URBIN RETREAT - MIAMI BEACH

1234-60 WASHINGTON AVENUE

MIAMI BEACH, FL

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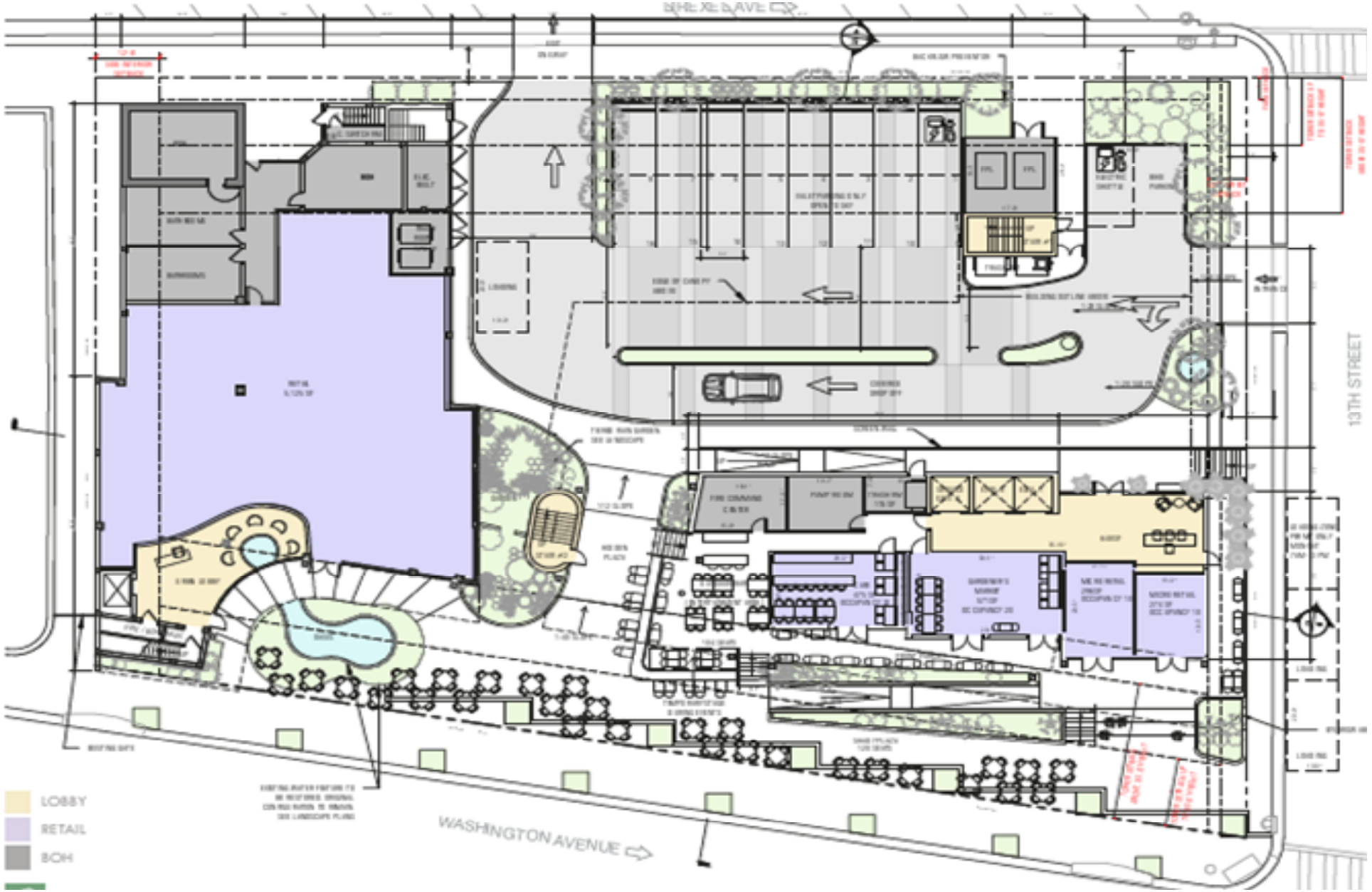
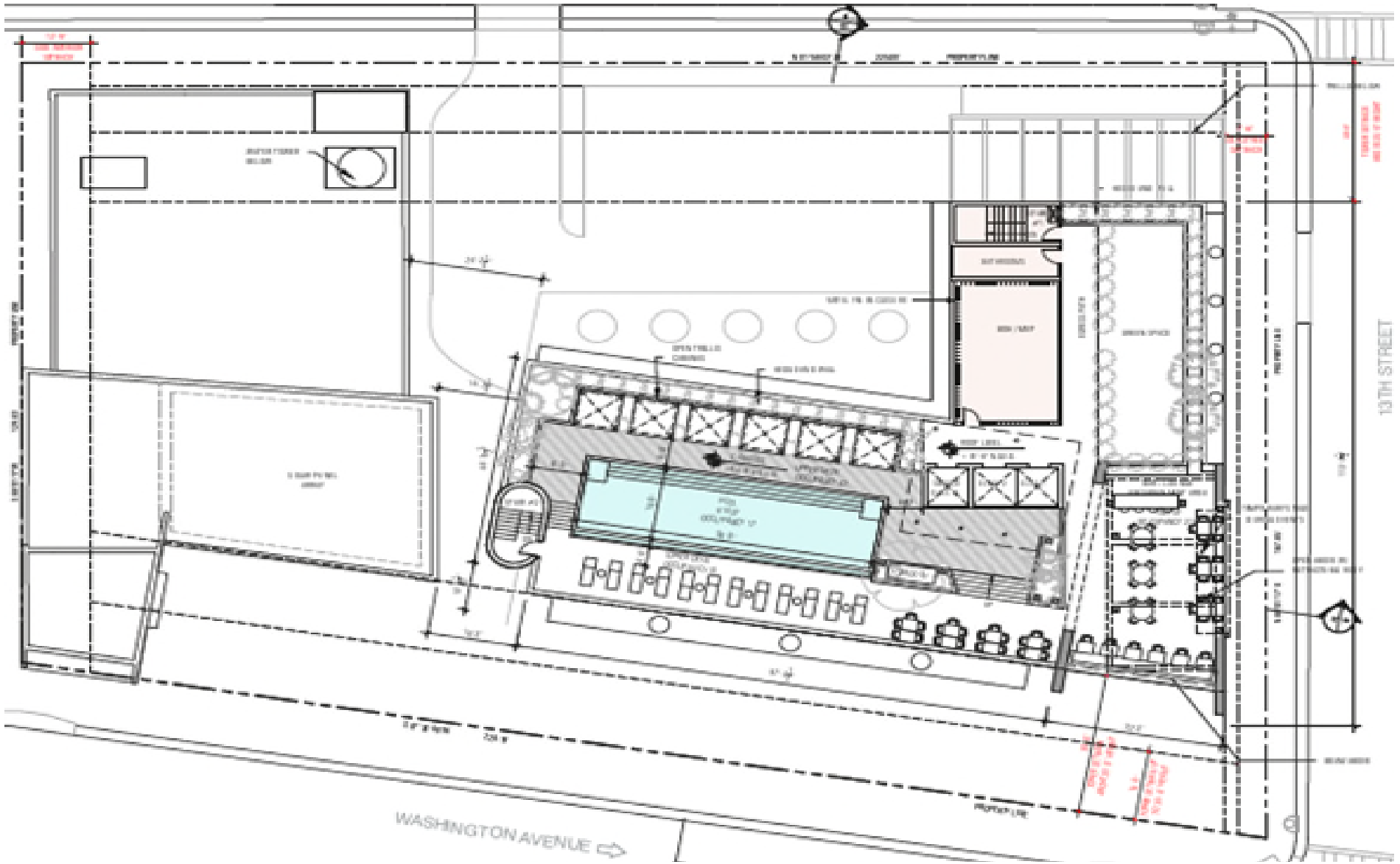
URBIN OFFERS AFFORDABLE GLOBAL MOBILITY THROUGH RESPONSIBLE GREEN LIVING AND WORKING IN URBAN CENTERS.

URBIN is a co-live, co-work, and wellness platform that fosters creativity and ignites connections through small units, big amenities and an emphasis on community. We are a circular community in search of a responsible, authentic and portable lifestyle.



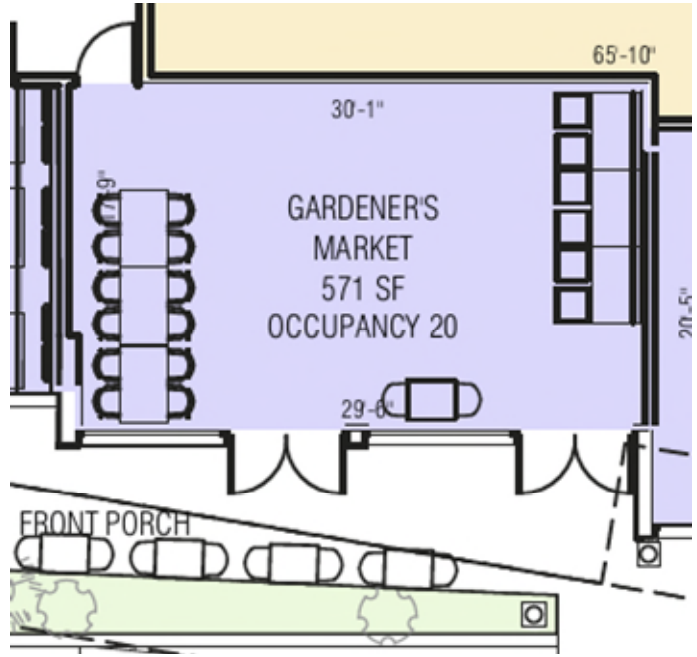
GROUND FLOOR



ROOFTOP

INDOOR RESTAURANT WITH OUTDOOR SEATING

OPERATOR: TBD
EMPLOYEES: 15
OCCUPANCY: 20
SEATING: 20 (Indoor)
120 (Shared Outdoor)



CONCEPT: GARDENER'S MARKET

HOURS OF OPERATION: 7AM – 5AM

HOURS OF ENTERTAINMENT: 11AM – 5AM

MUSIC: DJ/LIVE (Indoor) and AMBIENT (Indoor and Outdoor)

DESCRIPTION: THREE MEAL GARDNER'S MARKET SERVING GRAB-AND-GO, BREAKFAST, LUNCH, DINNER AND LATE-NIGHT BITES. ENTRY FROM WASHINGTON AVENUE.

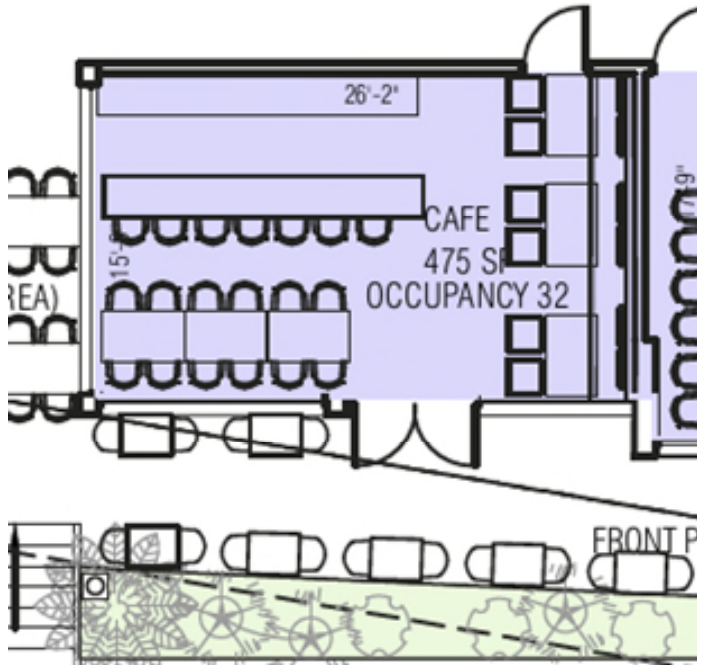
INDOOR RESTAURANT WITH OUTDOOR SEATING

OPERATOR: TBD

EMPLOYEES: 10

OCCUPANCY: 32

SEATING: 32 (Indoor)
120 (Shared Outdoor)



CONCEPT: CAFÉ

HOURS OF OPERATION: 7AM - 5AM

HOURS OF ENTERTAINMENT: 11AM - 5AM

MUSIC: DJ/LIVE (Indoor) and AMBIENT (Indoor and Outdoor)

DESCRIPTION: CAFÉ SERVING GRAB-AND-GO, BREAKFAST, LUNCH, DINNER AND LATE-NIGHT BITES. ENTRY FROM WASHINGTON AVENUE.

GROUND FLOOR BAR

OPERATOR: TBD

EMPLOYEES: 10

OCCUPANCY: 104

SEATING: 104

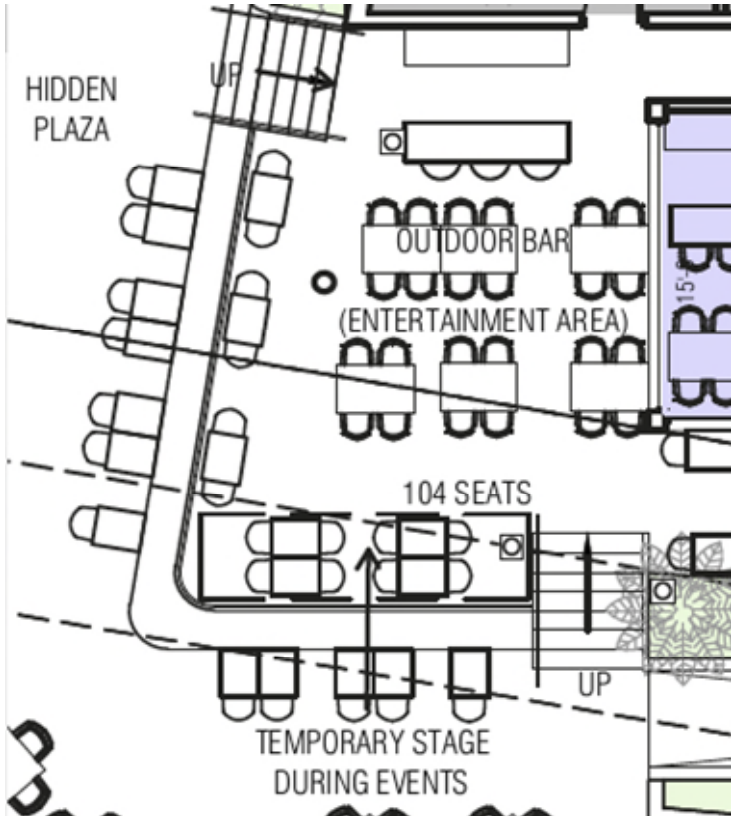
CONCEPT: BAR

HOURS OF OPERATION: 11AM – 5AM

HOURS OF ENTERTAINMENT: 11AM – 5AM

MUSIC: DJ/LIVE (Outdoor)

DESCRIPTION: GROUND FLOOR BAR WILL BE OPEN HOTEL GUESTS/RESIDENTS AND THE PUBLIC WITH ENTRY FROM WASHINGTON AVENUE.



