2.1.5 Traffic and Transportation/Pedestrian and Bicycle Facilities

2.1.5.1 Regulatory Setting

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

In July 1999, the U.S. Department of Transportation (USDOT) issued an Accessibility Policy Statement pledging a fully accessible multimodal transportation system. Accessibility in federally assisted programs is governed by the USDOT regulations (49 CFR 27) implementing Section 504 of the Rehabilitation Act (29 United States Code [USC] 794). The FHWA has enacted regulations for the implementation of the 1990 Americans with Disabilities Act (ADA), including a commitment to build transportation facilities that provide equal access for all persons. These regulations require application of the ADA requirements to federal-aid projects, including Transportation Enhancement Activities.

2.1.5.2 Affected Environment

This section is based on the Interstate 605/Katella Avenue Interchange PA/ED Traffic Study (Version 2.0) (Traffic Study), dated October 2017. It should be noted that, while the Traffic Study is dated October 2017, it is based upon traffic data collected from a range of sources during 2015 and 2016. As such, the year for existing conditions identified within the Traffic Study is 2015/2016.

2.1.5.2.1 Existing Facilities

The I-605/Katella Avenue interchange configuration is a mix of loop and direct ramp configurations that reflect the constraints of the Coyote Creek Channel. It is a modified full cloverleaf configuration with loop ramps in all quadrants except the southeast quadrant which contains a direct exit ramp from northbound I-605. Existing bridges over Katella Avenue are four-span reinforced concrete box girder bridges supported on concrete pile foundations. A direct exit ramp from southbound I-605 is located to the west of the Coyote Creek Channel, outside the project limits. All ramp termini incorporate free-right movements.

I-605, also known as the San Gabriel Freeway, is a major north-south freeway that runs west of the City, extending from I-405 in the south to the City of Duarte in the north. I-605 also serves as a critical goods movement corridor connecting the ports of Long Beach and Los Angeles to the Southern California Basin and beyond. I-605 has approximately one mile located in Orange County and 25.75 miles located in Los Angeles County. The route runs parallel to the San Gabriel River from the City of Seal Beach to the Santa Fe Dam in the City of Irwindale. It functions as a major collector and distributor route that feeds State Routes 22, 91, 60, and Interstates 405, 105, 5, 10, and 210. Within Orange County, I-605 is a controlled-access freeway with eight mixed-flow lanes and two High Occupancy Vehicle (HOV) lanes.

Katella Avenue is a key regional arterial in the east-west direction across Orange County. It provides regional access from the City of Los Alamitos to I-605 to the west, where it continues as Willow Street in the City of Long Beach in Los Angeles County. To the east, it connects to the Cities of Cypress, Stanton, Anaheim, and Garden Grove. It is identified as an 8-Lane Smart Street on the Orange County Master Plan of Arterial Highways, and as a Smart Street in the City of Los Alamitos General Plan Circulation Element. Additionally, it is identified as a Truck Route in the City of Los Alamitos General Plan (2010). The proposed project area includes Katella Avenue from Coyote Creek Channel to Civic Center Drive.

Sidewalk is provided on both sides of Katella Avenue through the interchange; however, both facilities terminate on the west side of the interchange before reaching the sidewalks on the Coyote Creek Channel bridge structure. Dedicated bike lanes are not provided through the interchange.

2.1.5.2.2 Traffic Volume Development

The starting point of volume development for 30 locations in the I-605/Katella Avenue Interchange Improvements project, as shown in Figure 2.1.5-1, Traffic Analysis Locations, was the baseline volumes developed for the Traffic Study. The volumes were developed from the post-processed I-605 mainline and ramp volumes developed for the I-605/SR-91/I-405 Congestion Hot-Spot Feasibility Project as well as traffic counts.

Other sources of baseline traffic volumes investigated and included for comparison are as follows:

- Caltrans traffic volume census ramp and mainline data for I-605.
- City of Los Alamitos General Plan (2015).
- 3669 Village Trip Generation Letter (Village 605 Project [i.e., former Super Media Site] traffic study).

For most locations, the traffic volumes were consistent amongst the various sources, however, the following PSR baseline volumes were adjusted based on the City of Los Alamitos General Plan existing condition:

- Katella Avenue Westbound, East of I-605 northbound On-Ramp (PM peak hour).
- Katella Avenue Eastbound, East of I-605 northbound Off-Ramp (AM peak hour).
- I-605 Northbound Off-Ramp to Eastbound Katella Avenue (AM and PM peak hours).
- I-605 Northbound On-Ramp from Eastbound Katella Avenue (AM peak hour).
- I-605 Northbound On-Ramp from Westbound Katella Avenue (AM and PM peak hours).

Continuity of flow adjustments were made along Katella Avenue and the I-605 Mainline to account for adjustments to upstream and downstream volumes.

Orange County Transportation Authority Model (OCTAM) Results

Orange County Transportation Authority Model (OCTAM) volumes for the study area were obtained for the 2015/2016 base year and 2035 opening year and post processed for use in the analysis for mainline and interchange ramps.

