13.5	13.2				3.7	4.2	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.2	20.9	21.2	41.8	29.2	29.5				28.8	29.1	28.1
LnGrp LOS	D	C	C	D	C	C				C	C	C
Approach Vol, veh/h		654			1377						513	
Approach Delay, s/veh		24.8			31.1						28.8	
Approach LOS		C			C						C	
Timer - Assigned Phs	1	2		4	5	6						
Phs Duration (G+Y+Rc), s	18.6	48.0		33.4	10.3	56.3						
Change Period (Y+Rc), s	4.9	* 4.9		4.9	4.4	4.9						
Max Green Setting (Gmax), s	12.1	* 43		30.6	11.1	44.1						
Max Q Clear Time (g_c+I1), s	7.3	13.7		11.4	6.5	31.1						
Green Ext Time (p_c), s	0.1	0.6		0.6	0.0	1.2						
Intersection Summary												
HCM 6th Ctrl Delay			29.0									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	689	0	0	1218	371	106
Future Volume (veh/h)	689	0	0	1218	371	106
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1856	1856	1856
Adj Flow Rate, veh/h	783	0	0	1310	403	115
Peak Hour Factor	0.88	0.88	0.93	0.93	0.92	0.92
Percent Heavy Veh, %	3	0	0	3	3	3
Cap, veh/h	2534	0	0	2534	474	217
Arrive On Green	1.00	0.00	0.00	0.72	0.14	0.14
Sat Flow, veh/h	3711	0	0	3711	3428	1572
Grp Volume(v), veh/h	783	0	0	1310	403	115
Grp Sat Flow(s),veh/h/ln	1763	0	0	1763	1714	1572
Q Serve(g_s), s	0.0	0.0	0.0	16.6	11.5	6.8
Cycle Q Clear(g_c), s	0.0	0.0	0.0	16.6	11.5	6.8
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2534	0	0	2534	474	217
V/C Ratio(X)	0.31	0.00	0.00	0.52	0.85	0.53
Avail Cap(c_a), veh/h	2534	0	0	2534	826	379
HCM Platoon Ratio	2.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.68	0.87	0.87
Uniform Delay (d), s/veh	0.0	0.0	0.0	6.3	42.1	40.1
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.5	1.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	5.1	5.0	2.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.3	0.0	0.0	6.8	43.5	40.7
LnGrp LOS	A	A	A	A	D	D
Approach Vol, veh/h	783			1310	518	
Approach Delay, s/veh	0.3			6.8	42.9	
Approach LOS	A			A	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	76.8	76.8	23.2
Change Period (Y+Rc), s	4.9	4.9	9.4
Max Green Setting (Gmax), s	61.6	61.6	24.1
Max Q Clear Time (g_c+I1), s	2.0	18.6	13.5
Green Ext Time (p_c), s	2.1	4.1	0.3

Intersection Summary	
HCM 6th Ctrl Delay	12.0
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWR	SWR2
Lane Configurations												
Traffic Volume (vph)	680	77	697	9	41	12	19	21	10	6	526	12
Future Volume (vph)	680	77	697	9	41	12	19	21	10	6	526	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0			5.0		4.5	
Lane Util. Factor	0.95		0.95			1.00			1.00		1.00	
Frpb, ped/bikes	0.99		1.00			0.99			1.00		1.00	
Flpb, ped/bikes	1.00		1.00			1.00			1.00		1.00	
Frt	0.98		1.00			0.96			0.98		0.86	
Flt Protected	1.00		1.00			0.97			0.97		1.00	
Satd. Flow (prot)	3421		3498			1706			1755		1596	
Flt Permitted	1.00		1.00			0.84			0.79		1.00	
Satd. Flow (perm)	3421		3498			1473			1424		1596	
Peak-hour factor, PHF	0.90	0.90	0.98	0.98	0.86	0.86	0.86	0.84	0.84	0.84	0.96	0.96
Adj. Flow (vph)	756	86	711	9	48	14	22	25	12	7	548	12
RTOR Reduction (vph)	7	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	835	0	720	0	0	84	0	0	44	0	561	0
Confl. Peds. (#/hr)		28					7					
Confl. Bikes (#/hr)		3					3					
Turn Type	NA		NA		Perm	NA		Perm	NA		Prot	
Protected Phases	2		6			8			4		5	
Permitted Phases					8			4				
Actuated Green, G (s)	89.0		62.9			10.5			10.5		21.6	
Effective Green, g (s)	89.0		62.9			10.5			10.5		21.6	
Actuated g/C Ratio	0.81		0.57			0.10			0.10		0.20	
Clearance Time (s)	5.5		5.5			5.0			5.0		4.5	
Vehicle Extension (s)	2.0		2.0			2.0			2.0		3.0	
Lane Grp Cap (vph)	2767		2000			140			135		313	
v/s Ratio Prot	0.24		c0.21								c0.35	
v/s Ratio Perm						c0.06			0.03			
v/c Ratio	0.30		0.36			0.60			0.33		1.79	
Uniform Delay, d1	2.7		12.7			47.7			46.4		44.2	
Progression Factor	1.00		1.00			1.00			1.00		1.00	
Incremental Delay, d2	0.3		0.5			4.6			0.5		369.1	
Delay (s)	2.9		13.2			52.3			47.0		413.3	
Level of Service	A		B			D			D		F	
Approach Delay (s)	2.9		13.2			52.3			47.0			
Approach LOS	A		B			D			D			

Intersection Summary			
HCM 2000 Control Delay	111.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	12.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	710	37	56	678	32	447
Future Vol, veh/h	710	37	56	678	32	447
Conflicting Peds, #/hr	0	4	1	0	4	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	89	89	84	84
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	789	41	63	762	38	532

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	834	0	1325	420
Stage 1	-	-	-	-	814	-
Stage 2	-	-	-	-	511	-
Critical Hdwy	-	-	4.16	-	6.86	6.96
Critical Hdwy Stg 1	-	-	-	-	5.86	-
Critical Hdwy Stg 2	-	-	-	-	5.86	-
Follow-up Hdwy	-	-	2.23	-	3.53	3.33
Pot Cap-1 Maneuver	-	-	789	-	146	579
Stage 1	-	-	-	-	393	-
Stage 2	-	-	-	-	564	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	786	-	125	576
Mov Cap-2 Maneuver	-	-	-	-	125	-
Stage 1	-	-	-	-	391	-
Stage 2	-	-	-	-	484	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	47.8
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	125	576	-	-	786	-
HCM Lane V/C Ratio	0.305	0.924	-	-	0.08	-
HCM Control Delay (s)	46	47.9	-	-	10	0.6
HCM Lane LOS	E	E	-	-	A	A
HCM 95th %tile Q(veh)	1.2	11.6	-	-	0.3	-

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	397	844	780	1818	0	0
Future Volume (vph)	397	844	780	1818	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	4.0	4.5	4.5		
Lane Util. Factor	1.00	0.91	0.95	0.88		
Frpb, ped/bikes	1.00	1.00	1.00	0.97		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	1.00	1.00	1.00	0.85		
Flt Protected	0.95	1.00	1.00	1.00		
Satd. Flow (prot)	1752	5036	3505	2690		
Flt Permitted	0.95	1.00	1.00	1.00		
Satd. Flow (perm)	1752	5036	3505	2690		
Peak-hour factor, PHF	0.91	0.91	0.97	0.97	0.92	0.92
Adj. Flow (vph)	436	927	804	1874	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	436	927	804	1874	0	0
Confl. Bikes (#/hr)				9		
Turn Type	Prot	NA	NA	Perm		
Protected Phases	5	Free	6			
Permitted Phases				6		
Actuated Green, G (s)	33.8	115.0	71.3	71.3		
Effective Green, g (s)	33.8	115.0	71.3	71.3		
Actuated g/C Ratio	0.29	1.00	0.62	0.62		
Clearance Time (s)	5.4		4.5	4.5		
Vehicle Extension (s)	3.0		2.8	2.8		
Lane Grp Cap (vph)	514	5036	2173	1667		
v/s Ratio Prot	c0.25	0.18	0.23			
v/s Ratio Perm				c0.70		
v/c Ratio	0.85	0.18	0.37	1.12		
Uniform Delay, d1	38.2	0.0	10.8	21.9		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	12.3	0.1	0.5	64.4		
Delay (s)	50.5	0.1	11.3	86.2		
Level of Service	D	A	B	F		
Approach Delay (s)		16.2	63.7		0.0	
Approach LOS		B	E		A	

Intersection Summary			
HCM 2000 Control Delay	47.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	89	313	15	1	17	2	1360	50	82	5	7	11
Future Volume (vph)	89	313	15	1	17	2	1360	50	82	5	7	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Lane Util. Factor	1.00	0.86		0.86		1.00	0.91			1.00		
Frpb, ped/bikes	1.00	1.00		0.97		1.00	1.00			0.99		
Flpb, ped/bikes	1.00	1.00		1.00		0.99	1.00			1.00		
Frt	1.00	0.99		0.85		1.00	0.99			0.99		
Flt Protected	0.95	1.00		1.00		0.95	1.00			0.96		
Satd. Flow (prot)	1752	4727		1313		1734	4991			1740		
Flt Permitted	0.95	1.00		1.00		0.35	1.00			0.33		
Satd. Flow (perm)	1752	4727		1313		646	4991			607		
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.94	0.94	0.94	0.94	0.81	0.81	0.81	0.65
Adj. Flow (vph)	102	360	17	1	18	2	1447	53	101	6	9	17
RTOR Reduction (vph)	0	0	0	0	0	0	2	0	0	4	0	0
Lane Group Flow (vph)	102	377	0	1	0	20	1498	0	0	112	0	0
Confl. Peds. (#/hr)				9	9			27			30	21
Confl. Bikes (#/hr)								3			1	
Turn Type	Prot	NA		Perm	custom	Prot	NA		Perm	NA		Perm
Protected Phases	5!	2				1	6			8		
Permitted Phases				2	1				8			4
Actuated Green, G (s)	12.0	70.4		70.4		11.3	70.2			18.6		
Effective Green, g (s)	12.0	70.4		70.4		11.3	70.2			18.6		
Actuated g/C Ratio	0.10	0.61		0.61		0.10	0.61			0.16		
Clearance Time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Vehicle Extension (s)	3.0	4.0		4.0		3.0	3.0			3.0		
Lane Grp Cap (vph)	182	2893		803		63	3046			98		
v/s Ratio Prot	c0.06	0.08					c0.30					
v/s Ratio Perm				0.00		0.03				c0.18		
v/c Ratio	0.56	0.13		0.00		0.32	0.49			1.14		
Uniform Delay, d1	49.0	9.4		8.7		48.3	12.5			48.2		
Progression Factor	1.00	1.00		1.00		1.00	1.00			1.00		
Incremental Delay, d2	3.9	0.1		0.0		2.9	0.6			133.9		
Delay (s)	52.9	9.5		8.7		51.2	13.0			182.1		
Level of Service	D	A		A		D	B			F		
Approach Delay (s)		18.7					13.5			182.1		
Approach LOS		B					B			F		