ROOFTOP POOL

OPERATOR: TBD

EMPLOYEES: 15

OCCUPANCY: 130

SEATING: 24

CONCEPT: TBD

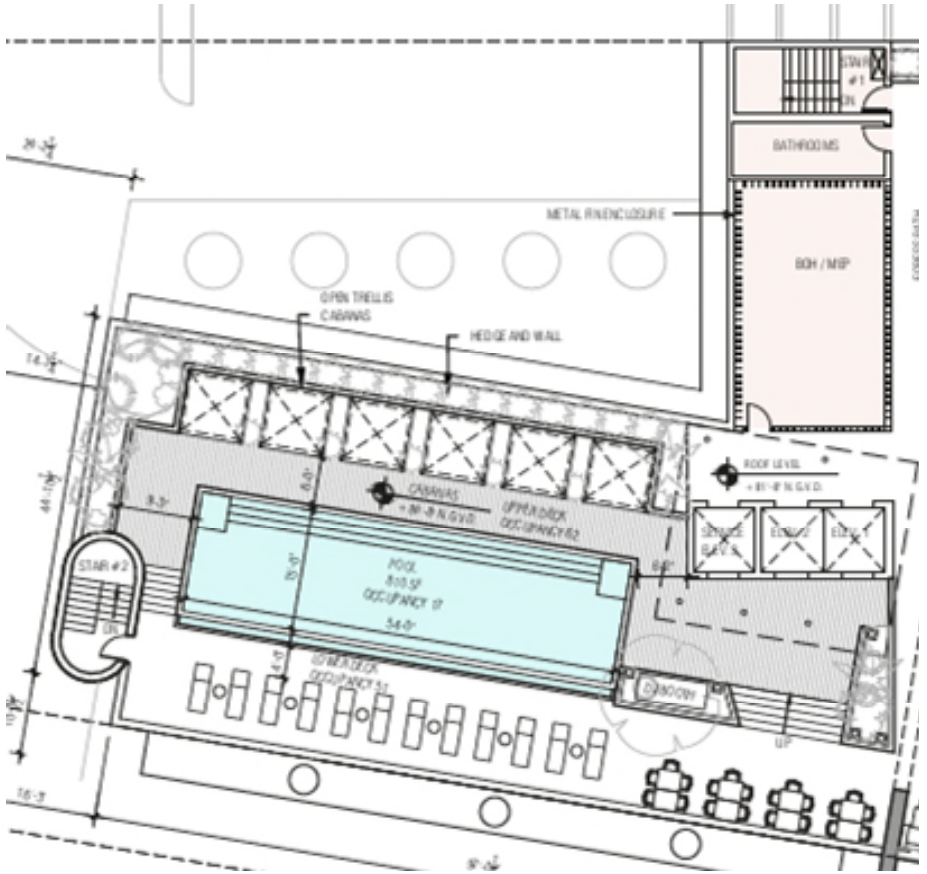
HOURS OF OPERATION: 7AM - 12AM

HOURS OF ENTERTAINMENT: Sun. - Wed. 11AM - 9PM

Thurs. - Sat. 11AM - 11PM

MUSIC: DJ/LIVE and AMBIENT

DESCRIPTION: FOR HOTEL GUESTS/RESIDENTS AND PRIVATE EVENTS ACCESSIBLE THROUGH THE BUILDING LOBBY.



ROOFTOP BAR

OPERATOR: TBD

EMPLOYEES: 15

OCCUPANYCY: 219

SEATING: 63

CONCEPT: BAR + LOUNGE

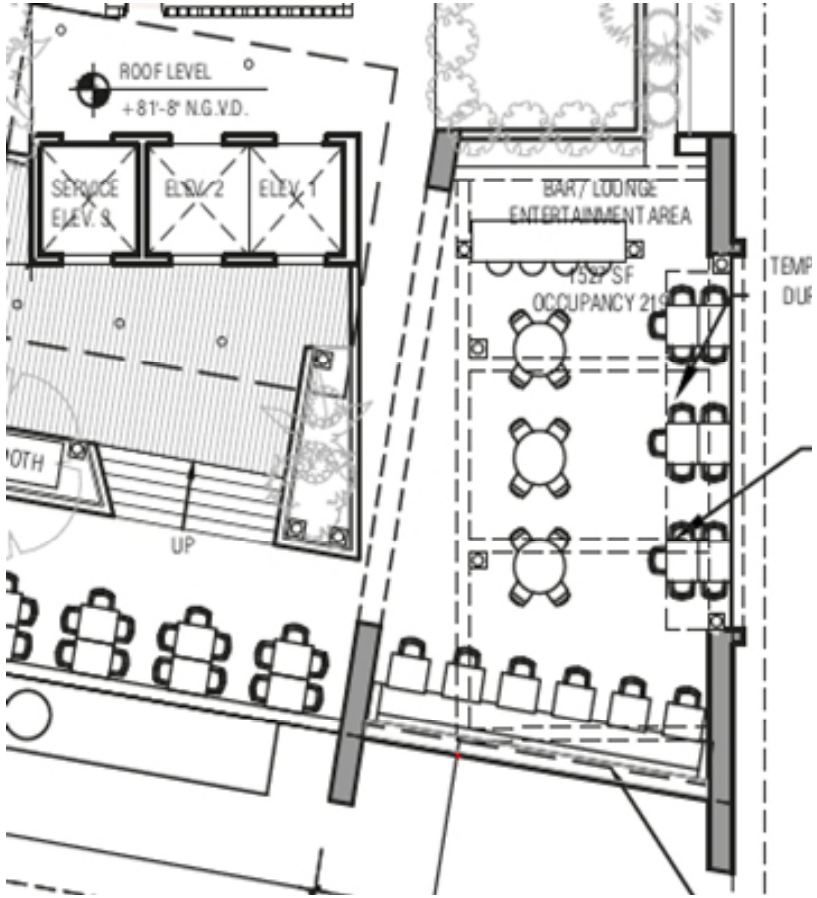
HOURS OF OPERATION: 11AM – 12AM

HOURS OF ENTERTAINMENT: Sun. – Wed. 11AM – 9PM

Thurs. – Sat. 11AM – 11PM

MUSIC: DJ/LIVE and AMBIENT

BAR AND LOUNGE WILL BE OUTDOOR AND OPEN TO THE PUBLIC. ACCESS WILL BE VIA THE BUILDING LOBBY. EGRESS AND SERVICE ACCESS WILL BE PROVIDED TO THE POOL.



MENU
AVOCADO TOAST
Tomatoes, red onions, red peppers, avocado
HUMMUS
Pita bread or veggies.
Breakfast
EGG WRAP
Egg, spinach, cheese and vegetarian bacon.
CROISSANT/MUFFIN/BAGEL
VEGGIE LOVERS BURGER
Chickpeas and quinoa burger with lettuce, tomato, avocado, red cabbage, red pepper and sprouts.
CHAMPAQUI
Green leaves, arugula, red cabbage, avocado, hummus, sautéed mushrooms, goat cheese and chia seeds.
ANDES
Green leaves, quinoa, lentils, sautéed mushrooms, tomato, red pepper, marinated tofu and poppy seeds.

VENUE	EMPLOYEES
Gardener's Market	15
Café	10
Ground Floor Bar	10
Rooftop Pool	15
Rooftop Bar	15

THE EMPLOYEE COUNT AS NOTED ABOVE IS BASED ON HIGH SEASON AND HIGH OCCUPANCY AT ANY GIVEN TIME.

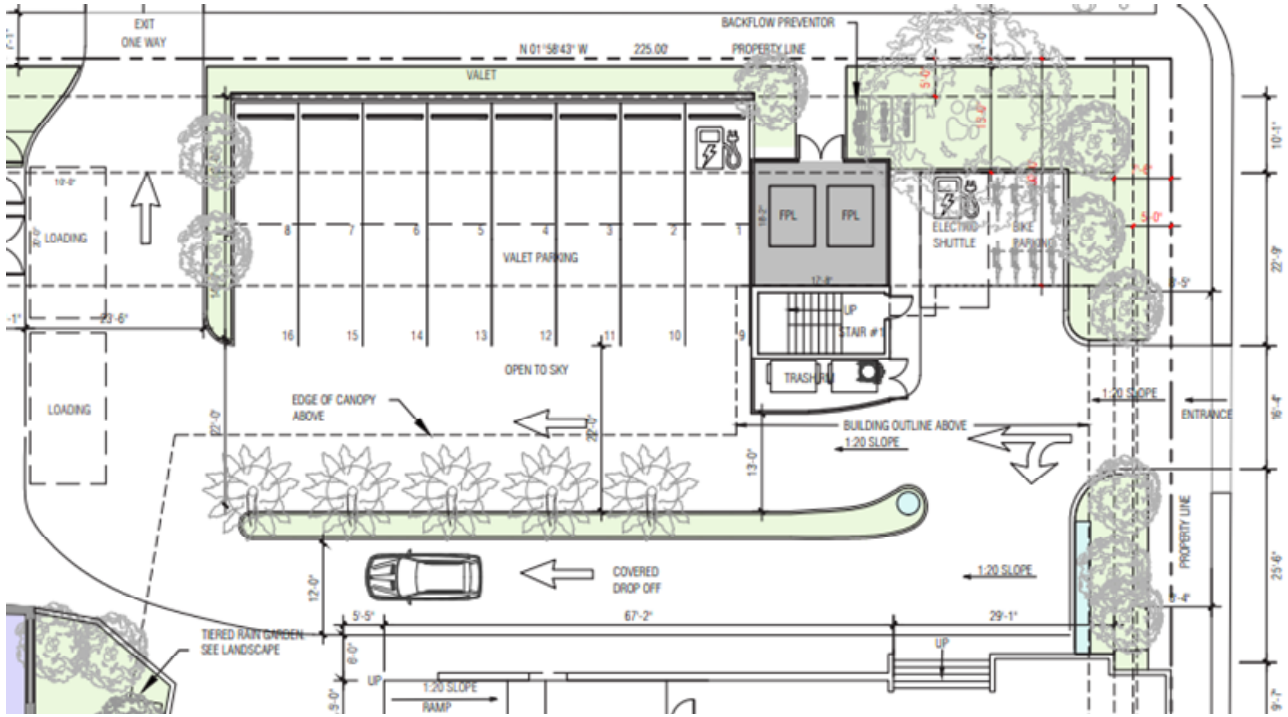
GUESTS & RESIDENTS

GUESTS WILL ARIVE VIA 13TH STREET ENTRANCE BETWEEN WASHINGTON AVENUE AND DREXEL AVENUE WHERE THEY MAY VALET THEIR CAR AND BE GREETED BY A HOTEL BELLMAN WHO WILL DIRECT THEM INTO HOTEL RECEPTION ON THE FIRST FLOOR. RESIDENTS WILL ENTER VIA LOBBY.

THE PUBLIC

RESTAURANTS AND CAFÉ PATRONS WILL ARRIVE IN THE SAME FASHION AS DESCRIBED ABOVE FOR GUESTS AND RESIDENTS OR DIRECTLY THROUGH THE RESTAURANT ON WASHINGTON AVENUE.

VALET SERVICE WILL BE OFFERED TO GUEST/RESIDENTS AND RETAIL PATRONS. ALL VEHICLES WILL USE THE DROP-OFF AREA DEPICTED ON THE SITE PLAN AS THE VALET STATION. 16 PARKING SPACES ARE PROPOSED ONSITE AND IT IS ANTICIAPTED MOST GUESTS/RESIDENTS WILL ARIVE ON FOOT OR VIA RIDE SHARING SERVICES. IT IS ANTICIAPTED RETAIL PATRONS WILL ARRIVE ON FOOT, BIKE, VIA RIDE SHARING SERVICES AND PARKING VIA NEARBY GARAGES (1130 WASHINGTON AVENUE; 1262 COLLINS AVENUE; 1301 COLLINS AVENUE).



IN AN EFFORT TO ENSURE MINIMAL IMPACT ON LOCAL RESIDENTS, GUESTS/RESIDENTS AND STREET TRAFFIC, THE APPLICANT WILL IMPLEMENT THE FOLLOWING PROCEDURES.

DELIVERIES:

- THE PROJECT IS DESIGNED TO ACCOMMODATE LARGE- AND SMALL-SCALE DELIVERIES AND MINIMIZE IMPACT ON ABUTTING RIGHT OF WAYS.
- LARGER DELIVERIES WILL BE ACCOMMODATED WITHIN THE EXISTING 13TH STREET LOADING ZONE. SIGNAGE IS IN PLACE TO LIMIT HOURS.
- SMALLER DELIVERIES WILL BE ACCOMMODATED FROM THE 13TH STREET DRIVEWAY ENTRANCE THROUGH THE LOADING DOCK WHERE THE RECEIVING AREA IS LOCATED.
- NO DELIVERIES WILL TAKE PLACE EARLIER THAN 6AM. MANAGEMENT WILL ENSURE DELIVERIES ARE EFFICIENT.

RESUSE & RECYCLING:

- COLLECTIONS WILL BE SCHEDULED NO EARLIER THAN 8AM. INTERNAL PROCEDURE WILL BE IMPLEMENTED BY MANAGEMENT TO ENSURE MINIMAL IMPACT TO GUESTS/RESIDENTS AND TRAFFIC.
- REFUSE AND RECYCLING FOR THE BUILDING WHICH WILL BE STORED IN DESIGNATED SECURED AREAS FOR PICK UP.

PURSUANT TO THE POLICIES OF THE BUILDING, ALL SECURITY WILL BE ADMINISTERED BY MANAGEMENT AND THE FOLLOWING MEASURES WILL BE IMPLEMENTED.

1. SECURITY WILL BE PRESENT 24-HOURS A DAY AND EACH ENTERTAINMENT VENUE WILL BE STAFFED WITH ITS OWN SECURITY AND EMPLOYEES TO MANAGE OCCUPANCY.
2. SECURITY CAMERAS WILL BE LOCATED AT MAJOR ENTRANCE AND EXIT POINTS OF THE PROPERTY.
3. SECURITY CAMERAS WILL BE INSTALLED TO MONITOR ALL POINTS OF SALE.
4. SECURITY CAMERAS WILL BE INSTALLED IN ELEVATORS TO MONITOR GUEST FLOW.
5. ADDITIONAL PERSONNEL WILL BE SCHEDULED ON HIGH OCCUPANCY DAYS.
6. SECURITY TO BE ASSIGNED TO POOL TO MONITOR OCCUPANCY AND MAINTAIN SEPARATION BETWEEN POOL AREA AND BAR AND LOUNGE AREA. TEMPORARY, DECORATIVE BARRICADES WILL SEPARATE THE VENUES DURING ENTERTAINMENT.

VENUE	OCCUPANCY	SEATING	HOURS OF OPERATION	HOURS OF ENTERTAINMENT	CUP REQUEST
Gardener's Market	20	20 Indoor 120 Shared Outdoor	7AM–5AM	11AM–5AM DJ/Live Indoor Only	N/A
Café	32	32 Indoor 120 Shared Outdoor	7AM–5AM	11AM–5AM DJ/Live Indoor Only	N/A
Ground Floor Bar	104	104 Outdoor	11AM–5AM	11AM–5AM	Open Air Entertainment Establishment
Rooftop Pool	130	24	7AM–12AM	Sun–Wed: 11AM–9PM Thurs–Sat: 11AM-11PM	Outdoor Entertainment Establishment
Rooftop Bar	219	63	11AM–12AM	Sun–Wed:11AM – 9PM Thurs– Sat: 11AM-11PM	Outdoor Entertainment Establishment/Neighborhood Impact Establishment

1234-60 Washington Avenue

Miami Beach, Florida 33139

prepared for:

Location Ventures

traffic study

TRAFTECH ENGINEERING, INC.

December 2019

TRAFTECH
ENGINEERING, INC.

December 2, 2019

Mr. Angel Luis Garcia
Vice President - Development
Location Ventures
2665 South Bayshore Drive
Suite 440/1101
Coconut Grove, Florida 33133

Re: **1234-1260 Washington Avenue – Miami Beach**
Traffic Engineering Study

Dear Angel:

Traf Tech Engineering, Inc. is pleased to provide you with the results of the updated traffic study undertaken for the proposed redevelopment of the existing site located on the west side of Washington Avenue just south of 13th Street in the City of Miami Beach, Florida. The revised study addresses the traffic-related comments provided by the City of Miami Beach.

It has been a pleasure working with Location Ventures on this project.

Sincerely,

TRAF TECH ENGINEERING, INC.

Joaquin E. Vargas, P.E.
Senior Transportation Engineer

JOAQUIN E. VARGAS
LICENSE
No 44174
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

December 2, 2019

8400 N. University Drive, Suite 309, Tamarac, FL 33321 T: 954-582-0988 F: 954-582-0989

INTRODUCTION

1234-60 Washington is a proposed redevelopment project planned to be located on the west side of Washington Avenue just south of 13th Street in the City of Miami Beach in Miami-Dade County, Florida. The location of the project site is illustrated in Figure 1 on the following page.