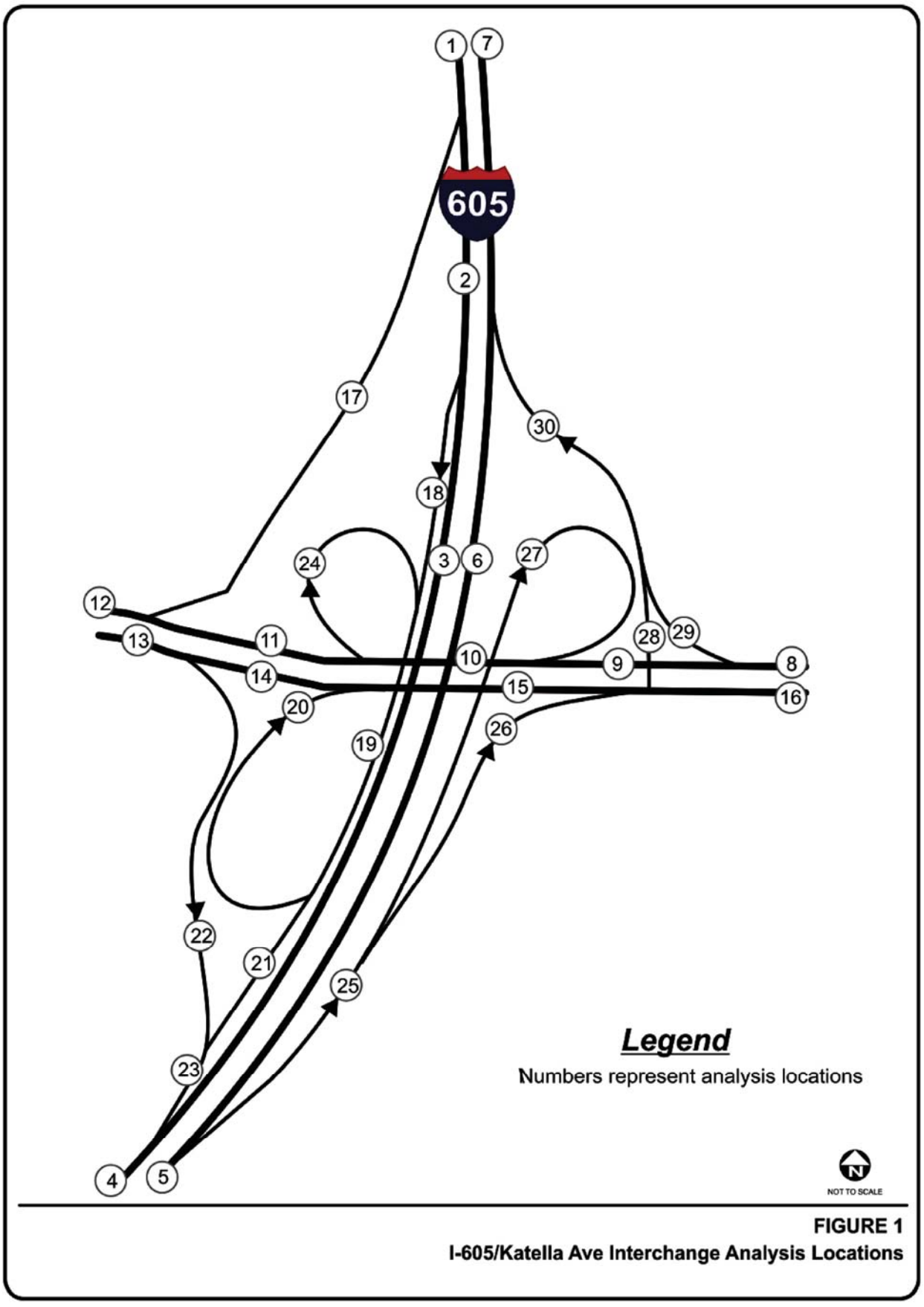

FIGURE 1
I-605/Katella Ave Interchange Analysis Locations

9/25/2017 JN M:\Mdata\155953\MXD\September 2017\Figure 2.1.5-1 Traffic Analysis Locations.mxd

INTERSTATE 605/KATELLA AVENUE INTERCHANGE IMPROVEMENTS PROJECT
INITIAL STUDY/ENVIRONMENTAL ASSESSMENT

Not to Scale

Source: Iteris

Traffic Analysis Locations

Figure 2.1.5-1

The primary use of the travel demand model is to forecast future traffic volume growth due to changes in population and employment. As such, freeway mainline and arterial volume changes are more indicative of that growth than individual ramp movements. Therefore, the study area boundary freeway mainline and arterial volumes were used to estimate changes in traffic patterns within the study area.

For the development of ramp volumes, the average directional link volume increase from 2015/2016 to 2035 along Katella Avenue was proportionately distributed to the on-ramp, off-ramp and through arterial movements.

The absolute growth in traffic volumes forecasted by OCTAM along Katella Avenue was distributed proportionately through the study area based on the baseline traffic volumes. As shown in Table 2.1.5-1, OCTAM Results – Average Change per Link (Year 2015/2016 to 2035), the volumes on Katella Avenue grew by approximately 700-800 vehicles in the AM peak hour and approximately 600-650 vehicles in the PM peak hour.

Table 2.1.5-1: OCTAM Results – Average Change per Link (Year 2015/2016 to 2035)

Locations	AM	PM
Eastbound Katella	718	573
Westbound Katella	785	646
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 11.		

Further adjustments were made to the volumes to obtain final 2055 traffic volumes which include: conservation of flow for all study locations, growth from the year 2035 to 2055, Super Media Site Trips, and Truck Percentage.

2035 to 2055 Growth

Since the OCTAM's furthest out future traffic forecast year is 2035, a growth factor was developed to project traffic volumes from 2035 conditions to 2055 conditions. The Orange County's forecasted growth in population and employment from 2030 to 2035 was used to develop the growth factor. This value was annualized for the 20-year period between 2035 and 2055 as 4.04 percent. The four percent growth factor was applied to the growth in traffic volume from 2035 to 2055 as opposed to the total 2035 volume since the land use in the area surrounding the study area is largely built out, even under existing conditions, as compared to Orange County as a whole. Furthermore, the primary cumulative project of the Super Media Site was included in its entirety and itself represents two to five percent growth on Katella Avenue and 1.5 to 3.5 percent growth on the study area ramps, as shown in Table 2.1.5-2, Growth Percentage from Existing to Future Years by Type of Roadway.

Table 2.1.5-2: Growth Percentage from 2035 to 2055 by Type of Roadway

Type	Year 2035		Year 2055		Village 605 Project Contribution	
	AM	PM	AM	PM	AM	PM
Freeway	12.7%	11.3%	13.2%	11.6%	0.2%	0.5%
Arterial	37.2%	37.4%	38.6%	38.6%	2.3%	5.6%
Ramps	24.5%	23.2%	25.4%	23.9%	1.6%	3.5%
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 11.						