Intersection Summary			
HCM 2000 Control Delay	26.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	201	38	147	997	107	161	72	82	49	113	291
Future Volume (veh/h)	105	201	38	147	997	107	161	72	82	49	113	291
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.95	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	125	239	0	155	1049	113	187	84	95	53	123	316
Peak Hour Factor	0.84	0.84	0.84	0.95	0.95	0.95	0.86	0.86	0.86	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	169	440		659	1581	671	87	636	284	67	314	468
Arrive On Green	0.05	0.12	0.00	0.37	0.45	0.45	0.05	0.18	0.18	0.04	0.17	0.17
Sat Flow, veh/h	3428	3526	1572	1767	3526	1497	1767	3526	1572	1767	1856	2768
Grp Volume(v), veh/h	125	239	0	155	1049	113	187	84	95	53	123	316
Grp Sat Flow(s),veh/h/ln	1714	1763	1572	1767	1763	1497	1767	1763	1572	1767	1856	1384
Q Serve(g_s), s	2.9	5.2	0.0	4.9	19.0	3.7	4.0	1.6	1.6	2.4	4.8	8.7
Cycle Q Clear(g_c), s	2.9	5.2	0.0	4.9	19.0	3.7	4.0	1.6	1.6	2.4	4.8	8.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	169	440		659	1581	671	87	636	284	67	314	468
V/C Ratio(X)	0.74	0.54		0.24	0.66	0.17	2.15	0.13	0.33	0.79	0.39	0.68
Avail Cap(c_a), veh/h	169	2011		659	1990	845	87	1647	735	87	867	1293
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.2	33.4	0.0	17.5	17.6	13.4	38.7	28.0	3.9	38.8	30.1	31.7
Incr Delay (d2), s/veh	14.3	2.0	0.0	0.1	0.7	0.2	554.3	0.1	0.8	23.0	1.1	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	2.3	0.0	1.9	7.1	1.2	15.1	0.7	1.6	1.5	2.2	3.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.4	35.4	0.0	17.6	18.3	13.5	593.0	28.1	4.8	61.8	31.2	34.0
LnGrp LOS	D	D		B	B	B	F	C	A	E	C	C
Approach Vol, veh/h		364			1317			366			492	
Approach Delay, s/veh		41.3			17.8			310.7			36.3	
Approach LOS		D			B			F			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	36.2	16.1	9.4	19.7	9.9	42.4	8.5	20.6
Change Period (Y+Rc), s	5.9	* 5.9	5.4	5.9	5.9	5.9	5.4	5.9
Max Green Setting (Gmax), s	4.0	* 46	4.0	38.0	4.0	45.9	4.0	38.0
Max Q Clear Time (g_c+I1), s	6.9	7.2	6.0	10.7	4.9	21.0	4.4	3.6
Green Ext Time (p_c), s	0.0	3.0	0.0	3.0	0.0	11.2	0.0	1.1

Intersection Summary	
HCM 6th Ctrl Delay	67.0
HCM 6th LOS	E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	285	32	175	359	0	0	0	0	109	223	34
Future Volume (veh/h)	0	285	32	175	359	0	0	0	0	109	223	34
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.92	0.99		1.00				1.00		0.44
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1856	1856	1856	1856	0				1856	1856	1856
Adj Flow Rate, veh/h	0	317	36	180	370	0				124	253	39
Peak Hour Factor	0.90	0.90	0.90	0.97	0.97	0.97				0.88	0.88	0.88
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1016	115	756	1395	0				154	316	49
Arrive On Green	0.00	0.63	0.63	0.11	1.00	0.00				0.16	0.16	0.16
Sat Flow, veh/h	0	1619	184	1767	1856	0				940	1930	299
Grp Volume(v), veh/h	0	0	353	180	370	0				239	0	177
Grp Sat Flow(s),veh/h/ln	0	0	1803	1767	1856	0				1809	0	1361
Q Serve(g_s), s	0.0	0.0	10.5	3.6	0.0	0.0				14.7	0.0	14.5
Cycle Q Clear(g_c), s	0.0	0.0	10.5	3.6	0.0	0.0				14.7	0.0	14.5
Prop In Lane	0.00		0.10	1.00		0.00				0.52		0.22
Lane Grp Cap(c), veh/h	0	0	1132	756	1395	0				296	0	223
V/C Ratio(X)	0.00	0.00	0.31	0.24	0.27	0.00				0.81	0.00	0.80
Avail Cap(c_a), veh/h	0	0	1132	926	1395	0				578	0	435
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	0.98	0.98	0.00				0.80	0.00	0.80
Uniform Delay (d), s/veh	0.0	0.0	10.0	5.3	0.0	0.0				46.7	0.0	46.6
Incr Delay (d2), s/veh	0.0	0.0	0.7	0.2	0.5	0.0				1.6	0.0	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	4.3	1.1	0.2	0.0				6.8	0.0	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	10.7	5.5	0.5	0.0				48.3	0.0	48.6
LnGrp LOS	A	A	B	A	A	A				D	A	D
Approach Vol, veh/h		353			550						416	
Approach Delay, s/veh		10.7			2.1						48.4	
Approach LOS		B			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	14.4	77.7		23.9		92.1
Change Period (Y+Rc), s	4.4	4.9		4.9		4.9
Max Green Setting (Gmax), s	21.1	43.6		37.1		69.1
Max Q Clear Time (g_c+I1), s	15.6	12.5		16.7		2.0
Green Ext Time (p_c), s	0.4	1.6		1.9		1.5

Intersection Summary			
HCM 6th Ctrl Delay			19.0
HCM 6th LOS			B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	368	0	0	514	299	21	224	152	0	0	0
Future Volume (veh/h)	15	368	0	0	514	299	21	224	152	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	0.95		1.00	1.00		0.80	1.00		0.78			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1856	1856	0	0	1856	1856	1856	1856	1856			
Adj Flow Rate, veh/h	16	396	0	0	553	322	23	241	163			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	51	1049	0	0	2103	749	411	438	266			
Arrive On Green	1.00	1.00	0.00	0.00	1.00	1.00	0.08	0.08	0.08			
Sat Flow, veh/h	31	1759	0	0	3618	1256	1767	1882	1142			
Grp Volume(v), veh/h	412	0	0	0	553	322	23	224	180			
Grp Sat Flow(s),veh/h/ln	1790	0	0	0	1763	1256	1767	1763	1261			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	1.4	14.2	16.0			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	1.4	14.2	16.0			
Prop In Lane	0.04		0.00	0.00		1.00	1.00		0.91			
Lane Grp Cap(c), veh/h	1100	0	0	0	2103	749	411	410	293			
V/C Ratio(X)	0.37	0.00	0.00	0.00	0.26	0.43	0.06	0.55	0.61			
Avail Cap(c_a), veh/h	1100	0	0	0	2103	749	535	533	382			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	2.00	2.00	0.33	0.33	0.33			
Upstream Filter(I)	0.95	0.00	0.00	0.00	0.84	0.84	0.83	0.83	0.83			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	41.7	47.6	48.5			
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.0	0.3	1.5	0.0	0.3	0.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.0	0.1	0.3	0.6	6.8	5.5			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.9	0.0	0.0	0.0	0.3	1.5	41.7	48.0	49.1			
LnGrp LOS	A	A	A	A	A	A	D	D	D			
Approach Vol, veh/h		412			875			427				
Approach Delay, s/veh		0.9			0.7			48.1				
Approach LOS		A			A			D				
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		79.1		36.9		79.1						
Change Period (Y+Rc), s		* 9.9		* 9.9		* 9.9						
Max Green Setting (Gmax), s		* 61		* 35		* 61						
Max Q Clear Time (g_c+I1), s		2.0		18.0		2.0						
Green Ext Time (p_c), s		1.1		1.1		1.9						
Intersection Summary												
HCM 6th Ctrl Delay			12.6									
HCM 6th LOS			B									

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	354	143	13	106	357	180	74	696	46	152	849	332
Future Volume (veh/h)	354	143	13	106	357	180	74	696	46	152	849	332
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.88	1.00		0.83	1.00		0.90	1.00		0.91
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	385	155	14	114	384	194	79	740	49	165	923	361
Peak Hour Factor	0.92	0.92	0.92	0.93	0.93	0.93	0.94	0.94	0.94	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	457	886	78	140	775	459	100	1242	82	193	1501	816
Arrive On Green	0.04	0.09	0.09	0.08	0.22	0.22	0.11	0.75	0.75	0.11	0.43	0.43
Sat Flow, veh/h	3428	3234	286	1767	3526	1306	1767	3331	220	1767	3526	1426
Grp Volume(v), veh/h	385	83	86	114	384	194	79	391	398	165	923	361
Grp Sat Flow(s),veh/h/ln	1714	1763	1757	1767	1763	1306	1767	1763	1788	1767	1763	1426
Q Serve(g_s), s	12.9	5.1	5.2	7.4	11.1	13.6	5.1	11.8	11.8	10.6	23.6	17.3
Cycle Q Clear(g_c), s	12.9	5.1	5.2	7.4	11.1	13.6	5.1	11.8	11.8	10.6	23.6	17.3
Prop In Lane	1.00		0.16	1.00		1.00	1.00		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	457	483	482	140	775	459	100	657	667	193	1501	816
V/C Ratio(X)	0.84	0.17	0.18	0.81	0.50	0.42	0.79	0.60	0.60	0.85	0.62	0.44
Avail Cap(c_a), veh/h	550	483	482	238	869	494	276	657	667	291	1501	816
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	0.93	0.93	0.93	0.96	0.96	0.96	0.92	0.92	0.92	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.2	40.6	40.7	52.6	39.6	30.6	50.8	10.8	10.8	50.7	25.9	15.1
Incr Delay (d2), s/veh	9.2	0.1	0.1	4.1	0.3	0.3	4.8	3.6	3.6	9.7	1.9	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	2.3	2.4	3.4	4.8	4.3	2.3	3.7	3.7	5.1	9.9	5.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.4	40.7	40.8	56.7	39.9	31.0	55.6	14.4	14.4	60.4	27.8	16.8
LnGrp LOS	E	D	D	E	D	C	E	B	B	E	C	B
Approach Vol, veh/h		554			692			868			1449	
Approach Delay, s/veh		56.5			40.1			18.1			28.8	
Approach LOS		E			D			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.6	36.7	11.0	54.8	19.9	30.4	17.1	48.6
Change Period (Y+Rc), s	4.4	4.9	4.4	5.4	4.4	4.9	4.4	5.4
Max Green Setting (Gmax), s	15.6	31.6	18.1	31.6	18.6	28.6	19.1	30.6
Max Q Clear Time (g_c+I1), s	9.4	7.2	7.1	25.6	14.9	15.6	12.6	13.8
Green Ext Time (p_c), s	0.1	0.7	0.1	4.1	0.5	2.0	0.1	6.0

Intersection Summary	
HCM 6th Ctrl Delay	32.7
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	225	80	355	579	20	89	38	10	6	58	36
Future Volume (veh/h)	39	225	80	355	579	20	89	38	10	6	58	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.85	1.00		0.86	0.91		0.84	0.87		0.84
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	44	256	91	386	629	22	103	44	12	7	70	43
Peak Hour Factor	0.88	0.88	0.88	0.92	0.92	0.92	0.86	0.86	0.86	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	56	1085	366	337	2109	813	282	332	90	321	247	151
Arrive On Green	0.03	0.44	0.44	0.19	0.60	0.60	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1767	2467	832	1767	3526	1359	1157	1340	366	1166	997	612
Grp Volume(v), veh/h	44	179	168	386	629	22	103	0	56	7	0	113
Grp Sat Flow(s),veh/h/ln	1767	1763	1536	1767	1763	1359	1157	0	1706	1166	0	1609
Q Serve(g_s), s	2.9	7.3	8.0	22.1	10.1	0.8	9.2	0.0	3.0	0.5	0.0	6.6
Cycle Q Clear(g_c), s	2.9	7.3	8.0	22.1	10.1	0.8	15.8	0.0	3.0	3.5	0.0	6.6
Prop In Lane	1.00		0.54	1.00		1.00	1.00		0.21	1.00		0.38
Lane Grp Cap(c), veh/h	56	775	676	337	2109	813	282	0	422	321	0	398
V/C Ratio(X)	0.78	0.23	0.25	1.15	0.30	0.03	0.36	0.00	0.13	0.02	0.00	0.28
Avail Cap(c_a), veh/h	245	775	676	337	2109	813	396	0	590	435	0	556
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	0.88	0.95	0.95	0.95	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	55.7	20.3	20.4	47.0	11.4	9.5	41.7	0.0	34.0	35.3	0.0	35.3
Incr Delay (d2), s/veh	7.4	0.6	0.8	93.8	0.3	0.1	0.3	0.0	0.1	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	3.2	3.0	18.4	4.0	0.2	2.7	0.0	1.3	0.2	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.1	20.9	21.2	140.8	11.7	9.6	42.0	0.0	34.0	35.3	0.0	35.5
LnGrp LOS	E	C	C	F	B	A	D	A	C	D	A	D
Approach Vol, veh/h		391			1037			159			120	
Approach Delay, s/veh		25.8			59.7			39.2			35.5	
Approach LOS		C			E			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	26.5	55.9		33.6	8.1	74.3		33.6
Change Period (Y+Rc), s	4.4	4.9		4.9	4.4	4.9		4.9
Max Green Setting (Gmax), s	22.1	39.6		40.1	16.1	45.6		40.1
Max Q Clear Time (g_c+I1), s	24.1	10.0		8.6	4.9	12.1		17.8
Green Ext Time (p_c), s	0.0	4.8		0.5	0.0	5.8		0.4