Traf Tech Engineering, Inc. was retained by Location Ventures to conduct a traffic study[1] in connection with the proposed mixed-use development. The study addresses trip generation and the traffic impacts created by the proposed project on the nearby transportation network. This study is divided into seven (7) sections, as listed below:

1. Inventory
2. Existing Conditions
3. Traffic Counts
4. Trip Generation
5. Trip Distribution and Traffic Assignment
6. Traffic Impact Analysis
7. Conclusions and Recommendations

[1] The traffic methodology was discussed and agreed with the City of Miami Beach staff and is presented in Appendix A.

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PROJECT LOCATION MAP

FIGURE 1
1234 Washington
Miami Beach, Florida

INVENTORY

Existing Land Uses and Access

The project site is currently developed with retail and office uses. The retail space consists of 10,927 square feet and the office building consists of 21,732 square feet. There is a small parking lot located at the site with two driveways (one on 13th Street and one on Drexel Avenue).

Proposed Land Uses and Access

The proposed re-development project consists of the following land uses and intensities:

- 56 hotel rooms
- 5,949 square feet of retail space
- 21,732 square feet of office space (office will remain)
- 49 residential units (mid-rise)

On-site parking is provided with 16 parking spaces. Additional nearby public parking will be available with valet service provided on site. The proposed project is anticipated to be built and occupied in 2022. The future redevelopment site will include one access driveway on 13th Street and one on Drexel Avenue. Appendix B contains a copy of the proposed site plan for the project site.

EXISTING CONDITIONS

This section addresses the existing roadway system located in the vicinity of the project site and nearby intersections.

Roadway System

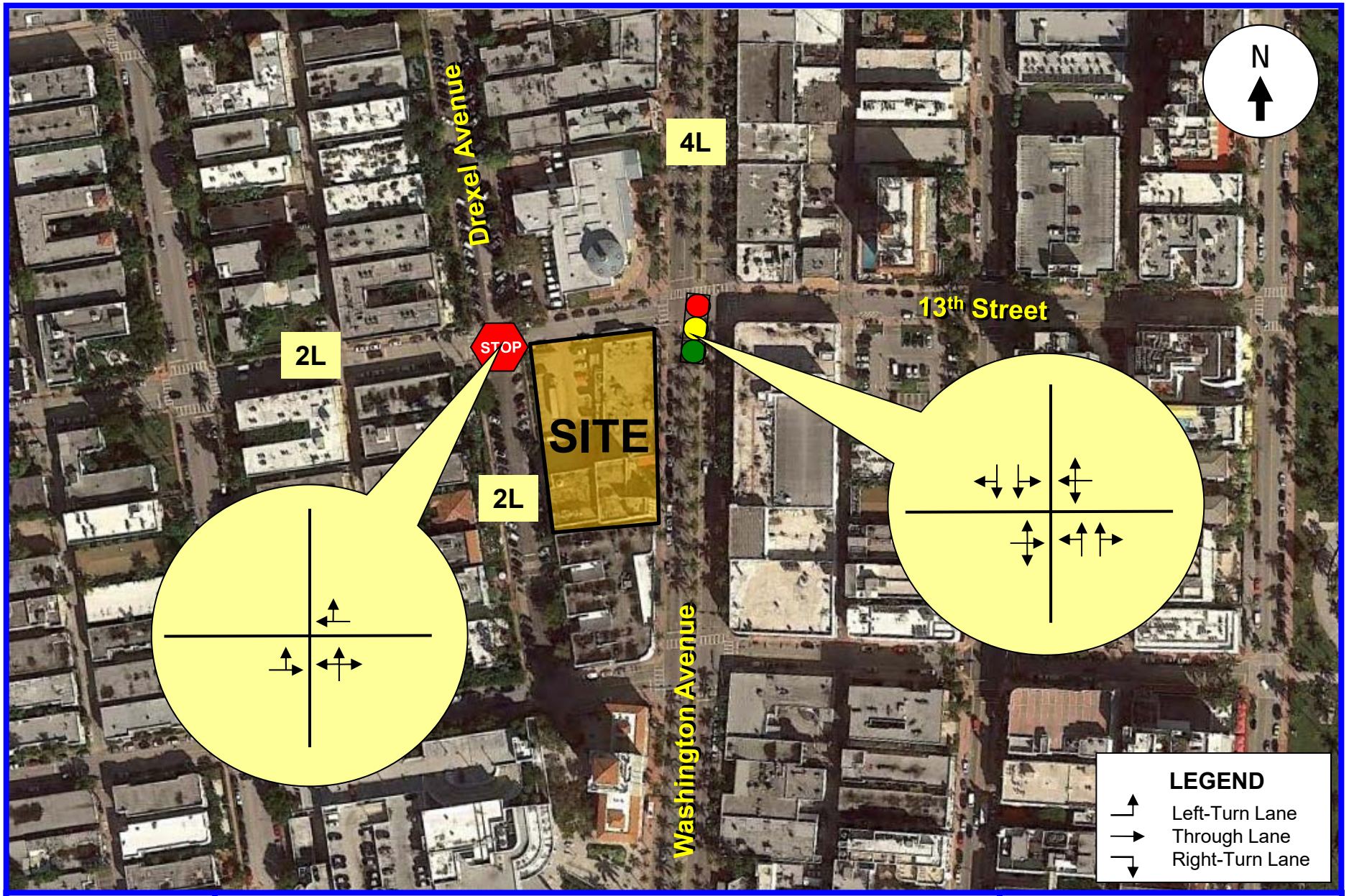
The roadway system located near the project site includes Washington Avenue, 13th Street and Drexel Avenue. Washington Avenue is a four-lane divided roadway and 13th Street is a 2-lane local street. Drexel Avenue operates in the northbound direction adjacent to the project site with one through lane.

Nearby Intersections

With the assistance of City of Miami Beach staff, two intersections (plus the future access driveways) were identified as the locations that will be impacted the most by the proposed project. These intersections include:

1. Washington Avenue and 13th Street (signalized)
2. Drexel Avenue and 13th Street (stop control)

Figure 2 shows the existing lane geometry of the eight intersections selected for analysis purposes. The number of lanes on the street system surrounding the project site is also depicted in the figure.



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EXISTING LANE GEOMETRY

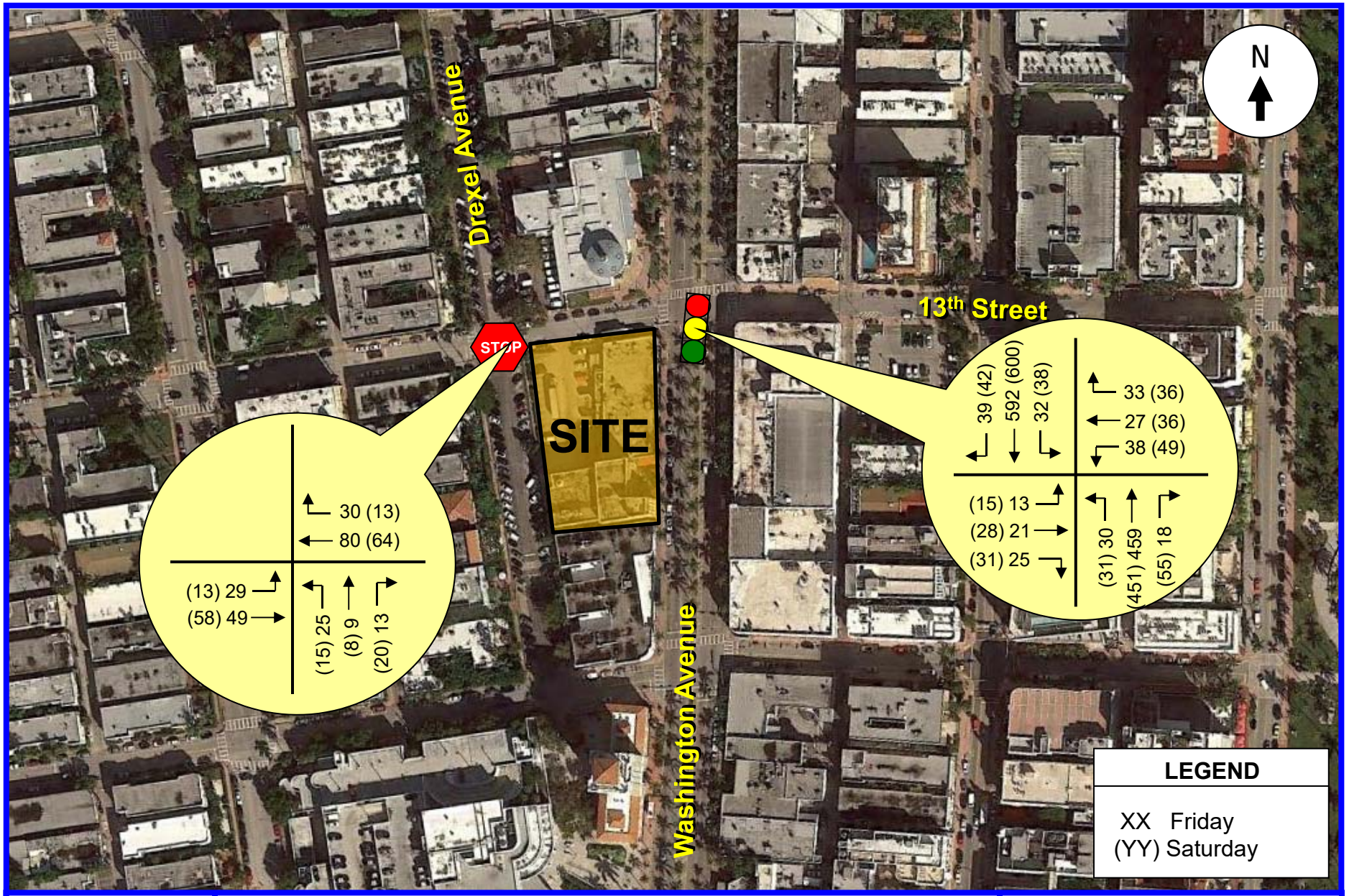
FIGURE 2
1234 Washington
Miami Beach, Florida

TRAFFIC COUNTS

Traf Tech Engineering, Inc., in association with Video Data Solutions collected intersection turning movement counts at the two study intersections. The intersection turning movement counts were collected on Friday, September 6, 2019 between 4:00 PM and 7:00 PM and Saturday, September 7, 2019 from 2:00 PM to 4:00 PM at the following eight intersections located near the project site:

3. Washington Avenue and 13th Street (signalized)
4. Drexel Avenue and 13th Street (stop control)

Figure 3 summarizes the results of the intersection turning movement counts undertaken during the Friday and Saturday peak hours. Appendix C contains the intersection turning movement counts, as collected in the field. The latest signal timing plan for the signalized intersections could not be obtained from the Miami-Dade County website (currently under maintenance). The timing was developed based on the operating plan of the study intersection (protected/permissive and permissive) and nearby signals cycle lengths during the study peak periods.



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EXISTING TRAFFIC COUNTS – Friday & (Saturday)
Peak Hour

FIGURE 3
1234 Washington
Miami Beach, Florida

TRIP GENERATION

The trip generation for the project was based on information contained in the Institute of Transportation Engineer's (ITE) *Trip Generation Manual* (10th Edition). According to the subject ITE manual, the most appropriate "land use" categories for the proposed uses includes ITE's Land Use 820 – Retail, ITE's Land Use 710 – Office, ITE's Land Use 221– Mid Rise, and ITE's Land Use 310 – Hotel.

Tables 1 and 2 summarize the external trips associated with the proposed mixed-use development during the weekday peak and Tables 3 and 4 summarize the external trips during the Saturday peak.

TABLE 1
Trip Generation Summary (Existing Uses)
1234-60 Washington for Weekday

			PM Peak Hour		
Land Use	**Size**	**Daily Trips**	**Total Trips**	**Inbound**	**Outbound**
Retail LUC 820	10,927	1,334	106	51	55
Office LUC 710	21,732	241	27	4	23
Subtotal		**1,576**	**132**	**55**	**77**
Internal (8%)		-87	-10	-5	-5
Driveway Volumes		**1,489**	**122**	**50**	**72**
Pass-by (Retail-25%)		-316	-25	-12	-13
External Trips		**1,173**	**97**	**38**	**59**

Source: ITE Trip Generation Manual (10th Edition)

TABLE 2
Trip Generation Summary (Proposed Uses)
1234-60 Washington for Weekday

			PM Peak Hour		
Land Use	**Size**	**Daily Trips**	**Total Trips**	**Inbound**	**Outbound**
Retail LUC 820	5,949	882	67	32	35
Office LUC 710	21,732	241	27	4	23
MF Mid Rise LUC 221	49	265	22	14	8
Hotel LUC 310	56	205	16	8	8
Subtotal		**1,594**	**132**	**58**	**74**
Internal (25%)		-127	-32	-16	-16
Driveway Volumes		**1,467**	**100**	**42**	**58**
Pass-by (Retail-25%)		-170	-13	-6	-7
External Trips		**1,297**	**87**	**36**	**51**
Difference:		**124**	**-9**	**-2**	**-8**

Source: ITE Trip Generation Manual (10th Edition)

TABLE 3 Trip Generation Summary (Existing Uses) 1234-60 Washington for Saturday					
		Saturday	Peak Hour		
Land Use	Size	Daily Trips	Total Trips	Inbound	Outbound
Retail LUC 820	10,927	2,259	108	56	52
Office LUC 710	21,732	48	12	6	6
Subtotal		**2,307**	**120**	**62**	**58**
Internal (4%)		-127	-4	-2	-2
Driveway Volumes		**2,180**	**115**	**60**	**55**
Pass-by (Retail-25%)		-566	-27	-14	-13
External Trips		**1,614**	**88**	**46**	**42**

Source: ITE Trip Generation Manual (10th Edition)

TABLE 4 Trip Generation Summary (Proposed Uses) 1234-60 Washington for Saturday					
		Saturday	Peak Hour		
Land Use	Size	Daily Trips	Total Trips	Inbound	Outbound
Retail LUC 820	5,949	1,549	67	35	32
Office LUC 710	21,732	48	12	6	6
MF Mid Rise LUC 221	49	241	27	13	14
Hotel LUC 310	56	244	45	25	20
Subtotal		**2,082**	**151**	**79**	**72**
Internal (24%)		-167	-36	-18	-18
Driveway Volumes		**1,915**	**115**	**61**	**54**
Pass-by (Retail-25%)		-302	-13	-7	-6
External Trips		**1,613**	**102**	**54**	**48**
Difference:		**0**	**14**	**8**	**5**

Source: ITE Trip Generation Manual (10th Edition)

As indicated at the bottom of Table 2, there are no external new trips anticipated to be generated by the proposed mixed-use project during the weekday peak hour. In contrast, Tables 3 and Table 4 indicate that the external new trips anticipated to be generated by the proposed project during the Saturday peak hour are approximately 14 vehicles per hour (eight inbound and five outbound).