Village 605 Project Site Trips

Trips generated by the Village 605 Project (former Super Media Site) development, located in the northeast quadrant of the interchange, were obtained from 3669 Village Trip Generation Letter dated October 12, 2016. From the information contained in the trip generation analysis, inbound trips to the site traveling eastbound on Katella Avenue would be approximately 26 percent and 55 percent of the total Village 605 Project trip generation in the AM and PM peak hours, respectively. Outbound site trips along westbound Katella Avenue would be approximately 26 percent and 32 percent of the total Village 605 Project trip generation in the AM and PM peak hours, respectively. Since the study did not indicate distribution beyond the site to a degree that could be used directly in this analysis, those site trips were distributed proportionally to the existing ramp and arterial mainline volumes. The Village 605 Project trips were added to the 2035 and 2055 volumes with no additional percentage of growth since they already represent the buildout conditions of the Village 605 Project.

The City of Los Alamitos announced in January 2018 that the Village 605 redevelopment project would not move forward. The traffic study was completed in 2017. However, inclusion of the trip generation of the previously-proposed Village 605 development represents a conservative analysis of the development potential of the site.

Truck Percentage

Study area truck percentages were obtained from Caltrans truck count data at two locations: I-605 at the Orange County/Los Angeles County Line and I-605 at Carson Road (mile post 1.74). Both locations indicated a truck percentage of 2 percent for 3-, 4-, and 5-axle vehicles. This percentage was applied to the projected volumes at all study locations in order to obtain volumes in Passenger Car Equivalents (PCE).

2.1.5.2.3 Methodology

Traffic operational analysis was performed based on the existing and future volumes of Existing, Opening Year (2035) and Future Year (2055) for the project Alternatives.

Traffic operational capacity and delay analysis performed is consistent with Highway Capacity Manual (HCM) methodologies, and in accordance with the methodologies prescribed by Caltrans. The HCM methodologies allow for the evaluation of vehicle platoons and impacts of upstream and downstream intersections. Level of service (LOS) standards defined by Caltrans and the City of Los Alamitos served as the basis for the analysis. Intersection LOS summaries are also presented.

Congestion in the project area is due to a combination of factors including very heavy traffic demand during short periods of time within the peak hours along the Katella Avenue corridor. The heavy flow is a result of local land uses plus pass-through traffic on Katella Avenue headed from the freeway to the east. The vicinity of the study area has substantial residential population and there are several schools which contribute traffic during the peak period. Katella Avenue between I-605 and Los Alamitos Boulevard does not have sufficient capacity to handle this level of traffic without resulting congestion and vehicle queues which extend from one intersection to the next. During a portion of the AM peak hour, it was observed that eastbound vehicle queues extend from Los Alamitos Boulevard all the way back to the freeway ramps which also affects the ability of the traffic to exit the I-605 freeway both northbound and southbound.

These observations indicate multiple factors combining to create congested conditions, whereas capacity analysis is generally focused on individual portions of the transportation network (ramps, freeway segments and intersections) as isolated locations which do not affect, and are not affected by, the adjacent roadway or freeway locations. Therefore, traffic microsimulation modeling using VISSIM software which accounts for the interaction among network conditions was conducted as part of the Traffic Study.

Basic Freeway Segment Analysis

Peak hour volumes along the freeway mainline are analyzed using the methodology contained in Chapter 11 – Basic Freeway Segments of the HCM 2010, with calculations performed using the Highway Capacity Software (HCS 2010, Version 6.1). The LOS for freeway segments is estimated using the HCM 2010 methodology for basic freeway segments, as shown in Table 2.1.5-3, Basic Freeway Segment LOS. The basic freeway segment can be characterized by two performance measures: density (passenger cars per mile per lane), and volume to capacity (v/c) ratio. These performance measures indicate how well traffic volumes and flow are being accommodated by the freeway segment.

Table 2.1.5-3: Basic Freeway Segment LOS

LOS	Density (pc/mi/hr)
A	0.0-11.0
B	11.1-18.0
C	18.1-26.0
D	36.1-35.0
E	35.1-45.0
F	> 45.0 or V/C > 1
Note: pc/mi/hr = passenger cars/mile/hour	
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 16.	

For basic freeway segments, density is used to measure LOS. The LOS density ranges are listed in Table 2.1.5-3. When demand conditions exceed capacity, forced flow results and the formulas used for estimating density and average speed are no longer applicable. As such, estimates for density and average speed are not provided for LOS “F” conditions due to this limitation of the methodology.

Freeway Ramp Analysis

Peak hour ramp operations are analyzed using the methodology contained in “Chapter 13 – Freeway Merge and Diverge Segments” of the HCM 2010. This analysis examines the LOS within the ramp influence areas of the freeway. The analysis of the on-ramps examines the impact of merging onto the freeway, while the analysis of the off-ramps examines the impacts of diverging from the freeway. Consistent with HCM 2010 procedures, a single-lane on-ramp that results in a lane addition is not analyzed as a merge area (HCM 2010, p. 25-9). A dual-lane off-ramp that results in a lane drop is analyzed as a major diverge area. Lane additions and major diverge areas are analyzed by means of a capacity analysis at each leg of the lane addition or major diverge area. A summary of the merge, diverge and weaving performance criteria is shown below in Table 2.1.5-4, Freeway Ramp Junction LOS.

Table 2.1.5-4: Freeway Ramp Junction LOS

LOS	Density (pc/mi/hr)
A	≤ 10
B	> 10-20
C	> 20-28
D	> 28-35
E	> 35-43
F	> 43

Note: pc/mi/hr = passenger cars/mile/hour.

Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 16.

Intersection Analysis

Intersection levels of service analyses were conducted using the HCM methodology (based on vehicle delay) for the study intersections. Under the HCM methodology, the intersection LOS's were analyzed with a saturation flow rate of 1,900 pc/hr/ln, which is the default value for HCM methodology.

Signalized intersections were analyzed using SYNCHRO 10. The LOS criteria is provided in Table 2.1.5-5, Intersection LOS. The minimum LOS standard for intersections is LOS D.