Intersection Summary	
HCM 6th Ctrl Delay	48.3
HCM 6th LOS	D

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	44	191	787	31	29	43
Future Volume (veh/h)	44	191	787	31	29	43
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98			0.90	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	52	225	884	35	31	45
Peak Hour Factor	0.85	0.85	0.89	0.89	0.95	0.95
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	539	2382	2323	92	105	94
Arrive On Green	0.68	0.68	0.68	0.68	0.06	0.06
Sat Flow, veh/h	593	3618	3532	136	1767	1572
Grp Volume(v), veh/h	52	225	453	466	31	45
Grp Sat Flow(s),veh/h/ln	593	1763	1763	1813	1767	1572
Q Serve(g_s), s	1.5	0.8	3.9	3.9	0.6	1.0
Cycle Q Clear(g_c), s	5.4	0.8	3.9	3.9	0.6	1.0
Prop In Lane	1.00			0.08	1.00	1.00
Lane Grp Cap(c), veh/h	539	2382	1191	1225	105	94
V/C Ratio(X)	0.10	0.09	0.38	0.38	0.29	0.48
Avail Cap(c_a), veh/h	809	3986	1993	2049	1812	1612
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	3.7	2.0	2.5	2.5	15.8	16.0
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.3	0.6	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.1	0.4	0.4	0.2	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	3.8	2.0	2.8	2.8	16.4	17.4
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		277	919		76	
Approach Delay, s/veh		2.3	2.8		17.0	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		28.6		6.5		28.6
Change Period (Y+Rc), s		4.9		4.4		4.9
Max Green Setting (Gmax), s		39.7		36.0		39.7
Max Q Clear Time (g_c+I1), s		7.4		3.0		5.9
Green Ext Time (p_c), s		3.7		0.1		10.4
Intersection Summary						
HCM 6th Ctrl Delay			3.5			
HCM 6th LOS			A			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	122	38	69	649	59	94	166	50	40	249	39
Future Volume (veh/h)	35	122	38	69	649	59	94	166	50	40	249	39
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.77	1.00		0.86	1.00		0.88	1.00		0.81
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	36	127	40	74	698	63	121	213	64	52	323	51
Peak Hour Factor	0.96	0.96	0.96	0.93	0.93	0.93	0.78	0.78	0.78	0.77	0.77	0.77
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	47	919	261	80	1422	518	80	898	257	66	622	428
Arrive On Green	0.03	0.36	0.36	0.05	0.38	0.38	0.05	0.34	0.34	0.04	0.34	0.34
Sat Flow, veh/h	1767	2521	716	1767	3711	1351	1767	2617	750	1767	1856	1277
Grp Volume(v), veh/h	36	85	82	74	698	63	121	140	137	52	323	51
Grp Sat Flow(s),veh/h/ln	1767	1763	1474	1767	1856	1351	1767	1763	1604	1767	1856	1277
Q Serve(g_s), s	1.8	2.8	3.3	3.7	12.7	2.7	4.0	5.0	5.4	2.6	12.4	2.5
Cycle Q Clear(g_c), s	1.8	2.8	3.3	3.7	12.7	2.7	4.0	5.0	5.4	2.6	12.4	2.5
Prop In Lane	1.00		0.49	1.00		1.00	1.00		0.47	1.00		1.00
Lane Grp Cap(c), veh/h	47	643	537	80	1422	518	80	605	550	66	622	428
V/C Ratio(X)	0.77	0.13	0.15	0.93	0.49	0.12	1.52	0.23	0.25	0.79	0.52	0.12
Avail Cap(c_a), veh/h	80	822	687	80	1730	629	80	738	671	80	777	535
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.9	18.8	18.9	42.2	20.8	17.7	42.3	20.8	20.9	42.3	23.7	20.4
Incr Delay (d2), s/veh	22.6	0.0	0.0	76.6	0.1	0.0	286.4	0.2	0.3	28.1	0.6	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	1.2	1.1	3.3	5.3	0.8	8.1	2.1	2.0	1.6	5.3	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.4	18.8	19.0	118.7	20.9	17.7	328.7	21.0	21.2	70.4	24.4	20.5
LnGrp LOS	E	B	B	F	C	B	F	C	C	E	C	C
Approach Vol, veh/h		203			835			398			426	
Approach Delay, s/veh		27.2			29.3			114.6			29.5	
Approach LOS		C			C			F			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	37.2	8.4	34.6	6.8	38.9	7.7	35.3
Change Period (Y+Rc), s	4.4	4.9	4.4	4.9	4.4	4.9	4.4	4.9
Max Green Setting (Gmax), s	4.0	41.3	4.0	37.1	4.0	41.3	4.0	37.1
Max Q Clear Time (g_c+I1), s	5.7	5.3	6.0	14.4	3.8	14.7	4.6	7.4
Green Ext Time (p_c), s	0.0	0.7	0.0	2.0	0.0	3.6	0.0	1.9

Intersection Summary	
HCM 6th Ctrl Delay	47.3
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	8.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	2	3	627	133	1	3	58	425
Future Vol, veh/h	0	0	0	0	2	3	627	133	1	3	58	425
Conflicting Peds, #/hr	0	0	0	33	0	36	10	0	33	36	0	13
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	62	62	62	90	90	90	89	89	89
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	0	3	5	697	148	1	3	65	478

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1922	2141	221	556	0	0	185	0	0
Stage 1	1579	1579	-	-	-	-	-	-	-
Stage 2	343	562	-	-	-	-	-	-	-
Critical Hdwy	6.43	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	73	48	816	1010	-	-	1384	-	-
Stage 1	185	168	-	-	-	-	-	-	-
Stage 2	716	508	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	17	0	761	1010	-	-	1337	-	-
Mov Cap-2 Maneuver	17	0	-	-	-	-	-	-	-
Stage 1	44	0	-	-	-	-	-	-	-
Stage 2	692	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	13.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1010	-	-	761	1337	-	-
HCM Lane V/C Ratio	0.69	-	-	0.011	0.003	-	-
HCM Control Delay (s)	16.1	0	-	9.8	7.7	0	-
HCM Lane LOS	C	A	-	A	A	A	-
HCM 95th %tile Q(veh)	5.8	-	-	0	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	161	24	43	111	0	0	0	0	84	323	35
Future Volume (veh/h)	0	161	24	43	111	0	0	0	0	84	323	35
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.92	0.96		1.00				1.00		0.80
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1856	1856	1856	1856	0				1856	1856	1856
Adj Flow Rate, veh/h	0	194	29	48	123	0				92	355	38
Peak Hour Factor	0.83	0.83	0.83	0.90	0.90	0.90				0.91	0.91	0.91
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	721	108	244	583	0				238	958	106
Arrive On Green	0.00	0.46	0.46	0.46	0.46	0.00				0.12	0.12	0.12
Sat Flow, veh/h	0	1556	233	354	1258	0				647	2605	289
Grp Volume(v), veh/h	0	0	223	171	0	0				259	0	226
Grp Sat Flow(s),veh/h/ln	0	0	1788	1612	0	0				1823	0	1718
Q Serve(g_s), s	0.0	0.0	4.4	0.0	0.0	0.0				7.6	0.0	7.0
Cycle Q Clear(g_c), s	0.0	0.0	4.4	3.2	0.0	0.0				7.6	0.0	7.0
Prop In Lane	0.00		0.13	0.28		0.00				0.35		0.17
Lane Grp Cap(c), veh/h	0	0	829	827	0	0				670	0	632
V/C Ratio(X)	0.00	0.00	0.27	0.21	0.00	0.00				0.39	0.00	0.36
Avail Cap(c_a), veh/h	0	0	829	827	0	0				883	0	832
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				0.33	0.33	0.33
Upstream Filter(I)	0.00	0.00	1.00	0.99	0.00	0.00				0.78	0.00	0.78
Uniform Delay (d), s/veh	0.0	0.0	9.5	9.2	0.0	0.0				19.5	0.0	19.2
Incr Delay (d2), s/veh	0.0	0.0	0.8	0.0	0.0	0.0				0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.7	1.1	0.0	0.0				3.4	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	10.3	9.2	0.0	0.0				19.6	0.0	19.3
LnGrp LOS	A	A	B	A	A	A				B	A	B
Approach Vol, veh/h		223			171						485	
Approach Delay, s/veh		10.3			9.2						19.4	
Approach LOS		B			A						B	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		31.8		26.2		31.8						
Change Period (Y+Rc), s		4.9		4.9		4.9						
Max Green Setting (Gmax), s		20.1		28.1		20.1						
Max Q Clear Time (g_c+I1), s		6.4		9.6		5.2						
Green Ext Time (p_c), s		0.4		1.1		0.3						
Intersection Summary												
HCM 6th Ctrl Delay			15.1									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	187	0	0	138	36	39	329	66	0	0	0
Future Volume (veh/h)	49	187	0	0	138	36	39	329	66	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	0.88		1.00	1.00		0.80	1.00		0.66			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1856	1856	0	0	1856	1856	1856	1856	1856			
Adj Flow Rate, veh/h	52	199	0	0	145	38	45	383	77			
Peak Hour Factor	0.94	0.94	0.94	0.95	0.95	0.95	0.86	0.86	0.86			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	228	825	0	0	788	207	427	650	125			
Arrive On Green	0.59	0.59	0.00	0.00	0.59	0.59	0.24	0.24	0.24			
Sat Flow, veh/h	259	1399	0	0	1337	350	1767	2692	520			
Grp Volume(v), veh/h	251	0	0	0	0	183	45	245	215			
Grp Sat Flow(s),veh/h/ln	1658	0	0	0	0	1687	1767	1763	1448			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	2.9	1.1	7.1	7.7			
Cycle Q Clear(g_c), s	3.7	0.0	0.0	0.0	0.0	2.9	1.1	7.1	7.7			
Prop In Lane	0.21		0.00	0.00		0.21	1.00		0.36			
Lane Grp Cap(c), veh/h	1053	0	0	0	0	995	427	425	350			
V/C Ratio(X)	0.24	0.00	0.00	0.00	0.00	0.18	0.11	0.58	0.61			
Avail Cap(c_a), veh/h	1053	0	0	0	0	995	826	824	677			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.98	0.00	0.00	0.00	0.00	0.85	1.00	1.00	1.00			
Uniform Delay (d), s/veh	5.6	0.0	0.0	0.0	0.0	5.5	17.1	19.4	19.6			
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.7			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.0	0.0	0.0	0.8	0.4	2.7	2.4			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.2	0.0	0.0	0.0	0.0	5.5	17.2	19.8	20.2			
LnGrp LOS	A	A	A	A	A	A	B	B	C			
Approach Vol, veh/h		251			183			505				
Approach Delay, s/veh		6.2			5.5			19.8				
Approach LOS		A			A			B				
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		39.1		18.9		39.1						
Change Period (Y+Rc), s		4.9		4.9		4.9						
Max Green Setting (Gmax), s		21.1		27.1		21.1						
Max Q Clear Time (g_c+I1), s		5.7		9.7		4.9						
Green Ext Time (p_c), s		0.5		1.1		0.4						
Intersection Summary												
HCM 6th Ctrl Delay			13.4									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	141	13	70	127	22	0	605	54	0	989	50
Future Volume (veh/h)	103	141	13	70	127	22	0	605	54	0	989	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.94	1.00		0.85	1.00		0.94	1.00		0.92
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	0	1856	1856	0	1856	1856
Adj Flow Rate, veh/h	123	168	15	74	135	23	0	688	61	0	1137	57
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.88	0.88	0.88	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	3	3	3	0	3	3	0	3	3
Cap, veh/h	152	351	31	95	268	46	0	1998	177	0	2087	105
Arrive On Green	0.03	0.07	0.07	0.05	0.18	0.18	0.00	0.61	0.61	0.00	1.00	1.00
Sat Flow, veh/h	1767	1668	149	1767	1502	256	0	3349	288	0	3494	170
Grp Volume(v), veh/h	123	0	183	74	0	158	0	372	377	0	589	605
Grp Sat Flow(s),veh/h/ln	1767	0	1817	1767	0	1758	0	1763	1781	0	1763	1809
Q Serve(g_s), s	8.0	0.0	11.2	4.8	0.0	9.4	0.0	12.0	12.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	8.0	0.0	11.2	4.8	0.0	9.4	0.0	12.0	12.0	0.0	0.0	0.0
Prop In Lane	1.00		0.08	1.00		0.15	0.00		0.16	0.00		0.09
Lane Grp Cap(c), veh/h	152	0	382	95	0	313	0	1082	1093	0	1082	1110
V/C Ratio(X)	0.81	0.00	0.48	0.78	0.00	0.50	0.00	0.34	0.34	0.00	0.54	0.55
Avail Cap(c_a), veh/h	321	0	589	200	0	449	0	1082	1093	0	1082	1110
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.77	0.77
Uniform Delay (d), s/veh	55.4	0.0	47.9	54.2	0.0	43.0	0.0	11.0	11.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	3.8	0.0	0.3	5.2	0.0	0.5	0.0	0.9	0.9	0.0	1.5	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	0.0	5.5	2.3	0.0	4.2	0.0	4.8	4.8	0.0	0.5	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.3	0.0	48.2	59.5	0.0	43.5	0.0	11.8	11.8	0.0	1.5	1.5
LnGrp LOS	E	A	D	E	A	D	A	B	B	A	A	A
Approach Vol, veh/h		306			232			749			1194	
Approach Delay, s/veh		52.6			48.6			11.8			1.5	
Approach LOS		D			D			B			A	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		76.1	10.6	29.3		76.1	14.3	25.6
Change Period (Y+Rc), s		4.9	4.4	4.9		4.9	4.4	4.9
Max Green Setting (Gmax), s		51.1	13.1	37.6		51.1	21.1	29.6
Max Q Clear Time (g_c+I1), s		14.0	6.8	13.2		2.0	10.0	11.4
Green Ext Time (p_c), s		1.7	0.0	0.4		3.1	0.1	0.3