The trip generation rates used to determine the trips associated with the existing and proposed uses are presented below:

ITE Land Use 820 – Retail

Weekday Daily Trip Generation
Ln (T) = 0.68 Ln (X) + 5.57
Where T = number of weekday daily trips and
X = 1000 Sq. Ft. GLA

Saturday Daily Trip Generation
Ln (T) = 0.62 Ln (X) + 6.24
Where T = number of Saturday daily trips and
X = 1000 Sq. Ft. GLA

Weekday PM Peak Hour of Adjacent Street
Ln (T) = 0.74 Ln (X) + 2.89 (48% inbound and 52% outbound)
Where T = number of weekday PM peak hour trips and
X = 1000 Sq. Ft. GLA

Saturday Peak Hour of Adjacent Street
Ln (T) = 0.79 Ln (X) + 2.79 (52% inbound and 48% outbound)
Where T = number of Saturday peak hour trips and
X = 1000 Sq. Ft. GLA

ITE Land Use 710 – Office

Weekday Daily Trip Generation
Ln (T) = 0.97 Ln (X) + 2.5
Where T = number of weekday daily trips and
X = 1000 Sq. Ft. GLA

Saturday Daily Trip Generation
T = 2.21(X)
Where T = number of Saturday daily trips and
X = 1000 Sq. Ft. GLA

Weekday PM Peak Hour of Adjacent Street
Ln (T) = 0.95 Ln (X) + 0.36 (16% inbound and 84% outbound)
Where T = number of weekday PM peak hour trips and
X = 1000 Sq. Ft. GLA

Saturday Peak Hour of Adjacent Street
T = 0.53 (X) (54% inbound and 46% outbound)
Where T = number of Saturday peak hour trips and
X = 1000 Sq. Ft. GLA

ITE Land Use 221 – Mid Rise

Weekday Daily Trip Generation
T = 5.45 (X) – 1.75
Where T = number of weekday daily trips and
X = number of rooms

Saturday Daily Trip Generation
T = 4.91(X)
Where T = number of Saturday daily trips and
X = 1000 Sq. Ft. GLA

Weekday Peak Hour of Adjacent Street
Ln (T) = 0.96 Ln (X) -0.63 (61% inbound and 39% outbound)
Where T = number of weekday peak hour trips and
X = number of rooms

Saturday Peak Hour of Adjacent Street
T = 0.42 (X) + 6.73 (49% inbound and 51% outbound)
Where T = number of Saturday peak hour trips and
X = 1000 Sq. Ft. GLA

ITE Land Use 310 – Hotel

Weekday Daily Trip Generation
T = 8.36 (X)
Where T = number of weekday daily trips and
X = number of rooms

Saturday Daily Trip Generation
T = 9.62(X) – 294.56
Where T = number of Saturday daily trips and
X = 1000 Sq. Ft. GLA

Weekday Peak Hour of Adjacent Street
T = 0.6 (X) (51% inbound and 49% outbound)
Where T = number of weekday peak hour trips and
X = number of rooms

Saturday Peak Hour of Adjacent Street
T = 0.72 (X) + 4.32 (56% inbound and 44% outbound)
Where T = number of Saturday peak hour trips and
X = 1000 Sq. Ft. GLA

TRIP DISTRUBUTION AND TRAFFIC ASSIGNMENT

The trip distribution and traffic assignment for the project were based on Miami-Dade County's Cardinal Distribution information for the study area. Table 5 summarizes the County's cardinal distribution data for Traffic Analysis Zone 645, which is applicable to the project site from the latest SERPM data published by Miami-Dade County.

TABLE 5
Project Trip Distribution
TAZ # 645

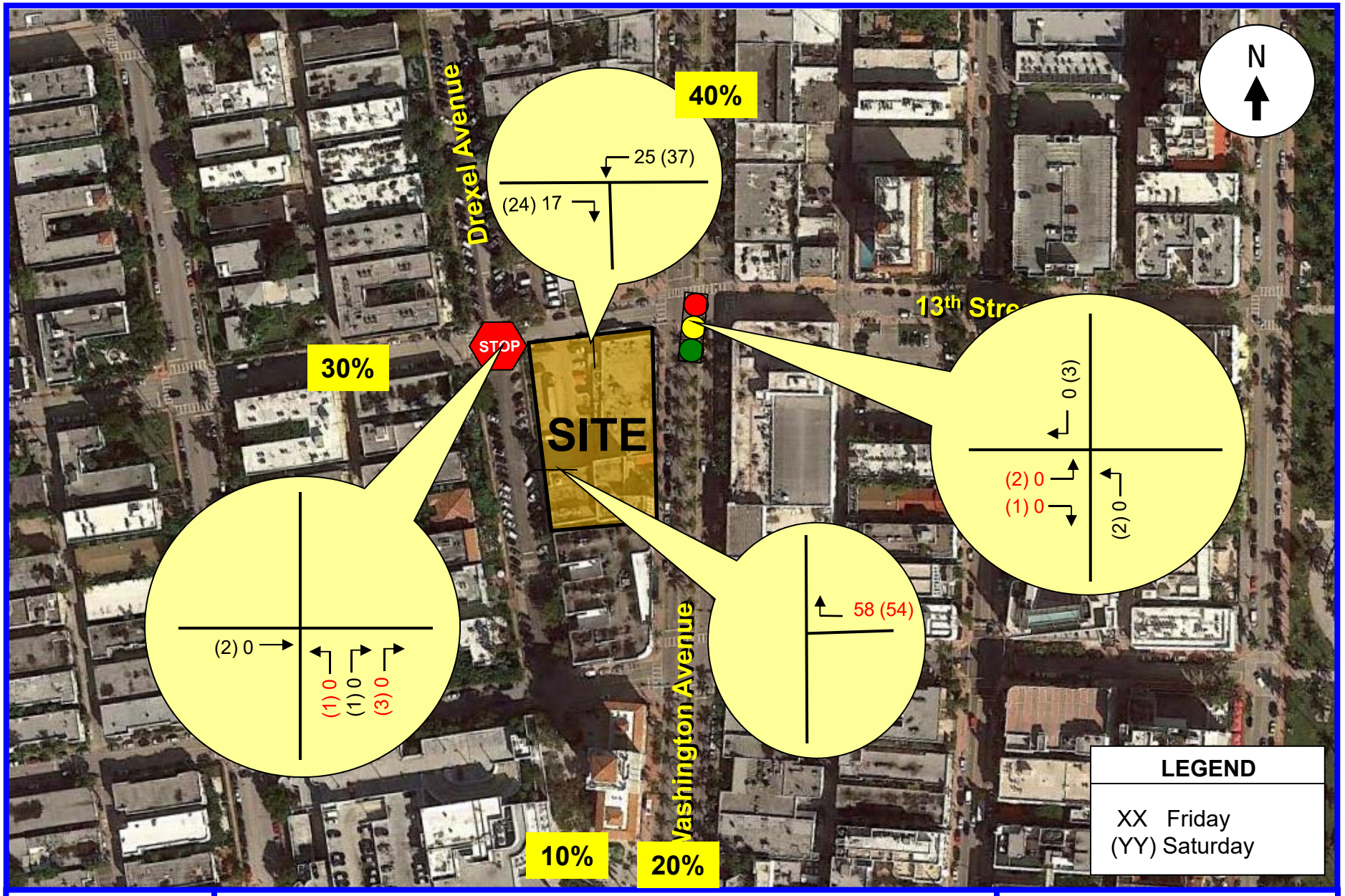
Year	Movement							
	NNE	ENE	ESE	SSE	SSW	WSW	WNW	NNW
2010	11.40%	0.00%	0.00%	0.00%	7.10%	21.60%	33.50%	26.30%
2040	21.20%	0.00%	0.00%	0.00%	12.50%	21.70%	26.20%	18.40%
2022*	15.32%	0.00%	0.00%	0.00%	9.26%	21.64%	30.58%	23.14%

*Note: * Interpolated Values*
Source: Miami-Dade County (2040 SERPM)

Based on the above, the following traffic assignment was assumed for the proposed mixed-use development:

- 40% to and from the north via Washington Avenue
- 20% to and from the south via Washington Avenue
- 30% to and from the west via 13th Street
- 10% to and from the south via Drexel Avenue

The new peak hour traffic generated by the project was assigned to the nearby transportation network using the traffic assignment documented above. The new project traffic assignment is summarized in Figure 4.



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ENGINEERING, INC.

TOTAL PROJECT TRAFFIC ASSIGNMENT - Trips

FIGURE 4
1234 Washington
Miami Beach, Florida

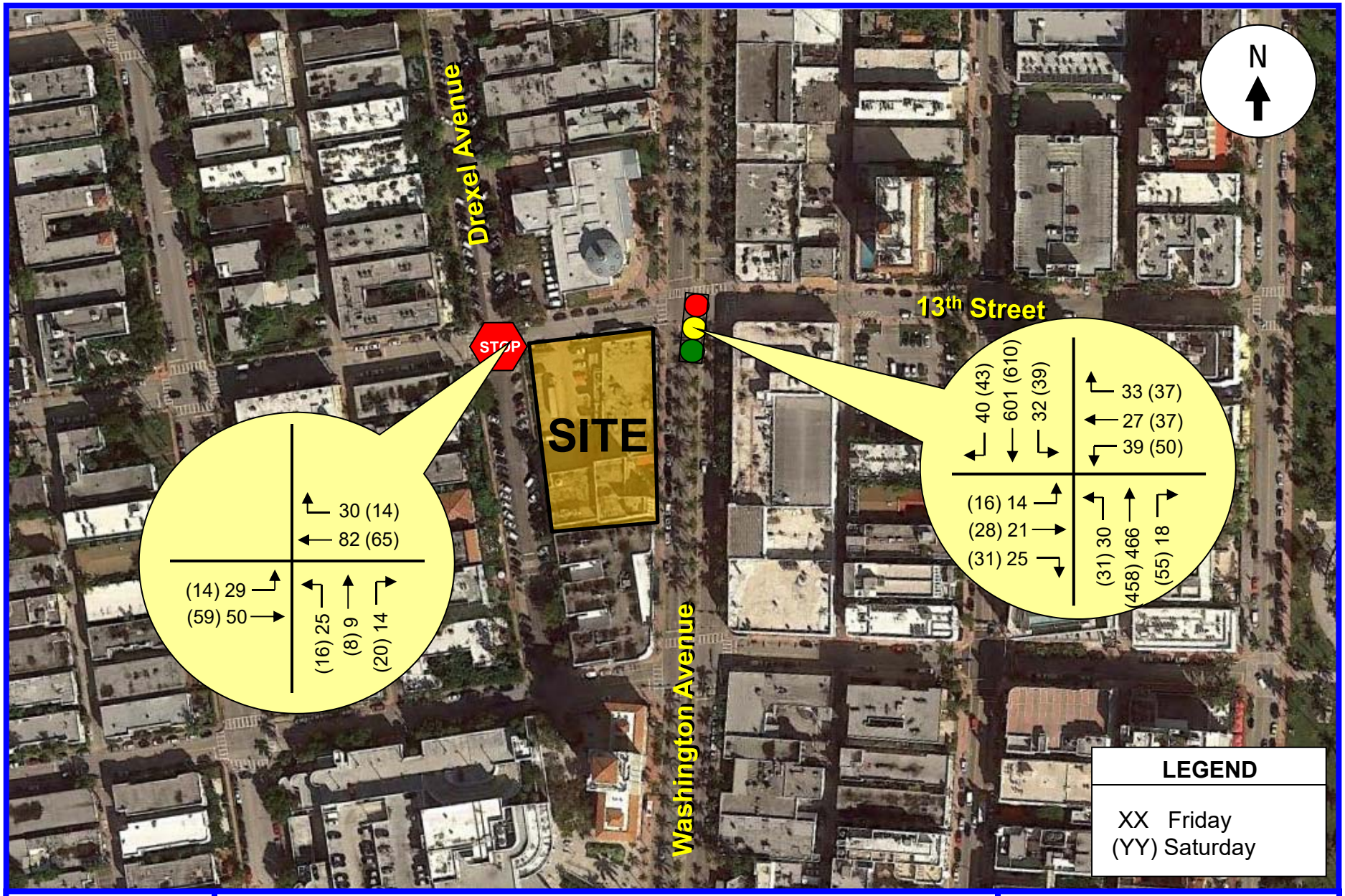
TRAFFIC ANALYSIS

This section of the study is divided into four parts. The first part consists of developing the future conditions traffic volumes for the study area. The second part includes level-of-service analyses for existing and future conditions. The third section evaluates the intersection of 13th Street and Drexel Avenue in order to determine if all-way stop control is preferred. The final section focusses on valet parking.

Future Conditions Traffic Volumes

Two sets of future traffic volumes were developed. The first set includes project buildout conditions without the proposed project and the second set adds the new trips anticipated to be generated by the project.

In order to develop year 2022 traffic volumes (project anticipated to be built and occupied by the year 2022), without the proposed project, two separate analyses were undertaken. The first analysis converts the existing peak hour traffic counts collected in the field during the month of September to average peak season conditions. Based on FDOT's Peak Season Factor Category report, a factor of 1.03 is required to convert traffic counts collected in the first week of September to average peak season conditions (refer to Appendix D). The second analysis includes a growth factor to project 2019 peak season traffic volumes to the year 2022. Based on traffic growth data published by the FDOT for a nearby traffic count stations, minimal traffic growth has occurred during the past five years (refer to Appendix D). A 0.5% growth rate was used to account for unforeseen approved project (committed trips) that may impact the study intersections. The new trips generated by the 1234-60 Washington project (refer to Figure 4) were added to the 2019 background traffic in order to develop total traffic conditions. The future traffic projections for the study intersections (peak season adjustments, growth rates and project traffic) are presented in tabular format in Appendix E. Figures 5 and 6 present the year 2022 future traffic volumes for the study area.

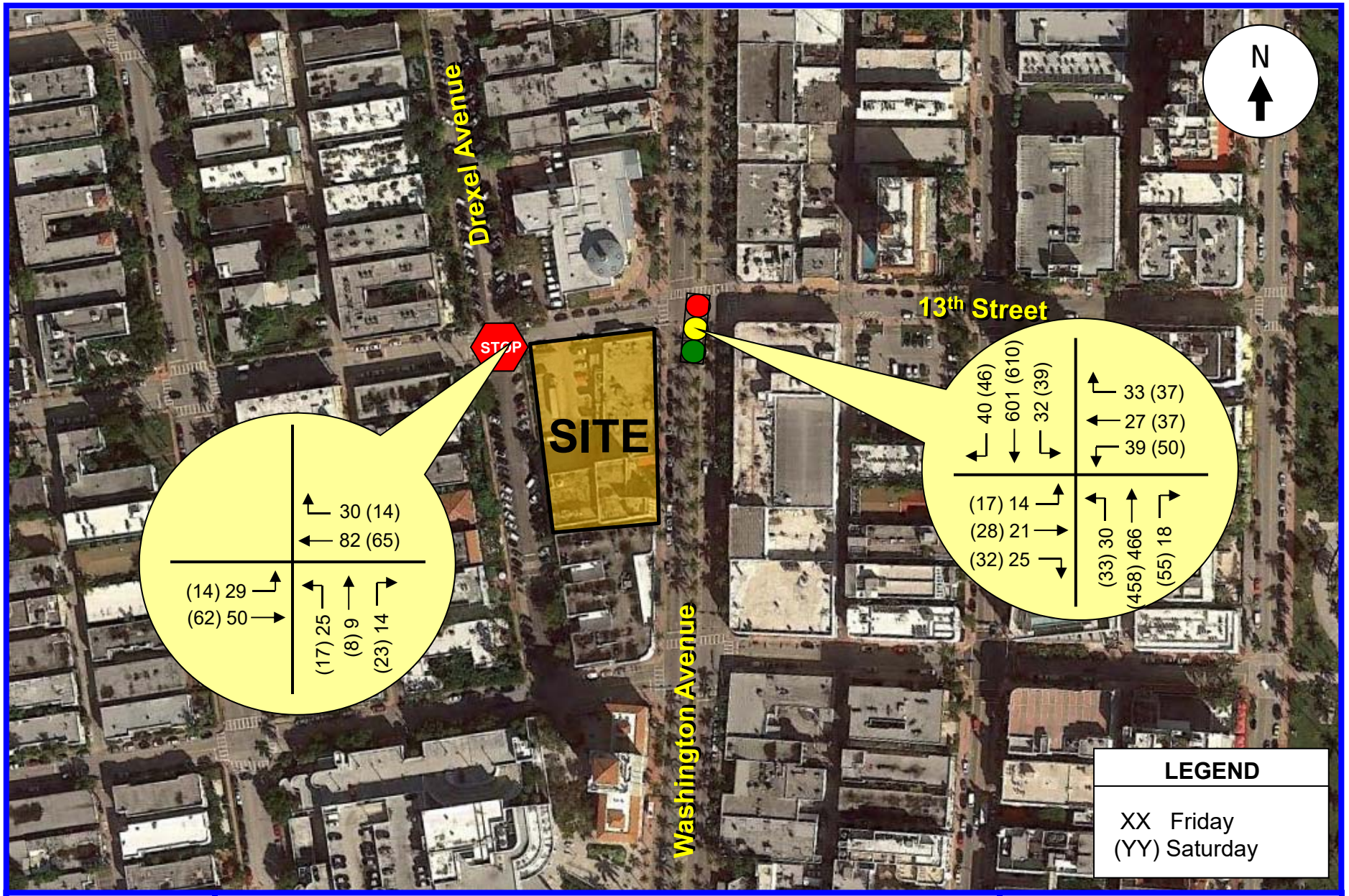


Traf Tech
ENGINEERING, INC.