Table 2.1.5-5: Intersection LOS

LOS	Description	Average Delay (Sec Del/Veh)
A	Excellent operation. All approaches to the intersection appear quite open, turning movements are easily made, and nearly all drivers find freedom of operation.	0.0-10.0
B	Very good operation. Many drivers begin to feel somewhat restricted within platoons of vehicles. This represents stable flow. An approach to an intersection may occasionally be fully utilized and traffic queues start to form.	10.1-20.0
C	Good operation. Occasionally drivers may have to wait more than 60 seconds, and backups may develop behind turning vehicles. Most drivers feel somewhat restricted.	20.1-35.0
D	Fair operation. Cars are sometimes required to wait more than 60 seconds during short peaks. There are no long-standing traffic queues.	35.1-55.0
E	Poor operation. Some long-standing vehicular queues develop on critical approaches to intersections. Delays may be up to several minutes.	55.1-80.0
F	Forced flow. Represents jammed conditions. Backups form locations downstream or on the cross street may restrict or prevent movement of vehicles out of the intersection approach lanes; therefore, volumes carried are not predictable. Potential for stop and go type traffic flow.	> 80.0

Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 17.

2.1.5.2.4 Existing Traffic Operations

Existing Levels of Service

The existing traffic study volumes are presented in Table 2.1.5-6, Existing Traffic Volumes. Since no access point changes or mainline capacity changes are included as part of the project Alternatives, each Alternative used the forecasted traffic volumes. For Alternative 3, which altered the southbound I-605 on-ramp from westbound Katella Avenue access point from a free-flow loop ramp to a left-turn at a signal controlled intersection, those volumes were shifted to the new intersection for analysis and away from the weaving movement of those volumes on the collector-distributor roadway.

Table 2.1.5-6: Existing Traffic Volumes

No.	Roadway	Count Location	Existing Conditions (2015/2016)	
			AM	PM
I-605 Mainline				
1	I-605 SB	North of Off-Ramp	5,683	5,963
2	I-605 SB	South of WB Off-Ramp	5,262	5,630
3	I-605 SB	South of EB C-D Off-Ramp	4,831	4,831
4	I-605 SB	South of On-Ramp	5,883	5,676
5	I-605 NB	South of Off-Ramp	6,047	6,148
6	I-605 NB	South of On-Ramp	4,841	5,286
7	I-605 NB	North of On-Ramp	5,691	6,589
Katella Avenue				
8	Katella Avenue WB	East of On-Ramp	2,710	2,432
9	Katella Avenue WB	West of NB On-Ramp	1,915	1,502
10	Katella Avenue WB	West of NB Off-Ramp	2,010	1,629
11	Katella Avenue WB	West of SB On-Ramp	1,378	1,075
12	Katella Avenue WB	West of SB Off-Ramp	1,799	1,408
13	Katella Avenue EB	West of SB On-Ramp	1,486	1,167
14	Katella Avenue EB	West of SB Off-Ramp	1,066	835
15	Katella Avenue EB	West of NB Off-Ramp	1,497	1,675
16	Katella Avenue EB	East of NB Off-Ramp	2,608	2,410
Ramps				
17	I-605 SB	Off-Ramp to WB Katella Avenue	421	333
18	I-605 SB	Off-Ramp to C-D Road (EB Katella Ave)	431	840
19	I-605 SB C-D Road	South of WB Katella Avenue On-Ramp	1,063	1,394
20	I-605 SB	Off-Ramp to EB Katella Avenue	431	840
21	I-605 SB C-D Road	South of EB Katella Avenue Off-Ramp	632	554
22	EB Katella Avenue On-Ramp	to SB I-605	420	332
23	SB On-Ramp	from Katella Avenue	1,052	886
24	WB Katella Avenue On-Ramp	to SB I-605	632	554
25	I-605 NB Off-Ramp	to Katella Avenue	1,206	862
26	I-605 NB Off-Ramp	to EB Katella Avenue	1,111	735
27	I-605 NB Off-Ramp	to WB Katella Avenue	95	127
28	I-605 NB Off-Ramp	from EB Katella Avenue	55	373
29	I-605 NB Off-Ramp	from WB Katella Avenue	795	930
30	I-605 NB Off-Ramp	from Katella Avenue	850	1,303

Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 13.

Table 2.1.5-6 provides information on the existing traffic volumes during the AM and PM peak hours on the I-605 Mainline, Katella Avenue, and ramps. As shown, traffic volumes along the I-605 Mainline are generally higher in the PM peak hour. Traffic volumes along Katella Avenue are generally higher in the AM peak hour. Traffic volumes are generally higher in the PM peak hour for off-ramps and generally higher in the AM peak hour for on-ramps.

I-605 generally operates at LOS C with the exception of one link, which operates at LOS D (northbound north of the Katella Avenue on-ramp); refer to Table 2.1.5-7, Existing Basic Freeway Segment LOS.

Table 2.1.5-7: Existing Basic Freeway Segment LOS

Freeway	No. of Lanes	AM Peak Hour			PM Peak Hour		
		Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
I-605 Northbound							
s/o Katella Ave Off-Ramp	4	6,047	25.4	C	6,148	25.9	C
Katella Ave Off-Ramp to Katella Ave On-Ramp	4	4,841	20.1	C	5,286	21.9	C
n/o Katella Ave On-Ramp	4	5,691	23.7	C	6,589	28.2	D
I-605 Southbound							
n/o Katella Ave WB Off-Ramp	4	5,683	23.7	C	5,963	25.0	C
n/o Katella Ave WB Off-Ramp to Katella Ave EB Off-Ramp	4	5,262	21.8	C	5,630	22.3	C
Katella Ave EB Off-Ramp to Katella Ave EB/WB On-Ramp	4	4,831	20.0	C	4,790	19.9	C
s/o Katella Ave EB/WB On-Ramps	4	5,883	24.6	C	5,676	23.6	C

Notes: pc/mi/ln = passenger cars per mile per lane as a measure of vehicle density.
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 19.

Segment density was calculated for each ramp segment; refer to Table 2.1.5-8, AM/PM Peak Hour Segment Density (Existing). The key factors in the segment density calculation are the capacity (number of lanes) and traffic volumes. As expected due to the high level of volume, the northbound off-ramp to eastbound Katella Avenue has the highest segment density in the AM peak hour (LOS D) with the southbound off-ramp to eastbound Katella Avenue showing high density in the PM peak hour (LOS F).