Intersection Summary	
HCM 6th Ctrl Delay	15.3
HCM 6th LOS	B

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	22	253	2	78	135	15	1	1	4	117	8	42
Future Vol, veh/h	22	253	2	78	135	15	1	1	4	117	8	42
Peak Hour Factor	0.91	0.91	0.91	0.88	0.88	0.88	0.50	0.50	0.50	0.89	0.89	0.89
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	24	278	2	89	153	17	2	2	8	131	9	47
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.2	10.6	8.4	10.4
HCM LOS	B	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	17%	8%	34%	70%
Vol Thru, %	17%	91%	59%	5%
Vol Right, %	67%	1%	7%	25%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	6	277	228	167
LT Vol	1	22	78	117
Through Vol	1	253	135	8
RT Vol	4	2	15	42
Lane Flow Rate	12	304	259	188
Geometry Grp	1	1	1	1
Degree of Util (X)	0.018	0.406	0.351	0.275
Departure Headway (Hd)	5.322	4.806	4.874	5.268
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	677	743	733	676
Service Time	3.322	2.873	2.943	3.349
HCM Lane V/C Ratio	0.018	0.409	0.353	0.278
HCM Control Delay	8.4	11.2	10.6	10.4
HCM Lane LOS	A	B	B	B
HCM 95th-tile Q	0.1	2	1.6	1.1

Intersection	
Intersection Delay, s/veh	21.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	168	172	12	2	239	375	18	14	0	33	1	35
Future Vol, veh/h	168	172	12	2	239	375	18	14	0	33	1	35
Peak Hour Factor	0.83	0.83	0.83	0.91	0.91	0.91	0.80	0.80	0.80	0.86	0.86	0.86
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	202	207	14	2	263	412	23	18	0	38	1	41
Number of Lanes	0	2	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	2
HCM Control Delay	13	28.6	10.4	10.4
HCM LOS	B	D	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	56%	66%	0%	0%	48%
Vol Thru, %	44%	34%	88%	39%	1%
Vol Right, %	0%	0%	12%	61%	51%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	32	254	98	616	69
LT Vol	18	168	0	2	33
Through Vol	14	86	86	239	1
RT Vol	0	0	12	375	35
Lane Flow Rate	40	306	118	677	80
Geometry Grp	2	7	7	5	2
Degree of Util (X)	0.076	0.501	0.179	0.856	0.141
Departure Headway (Hd)	6.798	5.891	5.469	4.554	6.343
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	529	615	658	785	567
Service Time	4.818	3.606	3.184	2.653	4.362
HCM Lane V/C Ratio	0.076	0.498	0.179	0.862	0.141
HCM Control Delay	10.4	14.4	9.4	28.6	10.4
HCM Lane LOS	B	B	A	D	B
HCM 95th-tile Q	0.2	2.8	0.6	10.3	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	984	64	245	618	82	0	0	0	501	152	82
Future Volume (veh/h)	32	984	64	245	618	82	0	0	0	501	152	82
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.83	1.00		0.91				1.00		0.69
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856				1856	1856	1856
Adj Flow Rate, veh/h	33	1025	67	258	651	86				336	408	85
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95				0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3				3	3	3
Cap, veh/h	41	1447	95	507	1751	231				497	522	304
Arrive On Green	0.02	0.44	0.44	0.15	0.57	0.57				0.28	0.28	0.28
Sat Flow, veh/h	1767	3310	216	3428	3091	407				1767	1856	1081
Grp Volume(v), veh/h	33	546	546	258	371	366				336	408	85
Grp Sat Flow(s),veh/h/ln	1767	1763	1763	1714	1763	1736				1767	1856	1081
Q Serve(g_s), s	2.0	27.8	27.8	7.6	12.7	12.8				18.6	22.3	6.7
Cycle Q Clear(g_c), s	2.0	27.8	27.8	7.6	12.7	12.8				18.6	22.3	6.7
Prop In Lane	1.00		0.12	1.00		0.23				1.00		1.00
Lane Grp Cap(c), veh/h	41	771	771	507	998	983				497	522	304
V/C Ratio(X)	0.80	0.71	0.71	0.51	0.37	0.37				0.68	0.78	0.28
Avail Cap(c_a), veh/h	178	771	771	507	998	983				524	550	320
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Uniform Delay (d), s/veh	53.5	25.2	25.2	43.2	13.1	13.1				35.1	36.4	30.8
Incr Delay (d2), s/veh	12.1	5.4	5.4	0.4	1.1	1.1				2.5	6.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	12.3	12.3	3.2	5.1	5.0				8.4	11.0	4.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.6	30.7	30.7	43.5	14.2	14.2				37.6	42.6	31.0
LnGrp LOS	E	C	C	D	B	B				D	D	C
Approach Vol, veh/h		1125			995						829	
Approach Delay, s/veh		31.7			21.8						39.4	
Approach LOS		C			C						D	

Timer - Assigned Phs	1	2		4	5	6
Phs Duration (G+Y+Rc), s	21.2	53.0		35.8	7.0	67.2
Change Period (Y+Rc), s	4.9	* 4.9		4.9	4.4	4.9
Max Green Setting (Gmax), s	15.1	* 48		32.6	11.1	52.1
Max Q Clear Time (g_c+I1), s	9.6	29.8		24.3	4.0	14.8
Green Ext Time (p_c), s	0.1	1.1		1.0	0.0	0.7

Intersection Summary			
HCM 6th Ctrl Delay			30.5
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↰↰	↱
Traffic Volume (veh/h)	1601	0	0	721	299	337
Future Volume (veh/h)	1601	0	0	721	299	337
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1856	1856	1856
Adj Flow Rate, veh/h	1685	0	0	784	325	366
Peak Hour Factor	0.95	0.95	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	0	0	3	3	3
Cap, veh/h	2188	0	0	2188	855	392
Arrive On Green	1.00	0.00	0.00	0.62	0.25	0.25
Sat Flow, veh/h	3711	0	0	3711	3428	1572
Grp Volume(v), veh/h	1685	0	0	784	325	366
Grp Sat Flow(s),veh/h/ln	1763	0	0	1763	1714	1572
Q Serve(g_s), s	0.0	0.0	0.0	11.9	8.6	25.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	11.9	8.6	25.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	2188	0	0	2188	855	392
V/C Ratio(X)	0.77	0.00	0.00	0.36	0.38	0.93
Avail Cap(c_a), veh/h	2188	0	0	2188	1032	473
HCM Platoon Ratio	2.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	0.86	0.68	0.68
Uniform Delay (d), s/veh	0.0	0.0	0.0	10.2	34.2	40.4
Incr Delay (d2), s/veh	2.7	0.0	0.0	0.4	0.1	16.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	0.0	4.4	3.6	11.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	2.7	0.0	0.0	10.6	34.3	56.8
LnGrp LOS	A	A	A	B	C	E
Approach Vol, veh/h	1685			784	691	
Approach Delay, s/veh	2.7			10.6	46.2	
Approach LOS	A			B	D	

Timer - Assigned Phs	2	6	8
Phs Duration (G+Y+Rc), s	73.2	73.2	36.8
Change Period (Y+Rc), s	4.9	4.9	9.4
Max Green Setting (Gmax), s	62.6	62.6	33.1
Max Q Clear Time (g_c+I1), s	2.0	13.9	27.0
Green Ext Time (p_c), s	6.1	2.1	0.4