BACKGROUND TRAFFIC – Year 2022

FIGURE 5
1234 Washington
Miami Beach, Florida

a



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ENGINEERING, INC.

TOTAL TRAFFIC WITH PROJECT – Year 2022

FIGURE 6
1234 Washington
Miami Beach, Florida

Figure 5 includes background traffic only (without the proposed project) and Figure 6 includes the additional traffic anticipated to be generated by the 1234-60 Washington Avenue mixed-use project.

Level of Service Analyses

Intersection capacity/level of service analyses were conducted for the study intersections and the exit access driveway. The analyses were undertaken following the capacity/level of service procedures outlined in the Highway Capacity Manual (HCS) using the SYNCHRO software. The results of the capacity analyses are summarized in Table 6. As indicated in Table 6, all study intersections are currently operating adequately and will continue to operate at a good level of service in the year 2022 with the proposed project in place.

TABLE 6
Intersection Level of Service and 95th Queue
1234 Washington

Intersection	2019 Existing	Future Traffic Conditions 2022 w/o Project	Future Traffic Conditions 2022 With Project
Washington Ave/13th St (Signal)	B (B)	B (B)	B (B)
- NB	79 ft (100 ft)	82 ft (103 ft)	82 ft (104 ft)
- SB	108 ft (135 ft)	112 ft (140 ft)	112 ft (140 ft)
Drexel Ave/ 13th St (TWSC)	B (B)	B (B)	B (B)
EB	B (B)	B (B)	B (B)
WB	10 ft (10 ft)	10 ft (10 ft)	10 ft (10 ft)
- EBL	12.5 ft (10 ft)	15 ft (10 ft)	15 ft (10 ft)
- WBL			
Drexel Ave and Driveway (Stop and outbound only)			
WB			A (A)

Weekday Peak (Saturday Peak)

The computer printouts of the intersection capacity analyses are contained in Appendix F.

Multiway Stop-Control Evaluation

The intersection of 13th Street and Drexel Avenue has low traffic volumes on both 13th Street and Drexel Avenue (northbound). The minimal volume thresholds of the MUTCD for an all-way stop control are not met (minimum threshold on 13th Street should be 300 vehicles during 8 hours and the maximum hourly volume projected for 13th Street is 191 vehicles in both directions). Similarly, the 200-vehicle per hour threshold required on Drexel Avenue is not met (maximum hourly volume projected is 48). Hence, it is recommended that the current intersection control should remain at the intersection of 13th Street and Drexel Avenue.

Valet Operation

The 1234-60 Washington project will provide valet service to hotel/resident and retail patrons. All vehicles will use the drop-off area depicted on the site plan as the valet station. Five vehicles can be accommodated on the valet station.

In order to determine the stacking requirements associated with the valet operation, a queuing analysis was undertaken. As indicated in Table 1, the maximum number of inbound vehicles associated with this project, during a one-hour period, is approximately 61 vehicles or one vehicle every 59 seconds.

A queuing analysis was conducted in order to ensure that the stacking at the valet station is sufficient to accommodate the maximum inbound vehicular demand anticipated at this facility. The length of queue anticipated at the valet station was determined using information contained in ITE's *Transportation and Land Development*, Chapter 8 – Drive-In Facilities[1]. For this analysis, the following input variables were used:

[1] By Vergil G. Stover and Frank J. Koepke.

- Service Rate: It was conservatively assumed that the average time to park/unpark a vehicle by a valet runner is approximately eight[1] minutes, or 7.5 vehicles per hour per valet runner. Assuming up to 10 valet runners, the maximum service rate of the facility is 75 vehicles in a one-hour period.

- Demand Rate: As indicated above, a maximum of 61 vehicles will arrive during the highest hour. Since 16 parking spaces are to be provided on site, up to 45 inbound vehicles will require valet service (assuming 100% valet usage).

Using equation 8-9b and Table 8-11 of ITE's *Transportation and Land Development*, the maximum length of queue anticipated on Park Avenue, at the 95% confidence level, is one (1) vehicle. Therefore, the 5-vehicle capacity of the valet station/drop-off area is sufficient to accommodate the peak valet operation. The results of the ITE queuing procedure is contained in Appendix G.

Maintenance of Traffic Plan (MOT) for Sidewalk Closure

A Maintenance of Traffic Plan (MOT) was developed for this project during the required sidewalk closures during the construction of the project. The MOT Plan is depicted in Figure 7.

AutoTURN

An AutoTURN analysis was undertaken for the on-site loading zone and the on-site valet parking spaces. As indicated in the AutoTURN evaluation located on Page 21, a single-unit truck can access the on-site loading zone. The valet parking spaces will require vehicles entering from 13th Street and backing into the parking stalls (refer to Page 22).

[1] A valet parking lot/garage has not been reserved for the project. For this reason, a conservative 8-minute parking time was assumed for the valet analysis.

To Be Set up in Accordance with MUTCD & FDOT Index 660

LEGEND

- Project Boundary
- Closed Sidewalk

NOTE: This is a conceptual MOT Plan for the closure of the existing Sidewalks during the construction phase of the project.

Traf Tech
ENGINEERING, INC.

Maintenance of Traffic Plan
(for Closed Sidewalks)

FIGURE 7
1234-60 Washington
Miami Beach, Florida

28'-6"

DREXEL AVENUE

13TH STREET

WASHINGTON AVENUE

ELEC. SWITCH RM.

ELEC. VAULT

BATHROOMS

BATHROOMS

1:40 SLOPE

HIDDEN PLAZA

FIRE / SCH

MAIL

FRONT PORCH

SHADY PLAZA

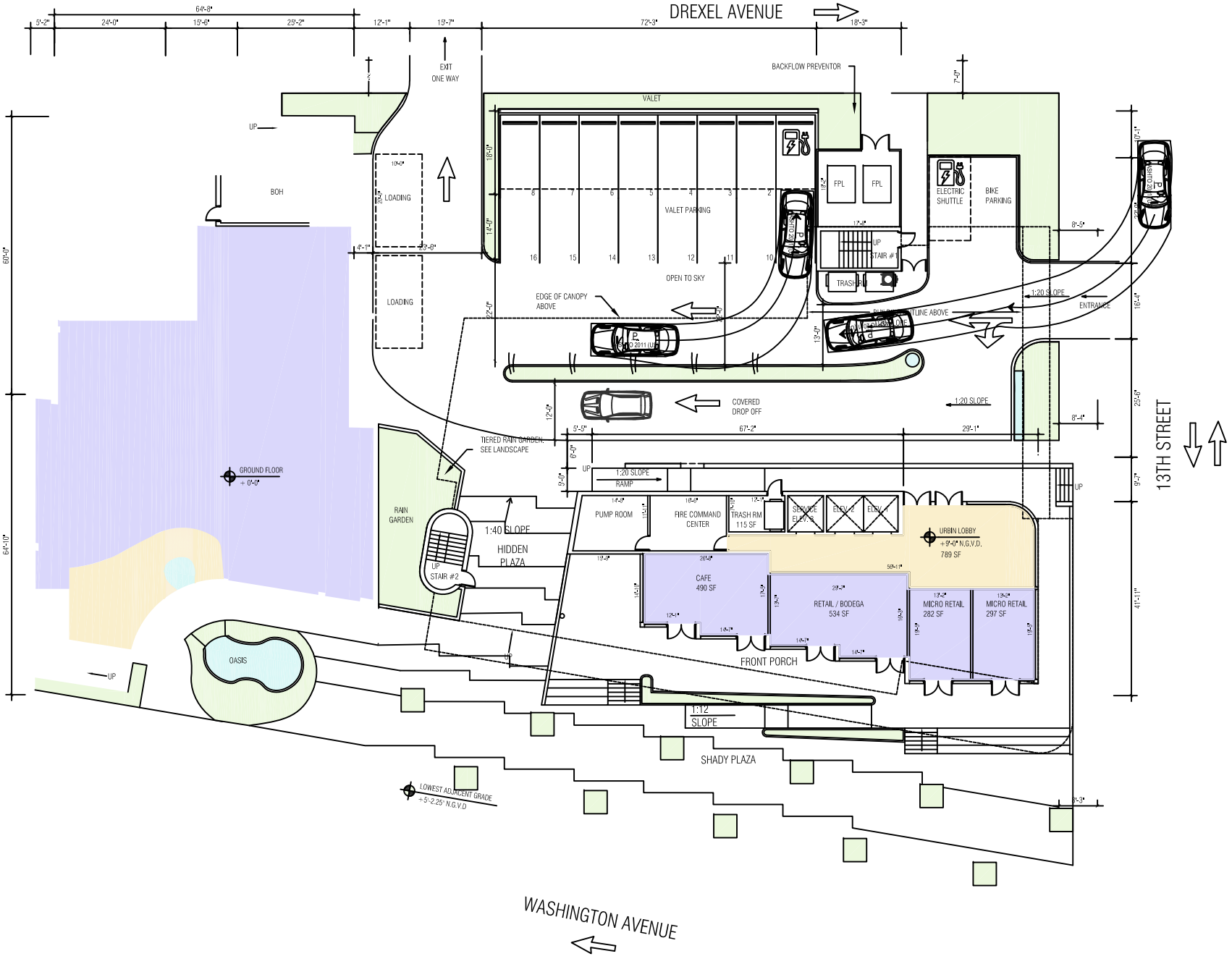
360.0

48.0

240.0

SU-30

	inches
Width	: 96.0
Track	: 96.0
Lock to Lock Time	: 6.0
Steering Angle	: 31.8


DREXEL AVENUE
EXIT
ONE WAY
BACKFLOW PREVENTOR
VALET
VALET PARKING
OPEN TO SKY
FPL
FPL
ELECTRIC SHUTTLE
BIKE PARKING
UP
STAIR #1
TRASH RM
BOH
LOADING
LOADING
EDGE OF CANOPY ABOVE
OUTLINE ABOVE
1:20 SLOPE
ENTRANCE
COVERED DROP OFF
1:20 SLOPE
TIERED RAIN GARDEN. SEE LANDSCAPE
GROUND FLOOR + 0'-0"
1:20 SLOPE RAMP
RAIN GARDEN
1:40 SLOPE
HIDDEN PLAZA
UP
STAIR #2
PUMP ROOM
FIRE COMMAND CENTER
TRASH RM 115 SF
SERVICE ELEV. 3
ELEV. 2
ELEV. 1
URBIN LOBBY +9'-0" N.G.V.D. 789 SF
CAFE 490 SF
RETAIL / BODEGA 534 SF
MICRO RETAIL 282 SF
MICRO RETAIL 297 SF
FRONT PORCH
OASIS
1:12 SLOPE
SHADY PLAZA
LOWEST ADJACENT GRADE +5'-2.25" N.G.V.D
13TH STREET
WASHINGTON AVENUE

CONCLUSIONS AND RECOMMENDATIONS

1234-60 Washington is a proposed redevelopment project planned to be located on the west side of Washington Avenue just south of 13th Street in the City of Miami Beach in Miami-Dade County, Florida. The project site is currently developed with retail and office uses. The retail space consists of 10,927 square feet and the office building consists of 21,732 square feet. There is a small parking lot located at the site with two driveways (one on 13th Street and one on Drexel Avenue).

The proposed re-development project consists of the following land uses and intensities:

- 56 hotel rooms
- 5,949 square feet of retail space
- 21,732 square feet of office space (office will remain)
- 49 residential units (mid-rise)

On-site parking is provided with 16 parking spaces. Additional nearby public parking will be available with valet service provided on site. The future redevelopment site will include one access driveway on 13th Street and one on Drexel Avenue.

The conclusions and recommendations of the traffic study are presented below:

- During the weekday peak period, the proposed redevelopment project results in less trips than the current uses on the site. During the Saturday peak period, the proposed mixed-use project is projected to have a de-minimus traffic impact to the surrounding street system (eight inbound trips and five outbound trips)

- All study intersections are currently operating adequately and will continue to operate at a good level of service in the year 2022 with the proposed project in place.

- The exit-only access driveway proposed on Drexel Avenue is projected to operate at an acceptable level of service.

- The on-site valet station should provide parking for at least three (3) vehicles.

- Up to 10 valet runners should be assigned to this facility during the anticipated peak periods.

- The current intersection control should remain at the intersection of 13th Street and Drexel Avenue.

Transportation Demand Management (TDM)

Travel Demand Management plans (TDM) establish policies and mechanisms to reduce automobile trips to and from designated facilities. TDM plans usually use several approaches to address all modes of transportation likely to be used to provide access to a facility such as single occupant driving, carpooling, transit, bicycling and walking. The goal of TDM plans is to increase the use of alternatives modes to single occupant driving, i.e., to reduce the number of automobile trips to and from the facility and consequently, minimizing automobile traffic impacts on the street system.

Successful TDM plans not only address all modes of transportation, but also use policies such as inducements for alternative modes (subsidies), physical enhancements (bike lockers, preferential parking for carpools) and disincentives for automobile use (no free parking for employees).

Potential measures for each mode are addressed below. Use of an employee transportation subsidy is also presented.

Pedestrian Access

Walking not only reduces automobile trips and their contribution to congestion and emissions, it also provides health benefits to the employees who use this mode of transportation. It is, however, the mode that is least likely to be used for a number of reasons. It is unlikely that employees of the restaurant/bar use will reside within a reasonable walking distance (within ¼ - ½ mile) of the subject facility. However, the area near the subject project is a high pedestrian traffic area and therefore, many future customers of the proposed mixed-use development are expected to be walking trips. Sidewalks exist on all roadways surrounding the project site (both sides of Washington Avenue, both sides of 13th Street and both sides of Drexel Avenue).

Bicycling

The site of the 1234-60 Washington mixed-use development offers two potential approaches to encourage cycling, the use of the Citi Bike program and use of retail/hotel employee-owned bicycles.

Use of Citi Bike could be supported by providing monthly passes to employees. Monthly passes are $15.00 for unlimited 30-minute rides and $25.00 for unlimited 60-minute rides. Within the immediate area of the project, there are two convenient Citi Bike rental station (Station 147 located on 13th Street between Drexel Avenue and Washington Avenue and Station 149 located near the intersection of Collins Avenue and 14th Street) and employees will be informed of the Citi Bike Stations.

(Goal: Offer 2 free City Bike passes to employees of the future retail/hotel users. Integrate bikeshare information into communication materials for commuters and future residents).

Mass Transit

There are two transit options for the 1234-Washington project. These transit routes include Route 150 and Route C. The nearest bus stop for these services is located on Washington Avenue just north of 13th Street. These transit routes provide frequent service and access to Miami-Dade County as well as connections to other destinations outside of the County. Employers of the future retail establishments can provide a significant inducement to employees to use public transportation (Miami-Dade Transit, MDT) through a transit subsidy. Transit subsidies can also provide tax benefits to both employees and employers.

MDT offers three methods to provide transit subsidies:

The employee uses pre-tax dollars from their salary to purchase monthly transit passes. There is no income tax on the portion of their salary used for transit passes. The pre-tax funds also reduce the employees' taxable salary, reducing the total amount of income tax paid by the employees. The employer pays the total cost of a monthly transit pass using a tax-deductible (to the employer) subsidy. The employer receives a tax deduction equivalent to the value of the transit subsidies provided to the employees. The transit subsidy is a fringe benefit to employees and is not taxable income.

Both the employer and employees share the cost of transit passes, paying for them with pre-tax dollars. The employer reduces his/her payroll taxes. Employees do not pay income tax on the money used for transit passes.

MDT monthly passes if purchased by an individual are $112.50. Corporate discounts are available based on the number of participating employees. For 4 – 99 employees, monthly passes are $101.25 per employee, for 100 or more employees, the cost is $95.65 per employee.

Goal: Offer free transit passes to employees, through coordination with South Florida Commuter Services. Request employee origin/destination information from commercial employers & Identify opportunities).

Carpooling

Carpooling is historically the least effective alternative transportation mode, even when implemented on a regional basis. Given that no on-site parking is provided for this facility, it is unlikely that carpooling will provide a significant amount of trip reduction. However, preferential parking could be made available to employees that carpool.

Goal: 2 free valet passes to carpool riders.

APPENDIX A

Traffic Methodology

TRAFTECH ENGINEERING, INC.