Table 2.1.5-8: AM/PM Peak Hour Segment Density (Existing)

Segment	Existing			
	AM Peak Hour		PM Peak Hour	
	Density	LOS	Density	LOS
Off-Ramps				
I-605 Southbound Off-Ramp to WB Katella*	9.7	A	7.6	A
I-605 Southbound Off-Ramp to EB Katella	14.4	B	52.2	F
I-605 Northbound Off-Ramp to EB Katella	31.8	D	20.5	C
I-605 Northbound Off-Ramp to WB Katella	2.7	A	3.6	A
On-Ramps				
I-605 Southbound On-Ramp (from EB Katella)**	11.2	B	9.0	A
I-605 Southbound On-Ramp (from WB Katella)**	23.7	C	27.3	C
I-605 Northbound On-Ramp**	9.4	A	16.0	B

Notes: *not in project limits; **combined in Alternative 3
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 20.

Weaving in the I-605/Katella Avenue interchange occurs in two places: along Katella Avenue westbound where I-605 northbound off-ramp traffic weaves with I-605 southbound on-ramp traffic in the span of 450 feet (Katella Avenue weave), and along the southbound collector-distributor (C-D) roadway where southbound I-605 off-ramp to eastbound Katella Avenue weaves with I-605 on-ramp traffic from westbound Katella Avenue via a loop ramp (collector-distributor weave). The Katella Avenue weave currently operates at LOS C and the southbound collector-distributor weave operates at LOS B; refer to Table 2.1.5-9, Weave Analysis (Existing).

Table 2.1.5-9: Weave Analysis (Existing)

Interchange	Existing			
	AM Peak Hour		PM Peak Hour	
	Density	LOS	Density	LOS
Katella Ave WB b/w I-605 NB Off-Ramp to I-605 SB On-Ramp				
Alternative 1 – No-Build	31.8	C	25.6	C
Alternatives 2 and 3	-	-	-	-
I-605 SB C-D Road b/w Katella WB On-Ramp and Katella EB Off-Ramp				
Alternative 1 – No-Build	17.3	B	19.2	B
Alternative 2	-	-	-	-
Alternative 3	-	-	-	-
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 21.				

The northbound I-605/Katella Avenue ramp intersection currently operates at LOS A at both the AM and PM peak hour; refer to Table 2.1.5-10, Peak Hour Intersection Delay/LOS.

Table 2.1.5-10: Peak Hour Intersection Delay/LOS

Intersection	Existing
AM Peak Hour	
NB Ramp Intersection	2.3/A
SB Ramp Intersection	-
PM Peak Hour	
NB Ramp Intersection	6.8/A
SB Ramp Intersection	-
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 22.	

Existing Travel Times and Speeds

Travel time was measured along the eight on- and off-ramp movements from and to the borders of the study area as well as Katella Avenue eastbound and westbound through the study area. Table 2.1.5-11, AM/PM Peak Hour Travel Time (in seconds), shows the existing travel time of each move in seconds for the AM and PM peak hours. As shown in Table 2.1.5-11, the PM peak hour Travel Time analysis experiences higher traffic volumes, and therefore has longer delays.

Table 2.1.5-11: AM/PM Peak Hour Travel Time (in seconds)

Travel Time Segments	Existing	
	AM Peak Hour	PM Peak Hour
Katella Avenue Eastbound	105	109
Katella Avenue Westbound	64	74
SB Off-Ramp to WB Katella Avenue*	33	31
SB Off-Ramp to EB Katella Avenue	62	105
NB Off-Ramp to EB Katella Avenue	33	33
NB Off-Ramp to WB Katella Avenue	68	68
EB Katella Avenue to SB On-Ramp	29	29
WB Katella Avenue to SB On-Ramp	60	80
EB Katella Avenue to NB On-Ramp	75	119
WB Katella Avenue to NB O- Ramp	14	14
Total	*543*	*663*
Notes: * Not in Project Limits		
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Pages 23 and 24.		

The network-wide average speed and the related metrics of vehicle hours of delay and vehicle hours traveled were calculated for each peak hour; refer to Table 2.1.5-12, AM/PM Peak Hour Speed Measures of Effectiveness. As shown in Table 2.1.5-12, the average speed is slower, and vehicle hours delay and vehicle hours travelled is longer in the PM peak hour.

Table 2.1.5-12: AM/PM Peak Hour Speed Measures of Effectiveness

MOE	Existing	
	AM Peak Hour	PM Peak Hour
Average Speed (mph)	40.0	32.7
Vehicle Hours Delay (VHD)	28,735	211,810
Vehicle Hours Travelled (VHT)	350,853	509,230
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 25.		

2.1.5.3 Environmental Consequences

The Traffic Study considered existing conditions, conditions under the No-Build Alternative, and the two Build Alternatives for 2035 and 2055 as follows:

- Existing Conditions (2015/2016)
- Alternative 1 (No-Build Alternative) Opening Year 2035 and Future Year 2055
- Alternative 2 Opening Year 2035 and Future Year 2055
- Alternative 3 Opening Year 2035 and Future Year 2055

The improvements in the Build Alternatives are shown in Chapter 1, Figures 1-4a through 1-4d and 1-5a through 1-5d for Alternatives 2 and 3, respectively. Those improvements are described in more detail in Chapter 1, Proposed Project, in this environmental document.

Future traffic study volumes are presented in Table 2.1.5-13, Future Traffic Volumes. Since no access point changes or mainline capacity changes are included as part of the project

Alternatives, each Alternative used the forecasted traffic volumes. For Alternative 3, which altered the southbound I-605 on-ramp from westbound Katella Avenue access point from a free-flow loop ramp to a left-turn at a signal controlled intersection, those volumes were shifted to the new intersection for analysis and away from the weaving movement of those volumes on the collector-distributor roadway.