Intersection Summary	
HCM 6th Ctrl Delay	14.2
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	SWR	SWR2
Lane Configurations												
Traffic Volume (vph)	1744	196	405	5	32	21	30	25	7	3	309	10
Future Volume (vph)	1744	196	405	5	32	21	30	25	7	3	309	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5		5.5			5.0			5.0		4.5	
Lane Util. Factor	0.95		0.95			1.00			1.00		1.00	
Frpb, ped/bikes	0.99		1.00			0.96			1.00		1.00	
Flpb, ped/bikes	1.00		1.00			1.00			1.00		1.00	
Frt	0.98		1.00			0.95			0.99		0.86	
Flt Protected	1.00		1.00			0.98			0.97		1.00	
Satd. Flow (prot)	3406		3498			1660			1762		1596	
Flt Permitted	1.00		1.00			0.86			0.71		1.00	
Satd. Flow (perm)	3406		3498			1460			1298		1596	
Peak-hour factor, PHF	0.98	0.98	0.89	0.89	0.67	0.67	0.67	0.73	0.73	0.73	0.74	0.74
Adj. Flow (vph)	1780	200	455	6	48	31	45	34	10	4	418	14
RTOR Reduction (vph)	8	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	1972	0	461	0	0	124	0	0	48	0	432	0
Confl. Peds. (#/hr)		52					27					
Turn Type	NA		NA		Perm	NA		Perm	NA		Prot	
Protected Phases	2		6			8			4		5	
Permitted Phases					8			4				
Actuated Green, G (s)	75.6		58.5			13.9			13.9		12.6	
Effective Green, g (s)	75.6		58.5			13.9			13.9		12.6	
Actuated g/C Ratio	0.76		0.58			0.14			0.14		0.13	
Clearance Time (s)	5.5		5.5			5.0			5.0		4.5	
Vehicle Extension (s)	2.0		2.0			2.0			2.0		3.0	
Lane Grp Cap (vph)	2574		2046			202			180		201	
v/s Ratio Prot	c0.58		0.13								c0.27	
v/s Ratio Perm						c0.08			0.04			
v/c Ratio	0.77		0.23			0.61			0.27		2.15	
Uniform Delay, d1	7.1		9.9			40.5			38.5		43.7	
Progression Factor	1.00		1.00			1.00			1.00		1.00	
Incremental Delay, d2	2.2		0.3			3.9			0.3		533.4	
Delay (s)	9.3		10.2			44.4			38.8		577.1	
Level of Service	A		B			D			D		F	
Approach Delay (s)	9.3		10.2			44.4			38.8			
Approach LOS	A		B			D			D			

Intersection Summary			
HCM 2000 Control Delay	91.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	486.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↱			↰↑	↰	↱
Traffic Vol, veh/h	1747	55	34	374	40	1021
Future Vol, veh/h	1747	55	34	374	40	1021
Conflicting Peds, #/hr	0	14	3	0	14	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	-	-	0	75
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	94	94
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	1820	57	35	390	43	1086

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1891	0	2142	956
Stage 1	-	-	-	-	1863	-
Stage 2	-	-	-	-	279	-
Critical Hdwy	-	-	4.16	-	6.86	6.96
Critical Hdwy Stg 1	-	-	-	-	5.86	-
Critical Hdwy Stg 2	-	-	-	-	5.86	-
Follow-up Hdwy	-	-	2.23	-	3.53	3.33
Pot Cap-1 Maneuver	-	-	308	-	~ 41	~ 257
Stage 1	-	-	-	-	107	-
Stage 2	-	-	-	-	740	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	304	-	~ 34	~ 253
Mov Cap-2 Maneuver	-	-	-	-	~ 34	-
Stage 1	-	-	-	-	106	-
Stage 2	-	-	-	-	623	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	$ 1478
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	34	253	-	-	304	-
HCM Lane V/C Ratio	1.252	4.293	-	-	0.117	-
HCM Control Delay (s)	$ 418.2	$ 1519.5	-	-	18.4	1.1
HCM Lane LOS	F	F	-	-	C	A
HCM 95th %tile Q(veh)	4.6	107.9	-	-	0.4	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	588	2496	425	609	0	0
Future Volume (vph)	588	2496	425	609	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	4.0	4.5	4.5		
Lane Util. Factor	1.00	0.91	0.95	0.88		
Frpb, ped/bikes	1.00	1.00	1.00	0.98		
Flpb, ped/bikes	1.00	1.00	1.00	1.00		
Frt	1.00	1.00	1.00	0.85		
Flt Protected	0.95	1.00	1.00	1.00		
Satd. Flow (prot)	1752	5036	3505	2696		
Flt Permitted	0.95	1.00	1.00	1.00		
Satd. Flow (perm)	1752	5036	3505	2696		
Peak-hour factor, PHF	0.96	0.96	0.94	0.94	0.92	0.92
Adj. Flow (vph)	612	2600	452	648	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	613	2600	452	648	0	0
Confl. Bikes (#/hr)				4		
Turn Type	Prot	NA	NA	Perm		
Protected Phases	5	Free	6			
Permitted Phases				6		
Actuated Green, G (s)	44.4	110.0	55.7	55.7		
Effective Green, g (s)	44.4	110.0	55.7	55.7		
Actuated g/C Ratio	0.40	1.00	0.51	0.51		
Clearance Time (s)	5.4		4.5	4.5		
Vehicle Extension (s)	3.0		2.8	2.8		
Lane Grp Cap (vph)	707	5036	1774	1365		
v/s Ratio Prot	c0.35	0.52	0.13			
v/s Ratio Perm				0.24		
v/c Ratio	0.87	0.52	0.25	0.47		
Uniform Delay, d1	30.1	0.0	15.4	17.6		
Progression Factor	1.00	1.00	1.00	1.00		
Incremental Delay, d2	10.9	0.4	0.3	1.2		
Delay (s)	41.0	0.4	15.7	18.8		
Level of Service	D	A	B	B		
Approach Delay (s)		8.1	17.6		0.0	
Approach LOS		A	B		A	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.9
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	EBR2	WBL2	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	55	1360	74	4	13	0	492	12	32	7	24	21
Future Volume (vph)	55	1360	74	4	13	0	492	12	32	7	24	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Lane Util. Factor	1.00	0.86		0.86		1.00	0.91			1.00		
Frpb, ped/bikes	1.00	1.00		0.96		1.00	1.00			0.96		
Flpb, ped/bikes	1.00	1.00		1.00		1.00	1.00			1.00		
Frt	1.00	0.99		0.85		1.00	1.00			0.95		
Flt Protected	0.95	1.00		1.00		0.95	1.00			0.97		
Satd. Flow (prot)	1752	4722		1301		1747	5004			1639		
Flt Permitted	0.95	1.00		1.00		0.43	1.00			0.63		
Satd. Flow (perm)	1752	4722		1301		799	5004			1067		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.87	0.87	0.87	0.87	0.83	0.83	0.83	0.76
Adj. Flow (vph)	61	1511	82	4	15	0	566	14	39	8	29	28
RTOR Reduction (vph)	0	0	0	1	0	0	1	0	0	25	0	0
Lane Group Flow (vph)	61	1593	0	3	0	15	579	0	0	51	0	0
Confl. Peds. (#/hr)				15	15			34			44	29
Confl. Bikes (#/hr)				1				1			1	
Turn Type	Prot	NA		Perm	custom	Prot	NA		Perm	NA		Perm
Protected Phases	5!	2				1	6			8		
Permitted Phases				2	1				8			4
Actuated Green, G (s)	12.2	70.1		70.1		9.2	67.6			16.0		
Effective Green, g (s)	12.2	70.1		70.1		9.2	67.6			16.0		
Actuated g/C Ratio	0.11	0.64		0.64		0.08	0.61			0.15		
Clearance Time (s)	4.4	4.9		4.9		4.9	4.9			4.9		
Vehicle Extension (s)	3.0	4.0		4.0		3.0	3.0			3.0		
Lane Grp Cap (vph)	194	3009		829		66	3075			155		
v/s Ratio Prot	0.03	c0.34					c0.12					
v/s Ratio Perm				0.00		0.02				0.05		
v/c Ratio	0.31	0.53		0.00		0.23	0.19			0.33		
Uniform Delay, d1	45.0	10.9		7.3		47.1	9.2			42.2		
Progression Factor	1.00	1.00		1.00		1.00	1.00			1.00		
Incremental Delay, d2	0.9	0.7		0.0		1.8	0.1			1.3		
Delay (s)	46.0	11.6		7.3		48.8	9.4			43.4		
Level of Service	D	B		A		D	A			D		
Approach Delay (s)		12.8					10.4			43.4		
Approach LOS		B					B			D		

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	389	924	17	115	354	77	83	191	109	81	116	139
Future Volume (veh/h)	389	924	17	115	354	77	83	191	109	81	116	139
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.88	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	427	1015	0	122	377	82	97	222	127	88	126	151
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.86	0.86	0.86	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	504	1421		276	1453	572	124	406	181	112	201	301
Arrive On Green	0.15	0.40	0.00	0.16	0.41	0.41	0.07	0.12	0.12	0.06	0.11	0.11
Sat Flow, veh/h	3428	3526	1572	1767	3526	1389	1767	3526	1572	1767	1856	2768
Grp Volume(v), veh/h	427	1015	0	122	377	82	97	222	127	88	126	151
Grp Sat Flow(s),veh/h/ln	1714	1763	1572	1767	1763	1389	1767	1763	1572	1767	1856	1384
Q Serve(g_s), s	10.7	21.3	0.0	5.5	6.2	3.3	4.8	5.2	4.6	4.3	5.7	4.5
Cycle Q Clear(g_c), s	10.7	21.3	0.0	5.5	6.2	3.3	4.8	5.2	4.6	4.3	5.7	4.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	504	1421		276	1453	572	124	406	181	112	201	301
V/C Ratio(X)	0.85	0.71		0.44	0.26	0.14	0.78	0.55	0.70	0.78	0.63	0.50
Avail Cap(c_a), veh/h	587	1820		276	1684	663	271	1520	678	134	657	980
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.6	22.0	0.0	33.7	17.1	16.2	40.3	36.8	17.0	40.7	37.6	37.0
Incr Delay (d2), s/veh	8.8	1.5	0.0	0.4	0.1	0.2	4.0	1.4	5.8	18.0	4.3	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	8.7	0.0	2.3	2.4	1.0	2.2	2.3	2.8	2.4	2.8	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.4	23.6	0.0	34.1	17.2	16.3	44.3	38.2	22.8	58.7	41.9	38.8
LnGrp LOS	D	C		C	B	B	D	D	C	E	D	D
Approach Vol, veh/h		1442			581			446			365	
Approach Delay, s/veh		30.0			20.6			35.1			44.7	
Approach LOS		C			C			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.7	41.4	11.6	15.5	18.9	42.2	11.0	16.1
Change Period (Y+Rc), s	5.9	* 5.9	5.4	5.9	5.9	5.9	5.4	5.9
Max Green Setting (Gmax), s	12.3	* 46	13.5	31.2	15.1	42.1	6.7	38.0
Max Q Clear Time (g_c+I1), s	17.5	23.3	6.8	7.7	12.7	8.2	6.3	7.2
Green Ext Time (p_c), s	0.1	12.3	0.1	1.9	0.3	3.9	0.0	2.4

Intersection Summary	
HCM 6th Ctrl Delay	30.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	418	23	147	402	0	0	0	0	145	237	40
Future Volume (veh/h)	0	418	23	147	402	0	0	0	0	145	237	40
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.89	1.00		1.00				1.00		0.40
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1856	1856	1856	1856	0				1856	1856	1856
Adj Flow Rate, veh/h	0	464	26	155	423	0				159	260	44
Peak Hour Factor	0.90	0.90	0.90	0.95	0.95	0.95				0.91	0.91	0.91
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	1039	58	631	1354	0				193	317	54
Arrive On Green	0.00	0.60	0.60	0.09	0.73	0.00				0.18	0.18	0.18
Sat Flow, veh/h	0	1727	97	1767	1856	0				1054	1737	296
Grp Volume(v), veh/h	0	0	490	155	423	0				272	0	191
Grp Sat Flow(s),veh/h/ln	0	0	1823	1767	1856	0				1803	0	1284
Q Serve(g_s), s	0.0	0.0	16.4	3.1	8.9	0.0				16.3	0.0	16.0
Cycle Q Clear(g_c), s	0.0	0.0	16.4	3.1	8.9	0.0				16.3	0.0	16.0
Prop In Lane	0.00		0.05	1.00		0.00				0.58		0.23
Lane Grp Cap(c), veh/h	0	0	1098	631	1354	0				329	0	235
V/C Ratio(X)	0.00	0.00	0.45	0.25	0.31	0.00				0.83	0.00	0.81
Avail Cap(c_a), veh/h	0	0	1098	760	1354	0				629	0	448
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	0.98	0.98	0.00				0.61	0.00	0.61
Uniform Delay (d), s/veh	0.0	0.0	12.1	7.0	5.3	0.0				44.0	0.0	43.9
Incr Delay (d2), s/veh	0.0	0.0	1.3	0.2	0.6	0.0				1.2	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	6.9	1.1	3.2	0.0				7.4	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	13.5	7.2	5.9	0.0				45.3	0.0	45.6
LnGrp LOS	A	A	B	A	A	A				D	A	D
Approach Vol, veh/h		490			578						463	
Approach Delay, s/veh		13.5			6.3						45.4	
Approach LOS		B			A						D	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	14.3	72.3		25.4		86.6
Change Period (Y+Rc), s	4.4	4.9		4.9		4.9
Max Green Setting (Gmax), s	18.1	40.6		39.1		63.1
Max Q Clear Time (g_c+I1), s	5.1	18.4		18.3		10.9
Green Ext Time (p_c), s	0.3	2.2		2.2		1.8