TO: 1224-60 Washington Avenue DATE: August 29, 2019

FROM: Joaquin Vargas

SUBJECT: Traffic Methodology for the 1234-60 Avenue Project

1234-60 Washington is a proposed mixed-use development planned to be located on the west side of Washington Avenue just south of 13th Street in the City of Miami Beach, Florida. A traffic methodology meeting was held on Wednesday, August 28, 2019 at the City of Miami Beach Offices. The following is a summary of the agreed-upon traffic analysis methodology in connection with the 1234-60 Washington Avenue project:

- The traffic study will evaluate the following two intersections:

  1) 13th Street and Washington Avenue (LOS and queueing standpoints)
  2) 13th Street and Drexel Avenue (LOS and queuing). This intersection will be analyzed as a 2-way stop control and as an all-way stop control

- The two proposed access driveways will also be evaluated

- Parking and secondary parking locations will be documented and analyzed.

- Valet storage will be identified and included in the study as well as the valet analysis (queues, number of valet runners, routes, etc.)

- Loading maneuverability for the internal loading spaces and freight loading for large trucks will be provided.

- Bicycle parking for the hotel and residential units will be included in the study with sufficient details

- Additional bicycle parking spaces will be proposed, if feasible for the office use

- Any dedicated office parking to be provided on site will be documented and the traffic impacts of these spaces will be documented, especially for the AM peak hour of typical weekdays.

- Updated trip generation tables will be provided reflecting the highest peak demand periods.

- Site plan will show the proposed dimensions of the sidewalks surrounding the project site.

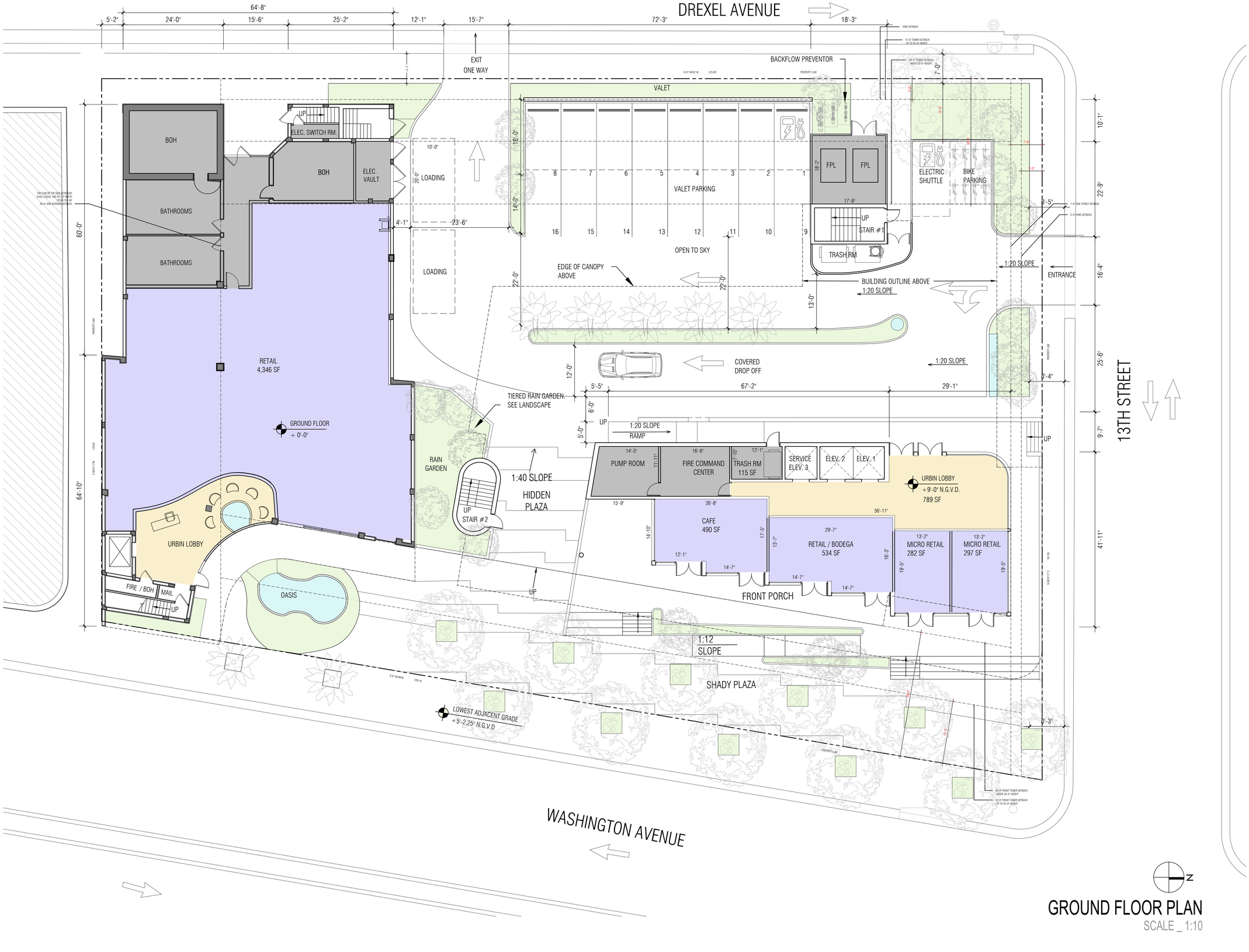
- Any impacts to existing parking spaces for access purposes will be documented.

- A conceptual MOT plan to maintain pedestrian mobility will be provided in the traffic study.

- A TDM plan will be developed for the project.

APPENDIX B

Site Plan – 1234 Washington


DREXEL AVENUE
64'-8"
5'-2"
24'-0"
15'-6"
25'-2"
12'-1"
15'-7"
72'-3"
18'-3"
EXIT
ONE WAY
BACKFLOW PREVENTOR
VALET
UP
ELEC. SWITCH RM.
BOH
BOH
ELEC. VAULT
BATHROOMS
BATHROOMS
10'-0"
LOADING
20'-0"
18'-0"
14'-0"
LOADING
4'-1"
23'-6"
VALET PARKING
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
OPEN TO SKY
FPL
FPL
18'-2"
17'-8"
UP
STAIR #1
TRASH RM
ELECTRIC SHUTTLE
BIKE PARKING
EDGE OF CANOPY ABOVE
22'-0"
22'-0"
13'-0"
BUILDING OUTLINE ABOVE
1:20 SLOPE
1:20 SLOPE
ENTRANCE
3'-5"
7'-0" SIDE STREET SETBACK
5'-0" YARD SETBACK
10'-1"
22'-9"
16'-4"
25'-6"
9'-7"
41'-11"
3'-4"
RETAIL
4,346 SF
GROUND FLOOR
+ 0'-0"
TIERED RAIN GARDEN.
SEE LANDSCAPE
COVERED
DROP OFF
1:20 SLOPE
12'-0"
5'-5"
67'-2"
29'-1"
6'-0"
UP
1:20 SLOPE
RAMP
5'-0"
UP
RAIN
GARDEN
1:40 SLOPE
HIDDEN
PLAZA
UP
STAIR #2
14'-5"
PUMP ROOM
11'-11"
16'-6"
FIRE COMMAND CENTER
12'-1"
TRASH RM
115 SF
SERVICE ELEV. 3
ELEV. 2
ELEV. 1
URBIN LOBBY
+9'-0" N.G.V.D.
789 SF
15'-9"
26'-8"
56'-11"
CAFE
490 SF
14'-10"
17'-5"
29'-7"
RETAIL / BODEGA
534 SF
13'-7"
16'-3"
13'-2"
MICRO RETAIL
282 SF
19'-5"
13'-2"
MICRO RETAIL
297 SF
19'-5"
12'-1"
14'-7"
14'-7"
14'-7"
FRONT PORCH
URBIN LOBBY
FIRE / BOH
MAIL
UP
OASIS
1:12
SLOPE
SHADY PLAZA
UP
64'-10"
LOWEST ADJACENT GRADE
+5'-2.25" N.G.V.D
3'-3"
WASHINGTON AVENUE
13TH STREET
N
GROUND FLOOR PLAN
SCALE _ 1:10

APPENDIX C

Signal Timing Plan and Traffic Counts

Traf Tech Engineering Inc.

File Name : 1A-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/6/2019
Page No : 1

Groups Printed- Peds & Bikes

	Drexel Ave From North				13th Street From East				Drexel Ave From South				13th Street From West				
Start Time	Bikes			Peds	Bikes			Peds	Bikes			Peds	Bikes			Peds	Int. Total
16:00	2	0	0	4	0	0	0	5	1	0	0	12	5	0	0	4	33
16:15	8	1	0	15	0	0	0	9	1	0	0	17	0	0	0	7	58
16:30	12	0	0	17	1	0	0	7	11	0	0	12	0	0	0	6	66
16:45	7	0	0	18	0	0	0	9	5	0	0	22	1	0	0	4	66
Total	29	1	0	54	1	0	0	30	18	0	0	63	6	0	0	21	223
17:00	6	0	0	13	0	0	0	18	5	0	0	15	0	0	0	1	58
17:15	2	0	0	9	0	0	0	10	3	0	0	30	0	0	0	2	56
17:30	4	0	0	11	2	0	0	8	3	0	0	8	0	0	0	0	36
17:45	12	0	0	9	1	0	0	4	11	0	0	13	1	0	0	6	57
Total	24	0	0	42	3	0	0	40	22	0	0	66	1	0	0	9	207
18:00	9	0	0	18	0	0	0	9	2	0	0	10	1	0	0	5	54
18:15	4	0	0	10	0	0	0	1	8	0	0	18	0	0	0	5	46
18:30	9	0	0	14	0	0	0	4	6	0	0	14	0	0	0	5	52
18:45	5	0	0	9	1	0	0	5	6	0	0	5	4	0	0	5	40
Total	27	0	0	51	1	0	0	19	22	0	0	47	5	0	0	20	192
Grand Total	80	1	0	147	5	0	0	89	62	0	0	176	12	0	0	50	622
Apprch %	35.1	0.4	0	64.5	5.3	0	0	94.7	26.1	0	0	73.9	19.4	0	0	80.6	
Total %	12.9	0.2	0	23.6	0.8	0	0	14.3	10	0	0	28.3	1.9	0	0	8	

Traf Tech Engineering Inc.

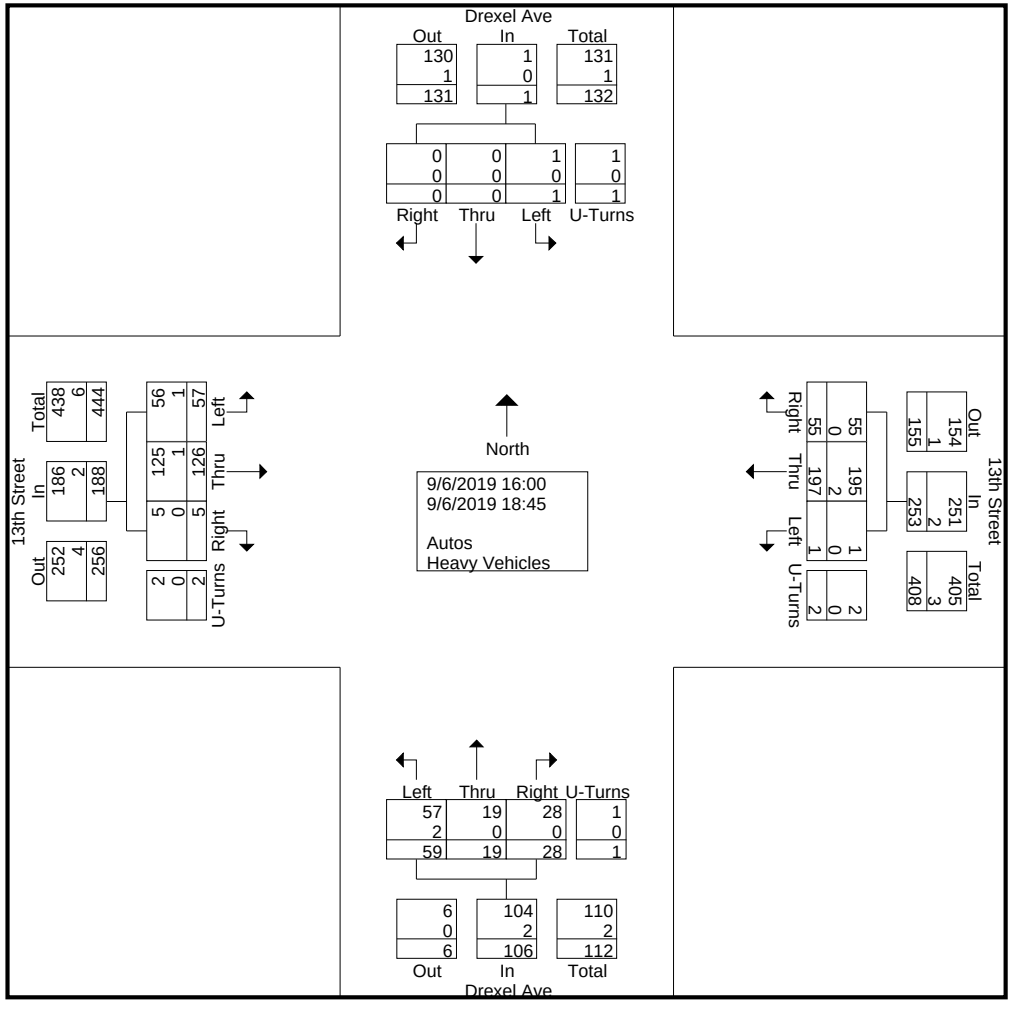
File Name : 1A-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/6/2019
Page No : 1

Groups Printed- Autos - Heavy Vehicles

	Drexel Ave From North					13th Street From East					Drexel Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
16:00	0	0	0	0	0	15	14	0	0	29	2	2	10	0	14	0	14	5	0	19	62
16:15	0	0	0	0	0	5	21	0	0	26	1	4	3	0	8	1	11	7	1	20	54
16:30	0	0	1	0	1	5	22	0	0	27	5	1	7	0	13	2	10	7	0	19	60
16:45	0	0	0	0	0	4	21	0	0	25	5	2	4	0	11	0	13	7	1	21	57
Total	0	0	1	0	1	29	78	0	0	107	13	9	24	0	46	3	48	26	2	79	233
17:00	0	0	0	0	0	2	20	0	0	22	4	3	6	0	13	0	13	7	0	20	55
17:15	0	0	0	0	0	1	15	0	0	16	1	1	5	1	8	0	8	4	0	12	36
17:30	0	0	0	0	0	4	17	1	0	22	3	2	3	0	8	0	9	4	0	13	43
17:45	0	0	0	0	0	10	14	0	1	25	3	0	2	0	5	0	15	4	0	19	49
Total	0	0	0	0	0	17	66	1	1	85	11	6	16	1	34	0	45	19	0	64	183
18:00	0	0	0	1	1	3	15	0	0	18	0	0	3	0	3	1	14	2	0	17	39
18:15	0	0	0	0	0	3	13	0	0	16	1	3	7	0	11	0	5	0	0	5	32
18:30	0	0	0	0	0	2	10	0	0	12	2	0	5	0	7	1	6	8	0	15	34
18:45	0	0	0	0	0	1	15	0	1	17	1	1	4	0	6	0	8	2	0	10	33
Total	0	0	0	1	1	9	53	0	1	63	4	4	19	0	27	2	33	12	0	47	138
Grand Total	0	0	1	1	2	55	197	1	2	255	28	19	59	1	107	5	126	57	2	190	554
Apprch %	0	0	50	50		21.6	77.3	0.4	0.8		26.2	17.8	55.1	0.9		2.6	66.3	30	1.1		
Total %	0	0	0.2	0.2	0.4	9.9	35.6	0.2	0.4	46	5.1	3.4	10.6	0.2	19.3	0.9	22.7	10.3	0.4	34.3	
Autos	0	0	1	1	2	55	195	1	2	253	28	19	57	1	105	5	125	56	2	188	548
% Autos	0	0	100	100	100	100	99	100	100	99.2	100	100	96.6	100	98.1	100	99.2	98.2	100	98.9	98.9
Heavy Vehicles																					
% Heavy Vehicles	0	0	0	0	0	0	1	0	0	0.8	0	0	3.4	0	1.9	0	0.8	1.8	0	1.1	1.1

Traf Tech Engineering Inc.