Table 2.1.5-13: Future Traffic Volumes

No.	Roadway	Count Location	Opening Year 2035 Volumes		Future 2055 Volumes	
			AM	PM	AM	PM
I-605 Mainline						
1	I-605 SB	North of Off-Ramp	6,315	6,751	6,336	6,776
2	I-605 SB	South of WB Off-Ramp	5,796	6,346	5,813	6,368
3	I-605 SB	South of EB C-D Off-Ramp	5,256	5,296	5,269	5,312
4	I-605 SB	South of On-Ramp	6,563	6,382	6,585	6,406
5	I-605 NB	South of Off-Ramp	7,058	6,798	7,093	6,818
6	I-605 NB	South of On-Ramp	5,548	5,725	5,573	5,739
7	I-605 NB	North of On-Ramp	6,611	7,330	6,643	7,353
Katella Avenue						
8	Katella Ave WB	East of On-Ramp	3,615	3,221	3,647	3,248
9	Katella Ave WB	West of NB On-Ramp	2,620	2,060	2,645	2,080
10	Katella Ave WB	West of NB Off-Ramp	2,737	2,215	2,763	2,235
11	Katella Ave WB	West of SB On-Ramp	1,946	1,523	1,967	1,539
12	Katella Ave WB	West of SB Off-Ramp	2,465	1,928	2,490	1,947
13	Katella Ave EB	West of SB On-Ramp	2,039	1,614	2,059	1,629
14	Katella Ave EB	West of SB Off-Ramp	1,523	1,219	1,540	1,232
15	Katella Ave EB	West of NB Off-Ramp	2,063	2,269	2,084	2,288
16	Katella Ave EB	East of NB Off-Ramp	3,456	3,188	3,486	3,212
Ramps						
17	I-605 SB	Off-Ramp to WB Katella Ave	520	405	523	408
18	I-605 SB	Off-Ramp to C-D Road (EB Katella Ave)	540	1,050	544	1,056
19	I-605 SB C-D Road	South of WB Katella Ave On-Ramp	1,320	1,724	1,329	1,734
20	I-605 SB	Off-Ramp to EB Katella Ave	540	1,050	544	1,056
21	I-605 SB C-D Road	South of EB Katella Ave Off-Ramp	791	692	797	696
22	EB Katella Ave On-Ramp	to SB I-605	516	395	520	397
23	SB On-Ramp	from Katella Ave	1,307	1,087	1,316	1,093
24	WB Katella Ave On-Ramp	to SB I-605	791	692	797	696
25	I-605 NB Off-Ramp	to Katella Ave	1,510	1,073	1,520	1,079
26	I-605 NB Off-Ramp	to EB Katella Ave	1,393	919	1,402	924
27	I-605 NB Off-Ramp	to WB Katella Ave	117	155	118	156
28	I-605 NB Off-Ramp	from EB Katella Ave	68	444	68	446
29	I-605 NB Off-Ramp	from WB Katella Ave	995	1,161	1,002	1,169
30	I-605 NB Off-Ramp	from Katella Ave	1,063	1,605	1,070	1,615

Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 13.

2.1.5.3.1 Temporary Impacts

Alternative 1 (No-Build Alternative)

Under this alternative, no reconstruction or improvements would be made to the existing I-605/Katella Avenue interchange other than routine roadway maintenance. As a result, the No-Build Alternative would not result in temporary impacts related to traffic and circulation or to pedestrian or bicycle facilities.

Alternatives 2 and 3 (Build Alternatives)

The construction of the Alternatives 2 and 3 would result in temporary impacts to traffic circulation and pedestrian and bicycle access on and in the vicinity of the project site. Those impacts could include short-term lane closures on I-605 interchange ramps and Katella Avenue as a result of modifications to the existing facilities. These temporary construction impacts would be similar for both Build Alternatives.

Construction activities expected to require temporary closures of the I-605 interchange ramps and Katella Avenue may include, but are not limited to:

- Installation of temporary railing (K-rail).
- Pavement restriping.
- Placement of concrete pavement using rapid set concrete, such as at ramp termini.
- Asphalt and concrete pavement construction and overlay operations.
- Utility work/traffic signal modifications.

Construction is anticipated to begin in 2033. The total duration of construction activities under the Build Alternatives would last between 12 to 18 months, depending on the Build Alternative. However, any ramp and lane closures would be limited to a substantially shorter duration. Closure of the I-605 interchange ramps is expected to occur, but would be limited to approximately two weekend closures to avoid impacts during peak hours. Additionally, the southernmost eastbound lane along Katella Avenue would be closed during construction to allow for proposed arterial improvements. This lane closure would occur over a period of approximately four to six weeks, and travel in both directions on Katella Avenue would be maintained at all times.

Construction of the project could result in temporary effects related to the circulation of vehicles, bicyclists, and pedestrians in the project area. To minimize these impacts, the Build Alternatives would include a Transportation Management Plan (TMP); refer to PF-TR-1. The Caltrans Transportation Management Plan Guidelines (TMP Guidelines) identifies the processes, roles, and responsibilities for preparing and implementing TMPs, as well as useful strategies for reducing congestion and managing work zone traffic impacts. Thus, effects related to short-term construction activities would not be adverse.

PF-TR-1 **Transportation Management Plan.** The project will include preparation of a Transportation Management Plan (TMP) during the Plans, Specifications, and Estimates (PS&E) phase to minimize construction related impacts. The TMP will include potential measures such as construction signage, measures for pedestrian protection, limitations on timing for lane closures to avoid peak hours, temporary striping plans, construction vehicle routing plans, and the need for a construction flagperson to direct traffic during heavy equipment use, among others.

2.1.5.3.2 Permanent Impacts

Alternative 1 (No-Build Alternative)

Traffic Operations

Levels of Service

Under this alternative, no improvements would be made to the existing I-605/Katella Avenue interchange other than routine roadway maintenance. As a result, segment density would continue to increase during the AM peak hour, receiving LOS E at the I-605 southbound off-ramp to eastbound Katella Avenue segment and LOS D at the I-605 southbound on-ramp segment (from eastbound Katella Avenue), and during the PM peak hour, more than doubling the density at the I-605 southbound off-ramp to eastbound Katella Avenue segment (LOS F) and the I-605 southbound on-ramp segment (from eastbound Katella Avenue) (LOS F); refer to Table 2.1.5-14, Opening Year (2035) Alternative 1 Basic Freeway Segment LOS and Table 2.1.5-15, Future Year (2055) Alternative 1 Basic Freeway Segment LOS.