Intersection Summary	
HCM 6th Ctrl Delay	20.4
HCM 6th LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	551	0	0	511	241	54	334	264	0	0	0
Future Volume (veh/h)	34	551	0	0	511	241	54	334	264	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	0.93		1.00	1.00		0.75	1.00		0.68			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1856	1856	0	0	1856	1856	1856	1856	1856			
Adj Flow Rate, veh/h	36	586	0	0	538	254	58	359	284			
Peak Hour Factor	0.94	0.94	0.94	0.95	0.95	0.95	0.93	0.93	0.93			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	67	894	0	0	1883	632	511	510	310			
Arrive On Green	1.00	1.00	0.00	0.00	1.00	1.00	0.10	0.10	0.10			
Sat Flow, veh/h	61	1675	0	0	3618	1184	1767	1763	1070			
Grp Volume(v), veh/h	622	0	0	0	538	254	58	359	284			
Grp Sat Flow(s),veh/h/ln	1736	0	0	0	1763	1184	1767	1763	1070			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	3.4	22.1	29.5			
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	3.4	22.1	29.5			
Prop In Lane	0.06		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	961	0	0	0	1883	632	511	510	310			
V/C Ratio(X)	0.65	0.00	0.00	0.00	0.29	0.40	0.11	0.70	0.92			
Avail Cap(c_a), veh/h	961	0	0	0	1883	632	554	552	335			
HCM Platoon Ratio	2.00	2.00	1.00	1.00	2.00	2.00	0.33	0.33	0.33			
Upstream Filter(I)	0.88	0.00	0.00	0.00	0.85	0.85	0.59	0.59	0.59			
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	37.5	46.0	49.3			
Incr Delay (d2), s/veh	3.0	0.0	0.0	0.0	0.3	1.6	0.0	1.7	18.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.8	0.0	0.0	0.0	0.1	0.3	1.5	10.7	10.1			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	3.0	0.0	0.0	0.0	0.3	1.6	37.5	47.7	67.7			
LnGrp LOS	A	A	A	A	A	A	D	D	E			
Approach Vol, veh/h		622			792			701				
Approach Delay, s/veh		3.0			0.7			55.0				
Approach LOS		A			A			D				

Timer - Assigned Phs		2		4		6			
Phs Duration (G+Y+Rc), s		69.7		42.3		69.7			
Change Period (Y+Rc), s		* 9.9		* 9.9		* 9.9			
Max Green Setting (Gmax), s		* 57		* 35		* 57			
Max Q Clear Time (g_c+I1), s		2.0		31.5		2.0			
Green Ext Time (p_c), s		1.9		0.9		1.8			

Intersection Summary	
HCM 6th Ctrl Delay	19.4
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	355	430	27	108	320	152	21	824	95	229	695	380
Future Volume (veh/h)	355	430	27	108	320	152	21	824	95	229	695	380
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.75	1.00		0.73	1.00		0.74	1.00		0.84
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	370	448	28	119	352	167	22	877	101	244	739	404
Peak Hour Factor	0.96	0.96	0.96	0.91	0.91	0.91	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	432	939	58	146	852	519	31	945	109	270	1566	782
Arrive On Green	0.04	0.09	0.09	0.08	0.24	0.24	0.02	0.41	0.41	0.15	0.44	0.44
Sat Flow, veh/h	3428	3296	204	1767	3526	1154	1767	3055	352	1767	3526	1315
Grp Volume(v), veh/h	370	238	238	119	352	167	22	506	472	244	739	404
Grp Sat Flow(s),veh/h/ln	1714	1763	1738	1767	1763	1154	1767	1763	1644	1767	1763	1315
Q Serve(g_s), s	12.0	14.3	14.6	7.4	9.4	11.5	1.4	30.6	30.6	15.2	16.5	21.4
Cycle Q Clear(g_c), s	12.0	14.3	14.6	7.4	9.4	11.5	1.4	30.6	30.6	15.2	16.5	21.4
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.21	1.00		1.00
Lane Grp Cap(c), veh/h	432	502	495	146	852	519	31	545	508	270	1566	782
V/C Ratio(X)	0.86	0.47	0.48	0.81	0.41	0.32	0.70	0.93	0.93	0.90	0.47	0.52
Avail Cap(c_a), veh/h	447	502	495	262	869	524	270	545	508	270	1566	782
HCM Platoon Ratio	0.33	0.33	0.33	1.00	1.00	1.00	1.33	1.33	1.33	1.00	1.00	1.00
Upstream Filter(I)	0.73	0.73	0.73	0.91	0.91	0.91	0.83	0.83	0.83	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.7	42.8	42.9	50.5	35.8	24.0	54.4	31.8	31.8	46.6	21.9	14.9
Incr Delay (d2), s/veh	11.3	0.3	0.3	3.8	0.2	0.2	8.5	21.4	22.5	30.4	1.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.2	6.8	6.9	3.4	4.1	3.1	0.7	15.1	14.2	8.8	6.7	6.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.0	43.0	43.2	54.3	35.9	24.2	62.9	53.2	54.3	77.1	22.9	17.4
LnGrp LOS	E	D	D	D	D	C	E	D	D	E	C	B
Approach Vol, veh/h		846			638			1000			1387	
Approach Delay, s/veh		52.2			36.3			53.9			30.8	
Approach LOS		D			D			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.7	36.8	6.4	55.2	18.5	32.0	21.5	40.0
Change Period (Y+Rc), s	4.4	4.9	4.4	5.4	4.4	4.9	4.4	5.4
Max Green Setting (Gmax), s	16.6	25.6	17.1	33.6	14.6	27.6	17.1	33.6
Max Q Clear Time (g_c+I1), s	9.4	16.6	3.4	23.4	14.0	13.5	17.2	32.6
Green Ext Time (p_c), s	0.1	1.5	0.0	5.8	0.1	2.0	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	42.4
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	158	735	171	131	420	17	137	62	35	28	82	72
Future Volume (veh/h)	158	735	171	131	420	17	137	62	35	28	82	72
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.75	1.00		0.79	0.88		0.68	0.78		0.77
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	170	790	184	139	447	18	159	72	41	35	101	89
Peak Hour Factor	0.93	0.93	0.93	0.94	0.94	0.94	0.86	0.86	0.86	0.81	0.81	0.81
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	200	1326	309	167	1703	599	242	258	147	278	218	192
Arrive On Green	0.11	0.50	0.50	0.09	0.48	0.48	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1767	2645	616	1767	3526	1240	1041	930	530	986	788	694
Grp Volume(v), veh/h	170	527	447	139	447	18	159	0	113	35	0	190
Grp Sat Flow(s),veh/h/ln	1767	1763	1498	1767	1763	1240	1041	0	1460	986	0	1482
Q Serve(g_s), s	10.6	23.8	23.8	8.7	8.4	0.9	16.7	0.0	6.8	3.2	0.0	11.9
Cycle Q Clear(g_c), s	10.6	23.8	23.8	8.7	8.4	0.9	28.6	0.0	6.8	10.0	0.0	11.9
Prop In Lane	1.00		0.41	1.00		1.00	1.00		0.36	1.00		0.47
Lane Grp Cap(c), veh/h	200	884	751	167	1703	599	242	0	404	278	0	411
V/C Ratio(X)	0.85	0.60	0.60	0.83	0.26	0.03	0.66	0.00	0.28	0.13	0.00	0.46
Avail Cap(c_a), veh/h	333	884	751	270	1703	599	280	0	457	313	0	465
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.57	0.57	0.57	0.98	0.98	0.98	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.7	19.9	19.9	49.8	17.1	15.2	45.4	0.0	31.7	35.6	0.0	33.6
Incr Delay (d2), s/veh	2.8	1.7	2.0	5.2	0.4	0.1	2.9	0.0	0.1	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	10.1	8.6	4.1	3.5	0.3	4.5	0.0	2.4	0.8	0.0	4.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	51.6	21.5	21.8	55.1	17.5	15.3	48.3	0.0	31.9	35.7	0.0	33.9
LnGrp LOS	D	C	C	E	B	B	D	A	C	D	A	C
Approach Vol, veh/h		1144			604			272			225	
Approach Delay, s/veh		26.1			26.1			41.5			34.2	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.0	61.1		35.9	17.1	59.0		35.9
Change Period (Y+Rc), s	4.4	4.9		4.9	4.4	4.9		4.9
Max Green Setting (Gmax), s	17.1	45.6		35.1	21.1	41.6		35.1
Max Q Clear Time (g_c+I1), s	10.7	25.8		13.9	12.6	10.4		30.6
Green Ext Time (p_c), s	0.1	12.1		1.0	0.1	3.8		0.4

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑	↑↱		↰	↱
Traffic Volume (veh/h)	90	743	370	26	94	69
Future Volume (veh/h)	90	743	370	26	94	69
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.93			0.84	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	93	766	430	30	113	83
Peak Hour Factor	0.97	0.97	0.86	0.86	0.83	0.83
Percent Heavy Veh, %	3	3	3	3	3	3
Cap, veh/h	708	2373	2219	154	184	164
Arrive On Green	0.67	0.67	0.67	0.67	0.10	0.10
Sat Flow, veh/h	859	3618	3389	228	1767	1572
Grp Volume(v), veh/h	93	766	228	232	113	83
Grp Sat Flow(s),veh/h/ln	859	1763	1763	1762	1767	1572
Q Serve(g_s), s	1.9	3.8	2.0	2.1	2.6	2.1
Cycle Q Clear(g_c), s	4.0	3.8	2.0	2.1	2.6	2.1
Prop In Lane	1.00			0.13	1.00	1.00
Lane Grp Cap(c), veh/h	708	2373	1187	1186	184	164
V/C Ratio(X)	0.13	0.32	0.19	0.20	0.61	0.51
Avail Cap(c_a), veh/h	946	3349	1675	1674	1522	1355
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	3.3	2.9	2.6	2.6	17.9	17.7
Incr Delay (d2), s/veh	0.2	0.2	0.1	0.1	1.2	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.6	0.3	0.3	1.0	0.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	3.5	3.0	2.7	2.7	19.1	18.6
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		859	460		196	
Approach Delay, s/veh		3.1	2.7		18.9	
Approach LOS		A	A		B	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		33.0		8.8		33.0
Change Period (Y+Rc), s		4.9		4.4		4.9
Max Green Setting (Gmax), s		39.7		36.0		39.7
Max Q Clear Time (g_c+I1), s		6.0		4.6		4.1
Green Ext Time (p_c), s		12.8		0.3		4.5