File Name : 1A-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/6/2019
Page No : 2



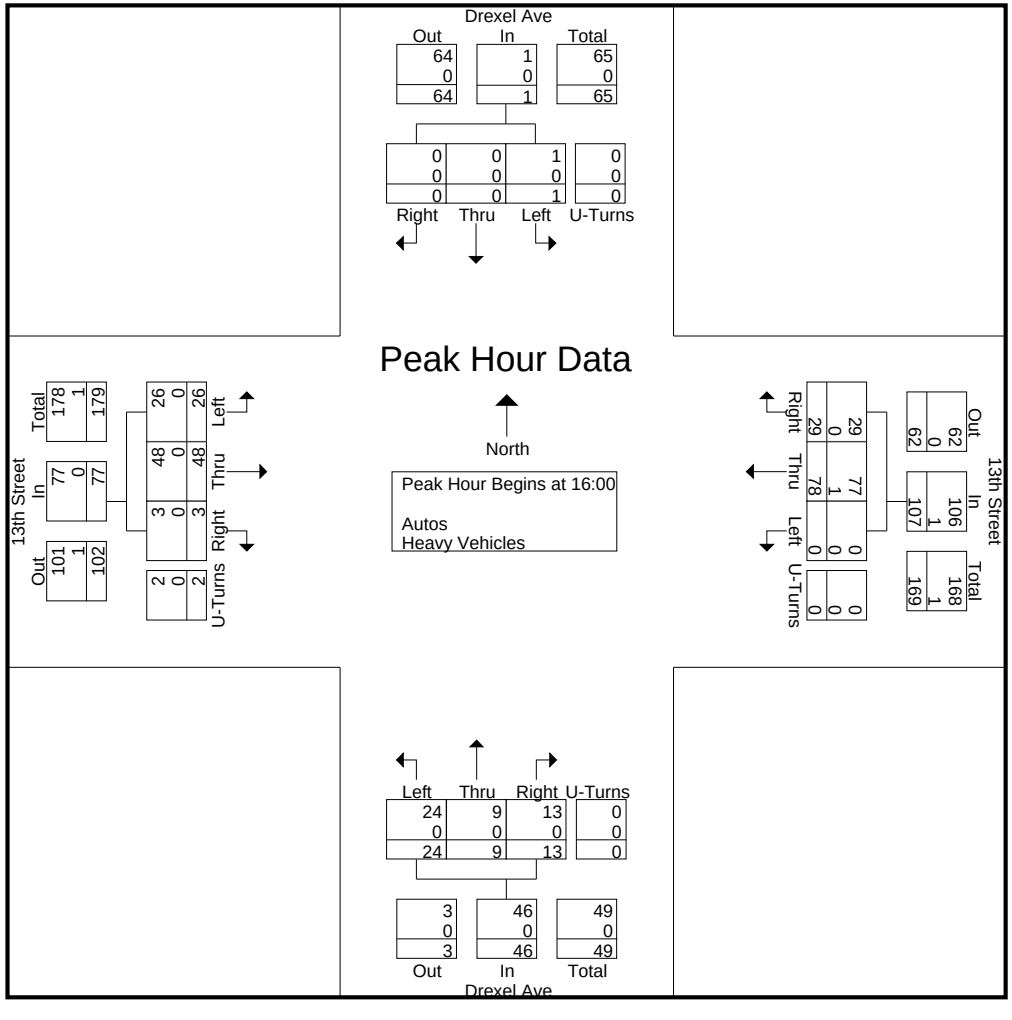
Traf Tech Engineering Inc.

File Name : 1A-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/6/2019
Page No : 3

	Drexel Ave From North					13th Street From East					Drexel Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 18:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:00																					
16:00	0	0	0	0	0	15	14	0	0	29	2	2	10	0	14	0	14	5	0	19	62
16:15	0	0	0	0	0	5	21	0	0	26	1	4	3	0	8	1	11	7	1	20	54
16:30	0	0	1	0	1	5	22	0	0	27	5	1	7	0	13	2	10	7	0	19	60
16:45	0	0	0	0	0	4	21	0	0	25	5	2	4	0	11	0	13	7	1	21	57
Total Volume	0	0	1	0	1	29	78	0	0	107	13	9	24	0	46	3	48	26	2	79	233
% App. Total	0	0	100	0		27.1	72.9	0	0		28.3	19.6	52.2	0		3.8	60.8	32.9	2.5		
PHF	.000	.000	.250	.000	.250	.483	.886	.000	.000	.922	.650	.563	.600	.000	.821	.375	.857	.929	.500	.940	.940
Autos	0	0	1	0	1	29	77	0	0	106	13	9	24	0	46	3	48	26	2	79	232
% Autos	0	0	100	0	100	100	98.7	0	0	99.1	100	100	100	0	100	100	100	100	100	100	99.6
Heavy Vehicles																					
% Heavy Vehicles	0	0	0	0	0	0	1.3	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.4

Traf Tech Engineering Inc.

File Name : 1A-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/6/2019
Page No : 4



Traf Tech Engineering Inc.

File Name : 1B-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/7/2019
Page No : 1

Groups Printed- Peds & Bikes

	Drexel Ave From North				13th Street From East				Drexel Ave From South				13th Street From West				
Start Time	Bikes			Peds	Bikes			Peds	Bikes			Peds	Bikes			Peds	Int. Total
14:00	6	0	0	20	0	0	0	1	11	0	0	23	0	0	0	3	64
14:15	7	0	0	14	0	0	0	4	14	0	0	11	1	0	0	5	56
14:30	4	0	0	13	2	0	0	2	10	0	0	14	1	0	0	3	49
14:45	5	0	0	11	1	0	0	6	8	0	0	21	0	0	0	2	54
Total	22	0	0	58	3	0	0	13	43	0	0	69	2	0	0	13	223
15:00	4	0	0	11	0	0	0	3	2	0	0	18	0	0	0	6	44
15:15	6	0	0	9	0	0	0	10	4	0	0	17	0	0	0	9	55
15:30	7	0	0	5	0	0	0	4	1	0	0	10	2	0	0	5	34
15:45	5	0	0	13	1	0	0	3	5	0	0	9	0	0	0	2	38
Total	22	0	0	38	1	0	0	20	12	0	0	54	2	0	0	22	171
Grand Total	44	0	0	96	4	0	0	33	55	0	0	123	4	0	0	35	394
Apprch %	31.4	0	0	68.6	10.8	0	0	89.2	30.9	0	0	69.1	10.3	0	0	89.7	
Total %	11.2	0	0	24.4	1	0	0	8.4	14	0	0	31.2	1	0	0	8.9	

Traf Tech Engineering Inc.

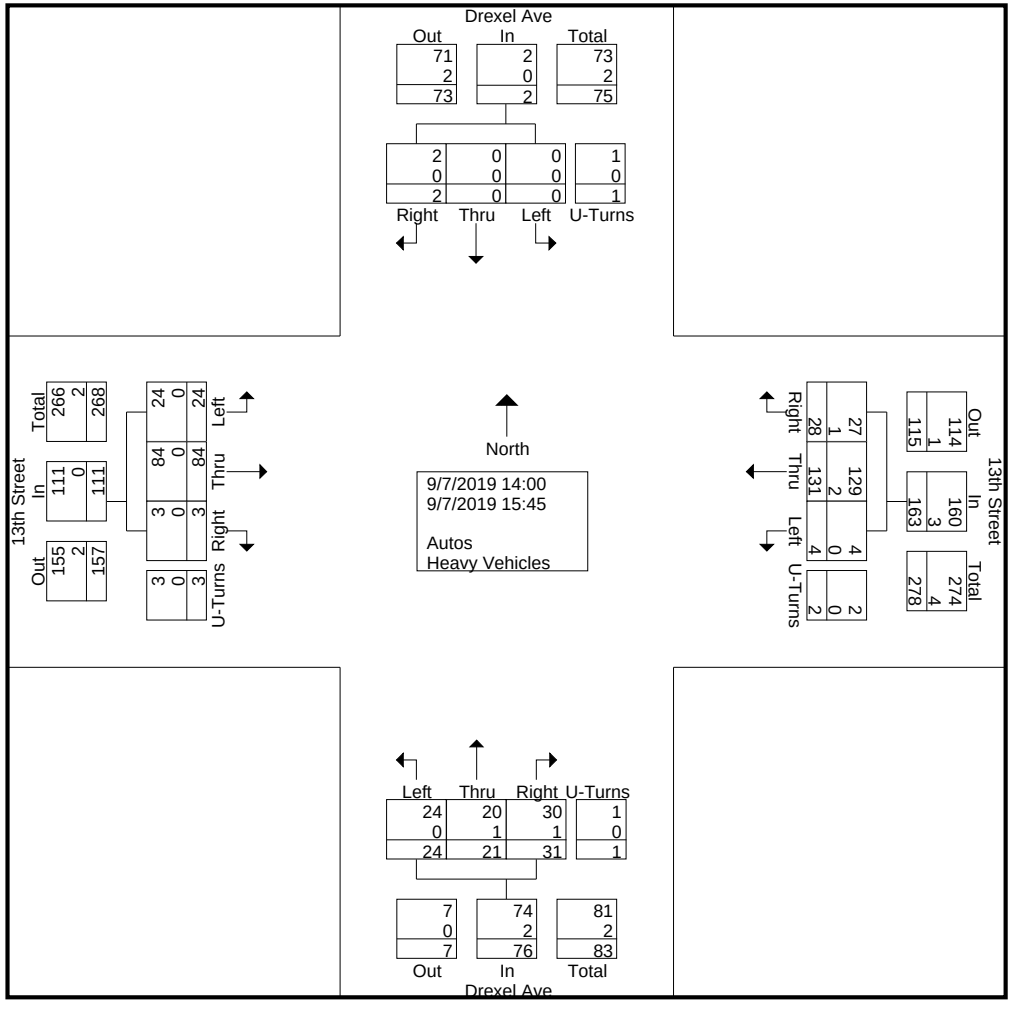
File Name : 1B-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/7/2019
Page No : 1

Groups Printed- Autos - Heavy Vehicles

	Drexel Ave From North					13th Street From East					Drexel Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
14:00	0	0	0	0	0	0	17	0	1	18	2	4	0	0	6	0	5	2	1	8	32
14:15	0	0	0	0	0	5	19	0	0	24	3	1	3	0	7	0	6	4	1	11	42
14:30	1	0	0	0	1	4	15	0	1	20	2	6	2	0	10	0	8	4	0	12	43
14:45	0	0	0	0	0	4	14	0	0	18	6	1	4	0	11	0	15	5	0	20	49
Total	1	0	0	0	1	13	65	0	2	80	13	12	9	0	34	0	34	15	2	51	166
15:00	1	0	0	0	1	2	16	0	0	18	2	1	3	0	6	0	7	4	0	11	36
15:15	0	0	0	1	1	3	20	4	0	27	5	2	4	1	12	1	16	0	1	18	58
15:30	0	0	0	0	0	4	12	0	0	16	6	4	3	0	13	0	18	4	0	22	51
15:45	0	0	0	0	0	6	18	0	0	24	5	2	5	0	12	2	9	1	0	12	48
Total	1	0	0	1	2	15	66	4	0	85	18	9	15	1	43	3	50	9	1	63	193
Grand Total	2	0	0	1	3	28	131	4	2	165	31	21	24	1	77	3	84	24	3	114	359
Apprch %	66.7	0	0	33.3		17	79.4	2.4	1.2		40.3	27.3	31.2	1.3		2.6	73.7	21.1	2.6		
Total %	0.6	0	0	0.3	0.8	7.8	36.5	1.1	0.6	46	8.6	5.8	6.7	0.3	21.4	0.8	23.4	6.7	0.8	31.8	
Autos	2	0	0	1	3	27	129	4	2	162	30	20	24	1	75	3	84	24	3	114	354
% Autos	100	0	0	100	100	96.4	98.5	100	100	98.2	96.8	95.2	100	100	97.4	100	100	100	100	100	98.6
Heavy Vehicles																					
% Heavy Vehicles	0	0	0	0	0	3.6	1.5	0	0	1.8	3.2	4.8	0	0	2.6	0	0	0	0	0	1.4

Traf Tech Engineering Inc.

File Name : 1B-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/7/2019
Page No : 2



Traf Tech Engineering Inc.

File Name : 1B-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/7/2019
Page No : 3

	Drexel Ave From North					13th Street From East					Drexel Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 14:00 to 15:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 14:45																					
14:45	0	0	0	0	0	4	14	0	0	18	6	1	4	0	11	0	15	5	0	20	49
15:00	1	0	0	0	1	2	16	0	0	18	2	1	3	0	6	0	7	4	0	11	36
15:15	0	0	0	1	1	3	20	4	0	27	5	2	4	1	12	1	16	0	1	18	58
15:30	0	0	0	0	0	4	12	0	0	16	6	4	3	0	13	0	18	4	0	22	51
Total Volume	1	0	0	1	2	13	62	4	0	79	19	8	14	1	42	1	56	13	1	71	194
% App. Total	50	0	0	50		16.5	78.5	5.1	0		45.2	19	33.3	2.4		1.4	78.9	18.3	1.4		
PHF	.250	.000	.000	.250	.500	.813	.775	.250	.000	.731	.792	.500	.875	.250	.808	.250	.778	.650	.250	.807	.836
Autos	1	0	0	1	2	12	60	4	0	76	18	7	14	1	40	1	56	13	1	71	189
% Autos	100	0	0	100	100	92.3	96.8	100	0	96.2	94.7	87.5	100	100	95.2	100	100	100	100	100	97.4
Heavy Vehicles																					
% Heavy Vehicles	0	0	0	0	0	7.7	3.2	0	0	3.8	5.3	12.5	0	0	4.8	0	0	0	0	0	2.6

Traf Tech Engineering Inc.

File Name : 1B-Drexel Ave & 13th Street
Site Code : 00000000
Start Date : 9/7/2019
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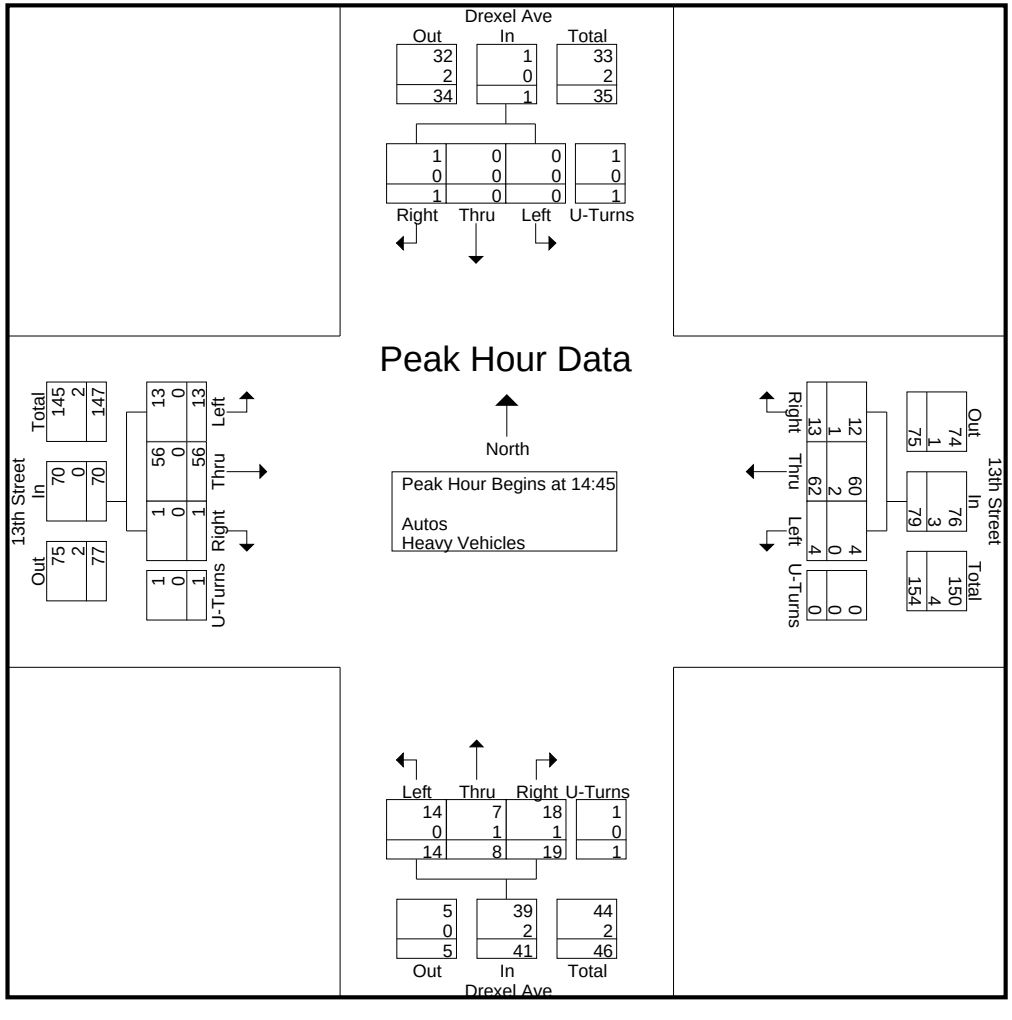

Traf Tech Engineering Inc.