Table 2.1.5-14: Opening Year (2035) Alternative 1 Basic Freeway Segment LOS

Freeway Segment	No. of Lanes	AM Peak Hour			PM Peak Hour		
		Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
I-605 Northbound							
s/o Katella Ave Off-Ramp	4	7,058	31.0	D	6,798	29.4	D
Katella Ave Off-Ramp to Katella Ave On-Ramp	4	5,548	23.1	C	5,725	23.9	C
n/o Katella Ave On-Ramp	4	6,611	28.3	D	7,330	32.8	D
I-605 Southbound							
n/o Katella Ave WB Off-Ramp	4	6,315	26.7	D	6,751	29.1	D
n/o Katella Ave WB Off-Ramp to Katella Ave EB Off-Ramp	4	5,796	24.2	C	6,346	29.6	D
Katella Ave EB Off-Ramp to Katella Ave EB/WB On-Ramp	4	5,256	21.8	C	5,296	22.0	C
s/o Katella Ave EB/WB On-Ramps	4	6,563	28.1	D	6,382	27.1	D
Notes: pc/mi/ln = passenger cars per mile per lane as a measure of vehicle density.							
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 19.							

Table 2.1.5-15: Future Year (2055) Alternative 1 Basic Freeway Segment LOS

Freeway Segment	No. of Lanes	AM Peak Hour			PM Peak Hour		
		Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
I-605 Northbound							
s/o Katella Ave Off-Ramp	4	7,093	31.2	D	6,818	29.5	D
Katella Ave Off-Ramp to Katella Ave On-Ramp	4	5,573	23.2	C	5,739	23.9	C
n/o Katella Ave On-Ramp	4	6,643	28.5	D	7,353	33.0	D
I-605 Southbound							
n/o Katella Ave WB Off-Ramp	4	6,336	26.9	D	6,776	29.3	D
n/o Katella Ave WB Off-Ramp to Katella Ave EB Off-Ramp	4	5,813	24.3	C	6,368	27.0	D
Katella Ave EB Off-Ramp to Katella Ave EB/WB On-Ramp	4	5,269	21.9	C	5,312	22.1	C
s/o Katella Ave EB/WB On-Ramps	4	6,585	28.2	D	6,406	27.2	D
Notes: pc/mi/ln: passenger cars per mile per lane as a measure of vehicle density.							
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 20.							

Weaving along Katella Avenue westbound and the southbound collector-distributor roadway would continue; refer to Table 2.1.5-16.

Table 2.1.5-16: Weave Analysis (Opening and Future Year)

Roadway	Opening Year (2035)				Future Year (2055)			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Katella Ave WB b/w I-605 NB Off-Ramp to I-605 SB On-Ramp								
Alternative 1 – No-Build	46.3	E	36.5	E	46.9	E	37.0	E
Alternatives 2 and 3	-	-	-	-	-	-	-	-
I-605 SB C-D Road b/w Katella WB On-Ramp and Katella EB Off-Ramp								
Alternative 1 – No-Build	22.3	B	24.0	B	22.4	B	24.1	C
Alternative 2	22.3	B	24.0	B	22.4	B	24.1	C
Alternative 3	-	-	-	-	-	-	-	-
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 21.								

Intersection delay/LOS is lower in the AM and PM peak hour for the No-Build Alternative as the No-Build Alternative would not include signal phases; refer to Table 2.1.5-17.

Table 2.1.5-17: Peak Hour Intersection Delay/LOS

Intersection	Opening Year (2035)			Future Year (2055)		
	No-Build	Alt 2	Alt 3	No-Build	Alt 2	Alt 3
AM Peak Hour						
NB Ramp Intersection	3.6/A	6.6/A	5.9/A	3.7/A	7.5/A	6.3/A
SB Ramp Intersection	-	-	9.4/A	-	-	9.5A
PM Peak Hour						
NB Ramp Intersection	13.0/B	31.7/C	32.8/C	13.3/B	32.5C	32.5/C
SB Ramp Intersection	-	-	10.1/B	-	-	10.3/B
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 22.						

Travel Times and Speeds

The No-Build Alternative has two controlled interchange movements--eastbound left to northbound and westbound through. Travel time along all segments in Future Year 2055 increases during both the AM and PM peak hour for the No-Build Alternative as compared to existing conditions; refer to Table 2.1.5-18. Further, the average speed decreases and the vehicle hours delay and vehicle hours travelled increase with the No-Build Alternative as compared to existing conditions; refer to Table 2.1.5-19.

Table 2.1.5-18: AM/PM Peak Hour Travel Time (in seconds)

Travel Time Segments	Future Year 2055					
	AM Peak Hour			PM Peak Hour		
	No-Build	Alt 2	Alt 3	No-Build	Alt 2	Alt 3
Katella Avenue Eastbound	234	197	228	248	211	222
Katella Avenue Westbound	84	74	86	274	191	221
SB Off-Ramp to WB Katella Avenue*	38	39	40	33	34	34
SB Off-Ramp to EB Katella Avenue	65	59	58	207	64	60
NB Off-Ramp to EB Katella Avenue	34	34	34	33	33	33
NB Off-Ramp to WB Katella Avenue	70	105	93	90	97	98
EB Katella Avenue to SB On-Ramp	29	29	46	36	47	54
WB Katella Avenue to SB On-Ramp	66	62	150	201	84	80
EB Katella Avenue to NB On-Ramp	90	100	121	123	207	207
WB Katella Avenue to NB On- Ramp	17	24	28	27	37	36
Total	*727*	*723*	*884*	*1,271*	*1,005*	*1,044*

Notes: * Not in Project Limits

Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Pages 23 and 24.

Table 2.1.5-19: AM/PM Peak Hour Speed Measures of Effectiveness

MOE	AM Peak Hour			PM Peak Hour		
	No-Build	Alt 2	Alt 3	No-Build	Alt 2	Alt 3
Average Speed (mph)	37.7	38.5	29.0	22.9	26.4	22.7
Vehicle Hours Delay (VHD)	67,706	55,688	214,416	439,778	267,082	363,768
Vehicle Hours Travelled (VHT)	498,106	488,067	635,776	821,990	675,455	762,718

Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Page 25.