Intersection Summary						
HCM 6th Ctrl Delay			5.0			
HCM 6th LOS			A			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	86	593	65	44	278	60	71	321	76	156	202	32
Future Volume (veh/h)	86	593	65	44	278	60	71	321	76	156	202	32
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.67	1.00		0.80	1.00		0.83	1.00		0.76
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	95	652	71	52	327	71	75	338	80	184	238	38
Peak Hour Factor	0.91	0.91	0.91	0.85	0.85	0.85	0.95	0.95	0.95	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	73	1126	122	66	1362	462	73	977	224	73	665	428
Arrive On Green	0.04	0.37	0.37	0.04	0.37	0.37	0.04	0.36	0.36	0.04	0.36	0.36
Sat Flow, veh/h	1767	3036	329	1767	3711	1260	1767	2728	626	1767	1856	1195
Grp Volume(v), veh/h	95	377	346	52	327	71	75	215	203	184	238	38
Grp Sat Flow(s),veh/h/ln	1767	1763	1602	1767	1856	1260	1767	1763	1591	1767	1856	1195
Q Serve(g_s), s	4.0	16.6	16.8	2.8	5.9	3.7	4.0	8.6	9.1	4.0	9.1	2.0
Cycle Q Clear(g_c), s	4.0	16.6	16.8	2.8	5.9	3.7	4.0	8.6	9.1	4.0	9.1	2.0
Prop In Lane	1.00		0.21	1.00		1.00	1.00		0.39	1.00		1.00
Lane Grp Cap(c), veh/h	73	654	594	66	1362	462	73	632	570	73	665	428
V/C Ratio(X)	1.30	0.58	0.58	0.78	0.24	0.15	1.03	0.34	0.36	2.52	0.36	0.09
Avail Cap(c_a), veh/h	73	752	683	73	1583	538	73	676	610	73	711	458
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.4	24.4	24.4	46.2	21.3	20.6	46.4	22.7	22.9	46.4	22.9	20.6
Incr Delay (d2), s/veh	205.6	0.3	0.4	38.7	0.0	0.1	113.0	0.4	0.4	722.6	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.9	6.9	6.4	1.9	2.5	1.1	4.0	3.6	3.4	16.4	3.9	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	252.0	24.7	24.8	84.9	21.3	20.6	159.4	23.1	23.3	769.0	23.2	20.7
LnGrp LOS	F	C	C	F	C	C	F	C	C	F	C	C
Approach Vol, veh/h		818			450			493			460	
Approach Delay, s/veh		51.2			28.5			43.9			321.3	
Approach LOS		D			C			D			F	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.0	40.8	8.4	39.6	8.4	40.4	8.4	39.6
Change Period (Y+Rc), s	4.4	4.9	4.4	4.9	4.4	4.9	4.4	4.9
Max Green Setting (Gmax), s	4.0	41.3	4.0	37.1	4.0	41.3	4.0	37.1
Max Q Clear Time (g_c+I1), s	6.0	18.8	6.0	11.1	6.0	7.9	6.0	11.1
Green Ext Time (p_c), s	0.0	3.4	0.0	1.4	0.0	1.7	0.0	3.0

Intersection Summary	
HCM 6th Ctrl Delay	100.9
HCM 6th LOS	F

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	3	4	6	313	209	4	16	159	216
Future Vol, veh/h	0	0	0	3	4	6	313	209	4	16	159	216
Conflicting Peds, #/hr	0	0	0	91	0	94	42	0	91	94	0	45
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	54	54	54	93	93	93	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	0	0	0	6	7	11	337	225	4	19	189	257

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1442	1524	415	491	0	0	323	0	0
Stage 1	995	995	-	-	-	-	-	-	-
Stage 2	447	529	-	-	-	-	-	-	-
Critical Hdwy	6.43	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	145	117	635	1067	-	-	1231	-	-
Stage 1	356	321	-	-	-	-	-	-	-
Stage 2	642	526	-	-	-	-	-	-	-
Platoon blocked, %					-	-		-	-
Mov Cap-1 Maneuver	75	0	526	1067	-	-	1121	-	-
Mov Cap-2 Maneuver	75	0	-	-	-	-	-	-	-
Stage 1	207	0	-	-	-	-	-	-	-
Stage 2	573	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.8	5.9	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1067	-	-	175	1121	-	-
HCM Lane V/C Ratio	0.315	-	-	0.138	0.017	-	-
HCM Control Delay (s)	9.9	0	-	28.8	8.3	0	-
HCM Lane LOS	A	A	-	D	A	A	-
HCM 95th %tile Q(veh)	1.4	-	-	0.5	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	268	25	43	170	0	0	0	0	96	284	34
Future Volume (veh/h)	0	268	25	43	170	0	0	0	0	96	284	34
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.84	0.93		1.00				1.00		0.70
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1856	1856	1856	1856	0				1856	1856	1856
Adj Flow Rate, veh/h	0	308	29	48	189	0				108	319	38
Peak Hour Factor	0.87	0.87	0.87	0.90	0.90	0.90				0.89	0.89	0.89
Percent Heavy Veh, %	0	3	3	3	3	0				3	3	3
Cap, veh/h	0	669	63	163	579	0				325	999	123
Arrive On Green	0.00	0.41	0.41	0.41	0.41	0.00				0.14	0.14	0.14
Sat Flow, veh/h	0	1638	154	210	1419	0				780	2397	295
Grp Volume(v), veh/h	0	0	337	237	0	0				251	0	214
Grp Sat Flow(s),veh/h/ln	0	0	1792	1629	0	0				1817	0	1656
Q Serve(g_s), s	0.0	0.0	7.7	0.1	0.0	0.0				7.0	0.0	6.5
Cycle Q Clear(g_c), s	0.0	0.0	7.7	7.7	0.0	0.0				7.0	0.0	6.5
Prop In Lane	0.00		0.09	0.20		0.00				0.43		0.18
Lane Grp Cap(c), veh/h	0	0	732	742	0	0				757	0	690
V/C Ratio(X)	0.00	0.00	0.46	0.32	0.00	0.00				0.33	0.00	0.31
Avail Cap(c_a), veh/h	0	0	732	742	0	0				814	0	742
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				0.33	0.33	0.33
Upstream Filter(I)	0.00	0.00	1.00	0.97	0.00	0.00				0.72	0.00	0.72
Uniform Delay (d), s/veh	0.0	0.0	12.1	11.2	0.0	0.0				17.1	0.0	16.9
Incr Delay (d2), s/veh	0.0	0.0	2.1	0.1	0.0	0.0				0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	3.1	1.8	0.0	0.0				3.0	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	14.2	11.3	0.0	0.0				17.2	0.0	17.0
LnGrp LOS	A	A	B	B	A	A				B	A	B
Approach Vol, veh/h		337			237						465	
Approach Delay, s/veh		14.2			11.3						17.1	
Approach LOS		B			B						B	

Timer - Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		27.8		28.2		27.8		
Change Period (Y+Rc), s		4.9		4.9		4.9		
Max Green Setting (Gmax), s		21.1		25.1		21.1		
Max Q Clear Time (g_c+I1), s		9.7		9.0		9.7		
Green Ext Time (p_c), s		0.7		1.1		0.5		

Intersection Summary			
HCM 6th Ctrl Delay			14.8
HCM 6th LOS			B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	305	0	0	163	72	62	538	197	0	0	0
Future Volume (veh/h)	33	305	0	0	163	72	62	538	197	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	0.80		1.00	1.00		0.61	1.00		0.57			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1856	1856	0	0	1856	1856	1856	1856	1856			
Adj Flow Rate, veh/h	35	328	0	0	172	76	65	560	205			
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.96	0.96	0.96			
Percent Heavy Veh, %	3	3	0	0	3	3	3	3	3			
Cap, veh/h	113	847	0	0	505	223	569	669	241			
Arrive On Green	0.17	0.17	0.00	0.00	0.50	0.50	0.32	0.32	0.32			
Sat Flow, veh/h	84	1684	0	0	1003	443	1767	2079	748			
Grp Volume(v), veh/h	363	0	0	0	0	248	65	473	292			
Grp Sat Flow(s),veh/h/ln	1767	0	0	0	0	1446	1767	1763	1064			
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	5.8	1.5	13.9	14.3			
Cycle Q Clear(g_c), s	9.8	0.0	0.0	0.0	0.0	5.8	1.5	13.9	14.3			
Prop In Lane	0.10		0.00	0.00		0.31	1.00		0.70			
Lane Grp Cap(c), veh/h	960	0	0	0	0	728	569	567	343			
V/C Ratio(X)	0.38	0.00	0.00	0.00	0.00	0.34	0.11	0.83	0.85			
Avail Cap(c_a), veh/h	960	0	0	0	0	728	761	759	458			
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.94	0.00	0.00	0.00	0.00	0.85	1.00	1.00	1.00			
Uniform Delay (d), s/veh	15.7	0.0	0.0	0.0	0.0	8.3	13.4	17.6	17.7			
Incr Delay (d2), s/veh	1.1	0.0	0.0	0.0	0.0	0.1	0.0	4.6	8.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.9	0.0	0.0	0.0	0.0	1.5	0.5	5.7	3.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.7	0.0	0.0	0.0	0.0	8.4	13.4	22.2	26.5			
LnGrp LOS	B	A	A	A	A	A	B	C	C			
Approach Vol, veh/h		363			248			830				
Approach Delay, s/veh		16.7			8.4			23.1				
Approach LOS		B			A			C				
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		33.1		22.9		33.1						
Change Period (Y+Rc), s		4.9		4.9		4.9						
Max Green Setting (Gmax), s		22.1		24.1		22.1						
Max Q Clear Time (g_c+I1), s		11.8		16.3		7.8						
Green Ext Time (p_c), s		0.7		1.7		0.6						
Intersection Summary												
HCM 6th Ctrl Delay			18.9									
HCM 6th LOS			B									

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	189	282	24	76	125	26	0	726	94	0	719	92
Future Volume (veh/h)	189	282	24	76	125	26	0	726	94	0	719	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.84	1.00		0.78	1.00		0.86	1.00		0.87
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	0	1856	1856	0	1856	1856
Adj Flow Rate, veh/h	201	300	26	85	140	29	0	748	97	0	765	98
Peak Hour Factor	0.94	0.94	0.94	0.89	0.89	0.89	0.97	0.97	0.97	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	0	3	3	0	3	3
Cap, veh/h	227	419	36	108	263	54	0	1716	222	0	1723	221
Arrive On Green	0.26	0.51	0.51	0.06	0.19	0.19	0.00	0.56	0.56	0.00	1.00	1.00
Sat Flow, veh/h	1767	1654	143	1767	1412	293	0	3164	398	0	3176	395
Grp Volume(v), veh/h	201	0	326	85	0	169	0	429	416	0	437	426
Grp Sat Flow(s),veh/h/ln	1767	0	1798	1767	0	1705	0	1763	1707	0	1763	1716
Q Serve(g_s), s	12.3	0.0	15.7	5.3	0.0	10.0	0.0	15.9	15.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	12.3	0.0	15.7	5.3	0.0	10.0	0.0	15.9	15.9	0.0	0.0	0.0
Prop In Lane	1.00		0.08	1.00		0.17	0.00		0.23	0.00		0.23
Lane Grp Cap(c), veh/h	227	0	455	108	0	317	0	985	954	0	985	959
V/C Ratio(X)	0.89	0.00	0.72	0.79	0.00	0.53	0.00	0.44	0.44	0.00	0.44	0.44
Avail Cap(c_a), veh/h	301	0	491	222	0	390	0	985	954	0	985	959
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	0.92	0.00	0.92	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.90	0.90
Uniform Delay (d), s/veh	40.9	0.0	24.5	51.9	0.0	41.2	0.0	14.4	14.4	0.0	0.0	0.0
Incr Delay (d2), s/veh	16.7	0.0	3.4	4.7	0.0	0.5	0.0	1.4	1.5	0.0	1.3	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	0.0	5.5	2.5	0.0	4.3	0.0	6.5	6.4	0.0	0.4	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.6	0.0	27.9	56.6	0.0	41.7	0.0	15.8	15.9	0.0	1.3	1.3
LnGrp LOS	E	A	C	E	A	D	A	B	B	A	A	A
Approach Vol, veh/h		527			254			845			863	
Approach Delay, s/veh		39.2			46.7			15.8			1.3	
Approach LOS		D			D			B			A	

Timer - Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		67.5	11.2	33.3		67.5	18.8	25.7
Change Period (Y+Rc), s		4.9	4.4	4.9		4.9	4.4	4.9
Max Green Setting (Gmax), s		53.1	14.1	30.6		53.1	19.1	25.6
Max Q Clear Time (g_c+I1), s		17.9	7.3	17.7		2.0	14.3	12.0
Green Ext Time (p_c), s		2.0	0.0	0.7		2.1	0.1	0.3

Intersection Summary			
HCM 6th Ctrl Delay			18.9
HCM 6th LOS			B

Intersection	
Intersection Delay, s/veh	38
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	582	2	59	222	26	0	2	8	238	3	30
Future Vol, veh/h	35	582	2	59	222	26	0	2	8	238	3	30
Peak Hour Factor	0.99	0.99	0.99	0.95	0.95	0.95	0.50	0.50	0.50	0.90	0.90	0.90
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	35	588	2	62	234	27	0	4	16	264	3	33
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	59.6	16.5	10.5	18.1
HCM LOS	F	C	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	6%	19%	88%
Vol Thru, %	20%	94%	72%	1%
Vol Right, %	80%	0%	8%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	10	619	307	271
LT Vol	0	35	59	238
Through Vol	2	582	222	3
RT Vol	8	2	26	30
Lane Flow Rate	20	625	323	301
Geometry Grp	1	1	1	1
Degree of Util (X)	0.04	1	0.555	0.566
Departure Headway (Hd)	7.194	5.755	6.183	6.762
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	503	638	591	542
Service Time	5.155	3.755	4.141	4.699
HCM Lane V/C Ratio	0.04	0.98	0.547	0.555
HCM Control Delay	10.5	59.6	16.5	18.1
HCM Lane LOS	B	F	C	C
HCM 95th-tile Q	0.1	15.3	3.4	3.5

Intersection	
Intersection Delay, s/veh	19.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	177	455	27	2	233	272	13	7	4	50	11	49
Future Vol, veh/h	177	455	27	2	233	272	13	7	4	50	11	49
Peak Hour Factor	0.96	0.96	0.96	0.91	0.91	0.91	0.60	0.60	0.60	0.86	0.86	0.86
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	184	474	28	2	256	299	22	12	7	58	13	57
Number of Lanes	0	2	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	2
HCM Control Delay	17.8	24.5	10.8	11.7
HCM LOS	C	C	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	54%	44%	0%	0%	45%
Vol Thru, %	29%	56%	89%	46%	10%
Vol Right, %	17%	0%	11%	54%	45%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	24	405	255	507	110
LT Vol	13	177	0	2	50
Through Vol	7	228	228	233	11
RT Vol	4	0	27	272	49
Lane Flow Rate	40	421	265	557	128
Geometry Grp	2	7	7	5	2
Degree of Util (X)	0.079	0.696	0.416	0.789	0.234
Departure Headway (Hd)	7.1	5.947	5.65	5.1	6.588
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	503	607	636	708	544
Service Time	5.171	3.687	3.39	3.137	4.644
HCM Lane V/C Ratio	0.08	0.694	0.417	0.787	0.235
HCM Control Delay	10.8	21.2	12.4	24.5	11.7
HCM Lane LOS	B	C	B	C	B
HCM 95th-tile Q	0.3	5.5	2	7.9	0.9

Attachment F - Arterial Analysis Results

Existing Conditions

Arterial Level of Service: EB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Fourth Avenue	IV	25	17.7	12.7	30.4	0.07	7.9	E
Fifth Avenue	IV	25	18.2	11.6	29.8	0.07	8.3	E
Sixth Avenue	IV	25	14.0	25.1	39.1	0.05	4.8	F
Tenth Avenue	IV	25	37.6	38.3	75.9	0.25	11.7	D
Normal Street	IV	25	49.3	6.2	55.5	0.32	20.9	B
Park Boulevard	IV	25	33.3	14.6	47.9	0.20	15.2	C
Total	IV		170.1	108.5	278.6	0.96	12.4	D

Arterial Level of Service: WB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Park Boulevard	IV	30	17.4	22.0	39.4	0.10	8.8	E
Normal Street	IV	25	33.3	7.1	40.4	0.20	18.0	C
Tenth Avenue	IV	30	42.5	10.0	52.5	0.32	22.1	B
Sixth Avenue	IV	30	32.4	41.9	74.3	0.25	11.9	D
Fifth Avenue	IV	30	12.0	9.0	21.0	0.05	9.0	D
Fourth Avenue	IV	30	15.6	1.7	17.3	0.07	14.3	C
Total	IV		153.2	91.7	244.9	0.99	14.5	C

Arterial Level of Service: EB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Fourth Avenue	IV	25	17.7	16.6	34.3	0.07	7.0	F
Fifth Avenue	IV	25	18.2	18.9	37.1	0.07	6.7	F
Sixth Avenue	IV	25	14.0	36.4	50.4	0.05	3.8	F
Tenth Avenue	IV	25	37.6	34.8	72.4	0.25	12.2	D
Normal Street	IV	25	49.3	8.6	57.9	0.32	20.0	B
Park Boulevard	IV	25	33.3	21.9	55.2	0.20	13.2	C
Total	IV		170.1	137.2	307.3	0.96	11.2	D

Arterial Level of Service: WB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Park Boulevard	IV	30	17.4	18.6	36.0	0.10	9.6	D
Normal Street	IV	25	33.3	7.6	40.9	0.20	17.8	C
Tenth Avenue	IV	30	42.5	16.5	59.0	0.32	19.7	B
Sixth Avenue	IV	30	32.4	40.3	72.7	0.25	12.2	D
Fifth Avenue	IV	30	12.0	9.1	21.1	0.05	9.0	E
Fourth Avenue	IV	30	15.6	11.0	26.6	0.07	9.3	D
Total	IV		153.2	103.1	256.3	0.99	13.9	C

Future Conditions

Arterial Level of Service: EB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Fourth Avenue	IV	25	17.7	26.5	44.2	0.07	5.4	F
Fifth Avenue	IV	25	18.2	20.7	38.9	0.07	6.3	F
Sixth Avenue	IV	25	14.0	26.4	40.4	0.05	4.7	F
Tenth Avenue	IV	25	37.6	39.3	76.9	0.25	11.5	D
Normal Street	IV	25	49.3	7.7	57.0	0.32	20.3	B
Park Boulevard	IV	25	33.3	20.2	53.5	0.20	13.6	C
Total	IV		170.1	140.8	310.9	0.96	11.1	D

Arterial Level of Service: WB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Park Boulevard	IV	30	17.4	29.3	46.7	0.10	7.4	E
Normal Street	IV	25	33.3	11.4	44.7	0.20	16.3	C
Tenth Avenue	IV	30	42.5	13.1	55.6	0.32	20.9	B
Sixth Avenue	IV	30	32.4	49.2	81.6	0.25	10.8	D
Fifth Avenue	IV	30	12.0	11.6	23.6	0.05	8.0	E
Fourth Avenue	IV	30	15.6	7.7	23.3	0.07	10.6	D
Total	IV		153.2	122.3	275.5	0.99	12.9	D

Arterial Level of Service: EB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Fourth Avenue	IV	25	17.7	35.0	52.7	0.07	4.6	F
Fifth Avenue	IV	25	18.2	60.6	78.8	0.07	3.1	F
Sixth Avenue	IV	25	14.0	33.4	47.4	0.05	4.0	F
Tenth Avenue	IV	25	37.6	86.0	123.6	0.25	7.2	E
Normal Street	IV	25	49.3	10.9	60.2	0.32	19.3	B
Park Boulevard	IV	25	33.3	28.2	61.5	0.20	11.8	D
Total	IV		170.1	254.1	424.2	0.96	8.1	E

Arterial Level of Service: WB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Park Boulevard	IV	30	17.4	20.6	38.0	0.10	9.1	D
Normal Street	IV	25	33.3	9.3	42.6	0.20	17.1	C
Tenth Avenue	IV	30	42.5	24.4	66.9	0.32	17.3	C
Sixth Avenue	IV	30	32.4	44.9	77.3	0.25	11.4	D
Fifth Avenue	IV	30	12.0	12.2	24.2	0.05	7.8	E
Fourth Avenue	IV	30	15.6	7.9	23.5	0.07	10.5	D
Total	IV		153.2	119.3	272.5	0.99	13.0	C

Hilcrest FPA (Preferred)

Arterial Level of Service: EB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
First Avenue	III	30	7.1	6.2	13.3	0.05	12.4	E
Fourth Avenue	III	30	17.8	2.5	20.3	0.13	23.5	C
Fifth Avenue	III	30	10.6	4.5	15.1	0.07	16.3	D
Sixth Avenue	III	30	8.2	4.9	13.1	0.05	14.5	D
Ninth Avenue	III	30	23.8	15.3	39.1	0.19	17.2	D
Tenth Avenue	III	30	9.1	7.7	16.8	0.06	12.6	E
Normal Street	III	30	40.9	5.3	46.2	0.32	25.1	B
Park Boulevard	III	30	25.7	5.5	31.2	0.20	23.3	C
Total	III		143.2	51.9	195.1	1.07	19.7	C

Arterial Level of Service: WB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Park Boulevard	III	30	13.6	5.5	19.1	0.10	18.2	C
Normal Street	III	30	25.7	5.3	31.0	0.20	23.5	C
Tenth Avenue	III	30	40.9	12.2	53.1	0.32	21.8	C
Ninth Avenue	III	30	9.1	15.3	24.4	0.06	8.7	F
Sixth Avenue	III	30	23.8	5.0	28.8	0.19	23.4	C
Fifth Avenue	III	30	8.2	4.5	12.7	0.05	14.9	D
Fourth Avenue	III	30	10.6	2.5	13.1	0.07	18.8	C
First Avenue	III	30	17.8	6.2	24.0	0.13	19.9	C
Total	III		149.7	56.5	206.2	1.12	19.6	C

Arterial Level of Service: EB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
First Avenue	III	30	7.1	6.2	13.3	0.05	12.4	E
Fourth Avenue	III	30	17.8	2.9	20.7	0.13	23.1	C
Fifth Avenue	III	30	10.6	17.9	28.5	0.07	8.7	F
Sixth Avenue	III	30	8.2	0.0	8.2	0.05	23.1	C
Ninth Avenue	III	30	23.8	15.3	39.1	0.19	17.2	D
Tenth Avenue	III	30	9.1	5.1	14.2	0.06	14.9	D
Normal Street	III	30	40.9	5.3	46.2	0.32	25.1	B
Park Boulevard	III	30	25.7	5.5	31.2	0.20	23.3	C
Total	III		143.2	58.2	201.4	1.07	19.1	C

Arterial Level of Service: WB University Avenue

Cross Street	Arterial Class	Flow Speed	Running Time	Signal Delay	Travel Time (s)	Dist (mi)	Arterial Speed	Arterial LOS
Park Boulevard	III	30	13.6	5.5	19.1	0.10	18.2	C
Normal Street	III	30	25.7	5.3	31.0	0.20	23.5	C
Tenth Avenue	III	30	40.9	7.2	48.1	0.32	24.1	B
Ninth Avenue	III	30	9.1	15.3	24.4	0.06	8.7	F
Sixth Avenue	III	30	23.8	0.0	23.8	0.19	28.3	B
Fifth Avenue	III	30	8.2	18.2	26.4	0.05	7.2	F
Fourth Avenue	III	30	10.6	2.9	13.5	0.07	18.3	C
First Avenue	III	30	17.8	6.2	24.0	0.13	19.9	C
Total	III		149.7	60.6	210.3	1.12	19.2	C