Alternatives 2 and 3 (Build Alternatives)

Alternatives 2 and 3 include modifications to I-605 interchange ramps and Katella Avenue, as well as pedestrian and bicycle improvements. The existing I-605 mainline would not be modified, with the exception of the northbound No. 4 lane at the northbound exit ramp. It would be restriped from a through lane to a through lane/ramp exit option. Katella Avenue would be widened and lane geometries would be modified to provide full standard lanes and shoulders through the interchange and to tie in with proposed ramp improvements. Proposed modifications to the northbound ramps and Katella Avenue east of the northbound ramps are similar in both Build Alternatives.

Opening Year and Future Year Traffic Operations

Opening Year and Future Year Levels of Service

As shown in Table 2.1.5-14 and 2.1.5-15, the opening year and future year analysis forecasts basic freeway LOS as LOS C or D for all segments. Similar to existing conditions, the northbound off-ramp to eastbound Katella Avenue has the highest segment density with the southbound off-ramp to eastbound Katella Avenue showing high density in the PM peak hour; refer to Table 2.1.5-20, AM/PM Peak Hour Segment Density (Future Year 2055). Build Alternative condition improvements in both peak hours are seen where additional lanes are

added at the southbound off-ramp to eastbound Katella Avenue and southbound on-ramp from westbound Katella Avenue.

Table 2.1.5-20: AM/PM Peak Hour Segment Density (Future Year 2055)

Segment	AM Peak Hour						PM Peak Hour					
	No-Build		Alt 2		Alt 3		No-Build		Alt 2		Alt 3	
	Den.	LOS	Den.	LOS	Den.	LOS	Den.	LOS	Den.	LOS	Den.	LOS
Off-Ramps												
I-605 Southbound Off-Ramp to WB Katella*	12.6	B	12.8	B	13.2	B	9.4	A	9.5	A	9.6	A
I-605 Southbound Off-Ramp to EB Katella	18.8	B	18.1	B	18.0	B	106.3	F	37.3	E	37.3	E
I-605 Northbound Off-Ramp to EB Katella	41.4	E	39.6	E	39.6	E	26.0	C	25.2	C	25.2	C
I-605 Northbound Off-Ramp to WB Katella	3.3	A	5.5	A	4.5	A	4.4	A	6.9	A	5.5	A
On-Ramps												
I-605 Southbound On-Ramp (from EB Katella)**	14.1	B	14.1	B	26.2	C	10.7	B	10.5	B	18.5	B
I-605 Southbound On-Ramp (from WB Katella)**	30.2	D	29.9	D			75.1	F	26.7	C		
I-605 Northbound On-Ramp**	11.9	B	12.7	B	13.1	B	17.7	B	19.5	B	19.7	B
Notes: *not in project limits; **combined in Alternative 3												
Source: I-605/Katella Avenue Interchange Traffic Study (October 2017), Pages 20 and 21.												

As stated above, weaving in the I-605/Katella Avenue interchange occurs in two places: along Katella Avenue westbound where I-605 northbound off-ramp traffic weaves with I-605 southbound on-ramp traffic in the span of 450 feet and along the southbound collector-distributor roadway where southbound I-605 off-ramp to eastbound Katella Avenue weaves with I-605 on-ramp traffic from westbound Katella Avenue via a loop ramp. Build Alternative 3 proposes to eliminate this weaving; refer to Table 2.1.5-16.

Intersection delay and resulting LOS was conducted for the northbound ramp intersection for Alternative 2 and the southbound ramp intersection for Alternative 3. As show in Table 2.1.5-17, the delay at the northbound intersection is higher in the AM and PM peak hour for the Build Alternatives than the No-Build Alternative due to additional signal phases for the Build Alternatives. However, the project is anticipated to result in operational benefits related to alternative modes of transportation, since the project would facilitate improved pedestrian and bicycle mobility within project limits.

Existing Travel Times and Speeds

Alternative 2 has four controlled moves, adding southbound right to westbound and westbound right to northbound. Alternative 3 adds three more additional controlled moves for the southbound ramps—westbound left, eastbound through, and eastbound right. Table 2.1.5-18 shows the travel time of each move in seconds for the AM and PM peak hours for existing and Future Year 2055, respectively. For the AM peak hour Travel Time analysis, the key differentiator among the scenarios is the addition of a traffic signal (and additional controlled interchange movements) at the southbound I-605 intersection with Katella Avenue in Alternative 3, which increases travel time relative to other scenarios. Alternative 2 shows six segments with travel time improvement or no change during the AM peak hour as compared to the No-Build Alternative. Four segments would have an increased travel time as compared to the No-Build Alternative. Alternative 3 shows three segments with travel time improvement or no change during the AM peak hour as compared to the No-Build Alternative. Seven segments would have an increased travel time as compared to the No-Build Alternative. However, as noted above, the project is anticipated to facilitate improved pedestrian and bicycle mobility within project limits, in addition to geometric improvements that would improve the efficiency of traffic operations within project limits.

The PM peak hour Travel Time analysis experiences higher traffic volumes, and therefore has longer delays. Both build scenarios show improvement over the No-Build Alternative. Travel time improvements along Katella Avenue, at the southbound off-ramp to eastbound Katella Avenue and westbound Katella Avenue to the southbound on-ramp are significant due to additional lanes to improve weaving conditions in the project area. One exception to the travel time improvements is eastbound Katella Avenue to the northbound on-ramp due to the conversion of the intersection from a two-phase operation to a four-phase operation. The former free-flow moves of the westbound Katella Avenue to northbound on-ramp and northbound off-ramp to westbound Katella Avenue are signal controlled under the two Build Alternatives.

As shown in Table 2.1.5-19, Alternatives 2 and 3 show improvements over the No-Build Alternative. Alternative 2 has increased speeds and lower delay in the AM and PM peak hours as compared to the No-Build Alternative, whereas Alternative 3 has slower speeds compared to the No-Build Alternative in both peak hours, has higher delay in the AM peak hour, but lower delay in the PM peak hour.

2.1.5.4 Avoidance, Minimization, and/or Mitigation Measures

No avoidance, minimization, and/or mitigation measures are required with adherence to the project feature described above.