File Name : 2A- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/6/2019

Groups Printed- Peds & Bikes

	Washington Ave From North				13th Street From East				Washington Ave From South				13th Street From West				
Start Time	Bikes			Peds	Bikes			Peds	Bikes			Peds	Bikes			Peds	Int. Total
16:00	4	0	0	21	14	0	0	37	2	0	0	28	5	0	0	31	142
16:15	5	0	0	19	7	0	0	52	3	0	0	23	3	0	0	34	146
16:30	7	0	0	21	6	0	0	39	5	0	0	25	5	0	0	43	151
16:45	6	0	0	34	6	0	0	50	4	0	0	27	3	0	0	37	167
Total	22	0	0	95	33	0	0	178	14	0	0	103	16	0	0	145	606
17:00	2	0	0	22	3	0	0	40	5	0	0	40	4	0	0	60	176
17:15	3	0	0	17	3	0	0	29	3	0	0	24	1	0	0	45	125
17:30	2	0	0	11	10	0	0	50	3	0	0	20	5	0	0	28	129
17:45	4	0	0	20	5	0	0	33	9	0	0	24	7	0	0	50	152
Total	11	0	0	70	21	0	0	152	20	0	0	108	17	0	0	183	582
18:00	1	0	0	32	2	0	0	56	3	0	0	29	6	0	0	29	158
18:15	2	0	0	21	1	0	0	42	7	0	0	27	2	0	0	39	141
18:30	4	0	0	25	9	0	0	44	6	0	0	21	10	0	0	44	163
18:45	2	0	0	17	1	0	0	28	6	0	0	23	5	0	0	28	110
Total	9	0	0	95	13	0	0	170	22	0	0	100	23	0	0	140	572
Grand Total	42	0	0	260	67	0	0	500	56	0	0	311	56	0	0	468	1760
Apprch %	13.9	0	0	86.1	11.8	0	0	88.2	15.3	0	0	84.7	10.7	0	0	89.3	
Total %	2.4	0	0	14.8	3.8	0	0	28.4	3.2	0	0	17.7	3.2	0	0	26.6	

Traf Tech Engineering Inc.

File Name : 2A- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/6/2019
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Groups Printed- Autos - Heavy Vehicles

	Washington Ave From North					13th Street From East					Washington Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
16:00	19	141	4	1	165	8	5	13	0	26	3	130	4	2	139	3	8	2	2	15	345
16:15	12	115	5	3	135	14	5	13	1	33	4	116	5	1	126	4	4	1	0	9	303
16:30	10	148	9	2	169	4	8	10	0	22	4	115	7	2	128	6	3	3	0	12	331
16:45	10	163	7	4	184	8	8	8	0	24	3	101	12	6	122	12	3	4	1	20	350
Total	51	567	25	10	653	34	26	44	1	105	14	462	28	11	515	25	18	10	3	56	1329
17:00	8	138	7	3	156	11	6	5	1	23	2	121	6	16	145	6	8	2	0	16	340
17:15	10	126	8	2	146	9	4	14	0	27	8	109	4	13	134	0	6	4	0	10	317
17:30	12	143	6	2	163	6	9	4	1	20	6	112	2	1	121	1	5	6	1	13	317
17:45	11	116	3	1	131	8	7	11	0	26	10	110	6	8	134	5	6	5	2	18	309
Total	41	523	24	8	596	34	26	34	2	96	26	452	18	38	534	12	25	17	3	57	1283
18:00	8	129	3	5	145	6	6	8	0	20	5	92	2	0	99	5	7	1	0	13	277
18:15	6	122	7	3	138	3	6	12	0	21	8	103	4	7	122	4	3	2	0	9	290
18:30	2	109	9	6	126	3	3	4	0	10	5	107	3	4	119	4	0	2	0	6	261
18:45	7	102	5	3	117	3	4	9	0	16	9	104	3	8	124	3	3	3	0	9	266
Total	23	462	24	17	526	15	19	33	0	67	27	406	12	19	464	16	13	8	0	37	1094
Grand Total	115	1552	73	35	1775	83	71	111	3	268	67	1320	58	68	1513	53	56	35	6	150	3706
Apprch %	6.5	87.4	4.1	2		31	26.5	41.4	1.1		4.4	87.2	3.8	4.5		35.3	37.3	23.3	4		
Total %	3.1	41.9	2	0.9	47.9	2.2	1.9	3	0.1	7.2	1.8	35.6	1.6	1.8	40.8	1.4	1.5	0.9	0.2	4	
Autos	114	1491	71	34	1710	82	71	110	3	266	67	1266	57	68	1458	50	56	35	6	147	3581
% Autos	99.1	96.1	97.3	97.1	96.3	98.8	100	99.1	100	99.3	100	95.9	98.3	100	96.4	94.3	100	100	100	98	96.6
Heavy Vehicles																					
% Heavy Vehicles	0.9	3.9	2.7	2.9	3.7	1.2	0	0.9	0	0.7	0	4.1	1.7	0	3.6	5.7	0	0	0	2	3.4

Traf Tech Engineering Inc.

File Name : 2A- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/6/2019
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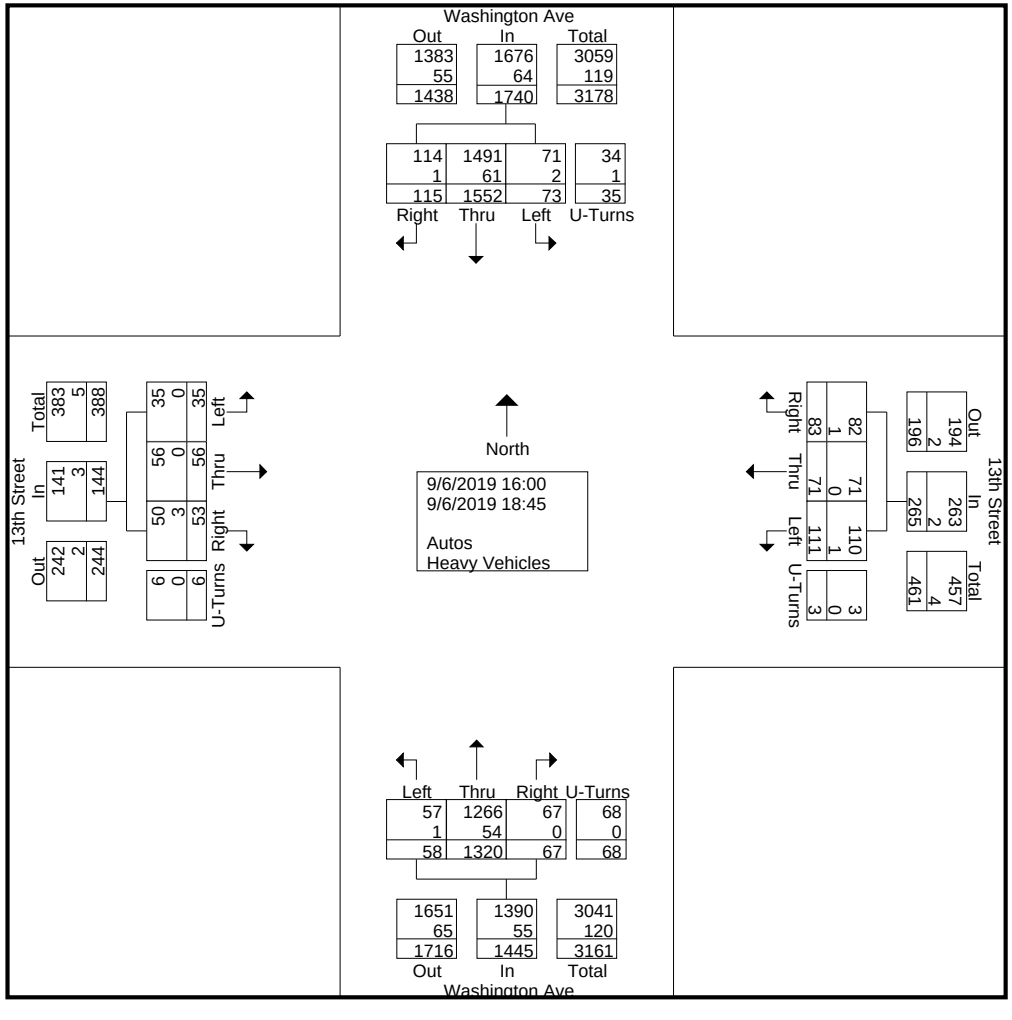

Traf Tech Engineering Inc.

File Name : 2A- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/6/2019

	Washington Ave From North					13th Street From East					Washington Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 18:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:30																					
16:30	10	148	9	2	169	4	8	10	0	22	4	115	7	2	128	6	3	3	0	12	331
16:45	10	163	7	4	184	8	8	8	0	24	3	101	12	6	122	12	3	4	1	20	350
17:00	8	138	7	3	156	11	6	5	1	23	2	121	6	16	145	6	8	2	0	16	340
17:15	10	126	8	2	146	9	4	14	0	27	8	109	4	13	134	0	6	4	0	10	317
Total Volume	38	575	31	11	655	32	26	37	1	96	17	446	29	37	529	24	20	13	1	58	1338
% App. Total	5.8	87.8	4.7	1.7		33.3	27.1	38.5	1		3.2	84.3	5.5	7		41.4	34.5	22.4	1.7		
PHF	.950	.882	.861	.688	.890	.727	.813	.661	.250	.889	.531	.921	.604	.578	.912	.500	.625	.813	.250	.725	.956
Autos	37	550	31	11	629	32	26	36	1	95	17	428	28	37	510	23	20	13	1	57	1291
% Autos	97.4	95.7	100	100	96.0	100	100	97.3	100	99.0	100	96.0	96.6	100	96.4	95.8	100	100	100	98.3	96.5
Heavy Vehicles																					
% Heavy Vehicles	2.6	4.3	0	0	4.0	0	0	2.7	0	1.0	0	4.0	3.4	0	3.6	4.2	0	0	0	1.7	3.5

Traf Tech Engineering Inc.

File Name : 2A- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/6/2019
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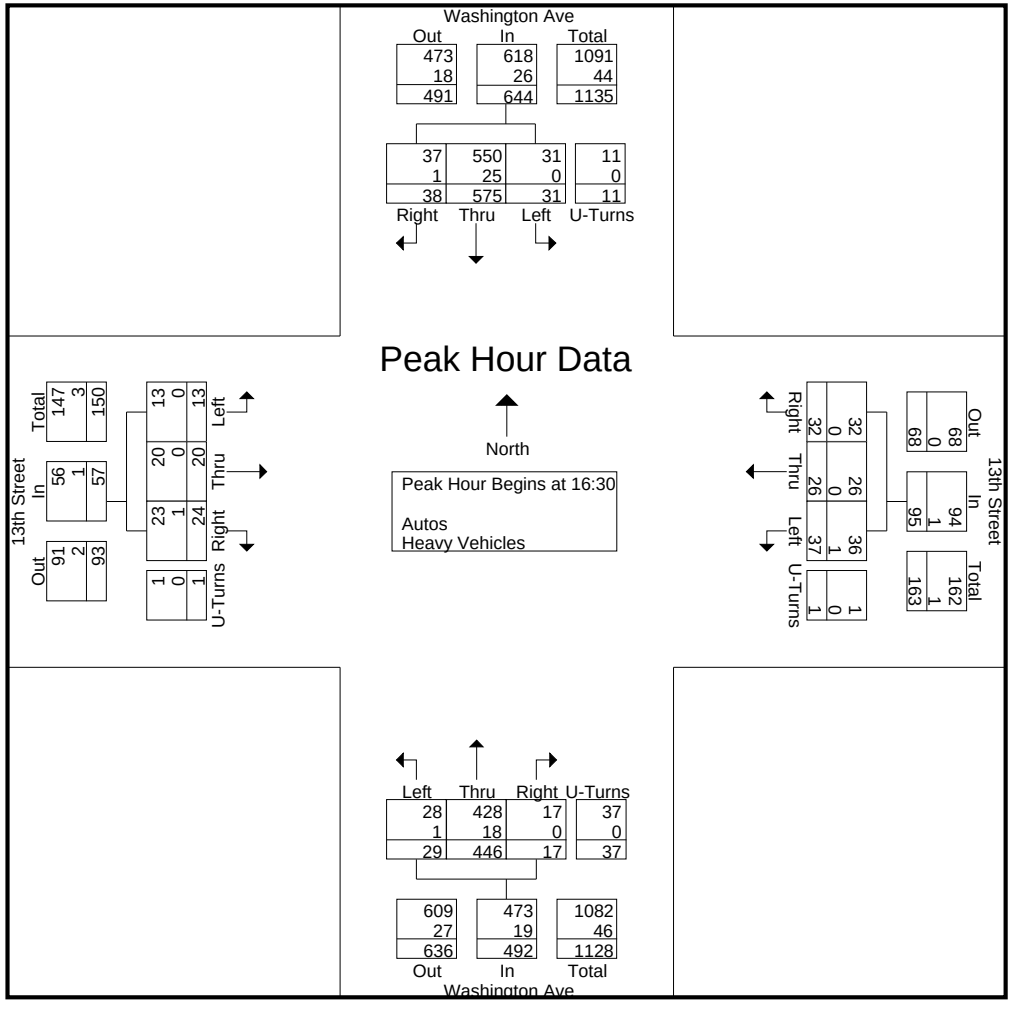


Traf Tech Engineering Inc.

File Name : 2B- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/7/2019
Page No : 1

Groups Printed- Peds & Bikes

	Washington Ave From North				13th Street From East				Washington Ave From South				13th Street From West				
Start Time	Bikes			Peds	Bikes			Peds	Bikes			Peds	Bikes			Peds	Int. Total
14:00	3	0	0	25	6	0	0	57	8	0	0	44	1	0	0	27	171
14:15	3	0	0	20	4	0	0	85	15	0	0	34	3	0	0	33	197
14:30	5	0	0	23	5	0	0	56	11	0	0	42	1	0	0	37	180
14:45	4	0	0	11	4	0	0	29	4	0	0	44	3	0	0	35	134
Total	15	0	0	79	19	0	0	227	38	0	0	164	8	0	0	132	682
15:00	4	0	0	26	8	0	0	91	1	0	0	28	2	0	0	37	197
15:15	3	0	0	9	2	0	0	59	3	0	0	47	2	0	0	36	161
15:30	4	0	0	21	9	0	0	46	3	0	0	53	1	0	0	45	182
15:45	1	0	0	17	3	0	0	49	4	0	0	39	1	0	0	41	155
Total	12	0	0	73	22	0	0	245	11	0	0	167	6	0	0	159	695
Grand Total	27	0	0	152	41	0	0	472	49	0	0	331	14	0	0	291	1377
Apprch %	15.1	0	0	84.9	8	0	0	92	12.9	0	0	87.1	4.6	0	0	95.4	
Total %	2	0	0	11	3	0	0	34.3	3.6	0	0	24	1	0	0	21.1	

Traf Tech Engineering Inc.

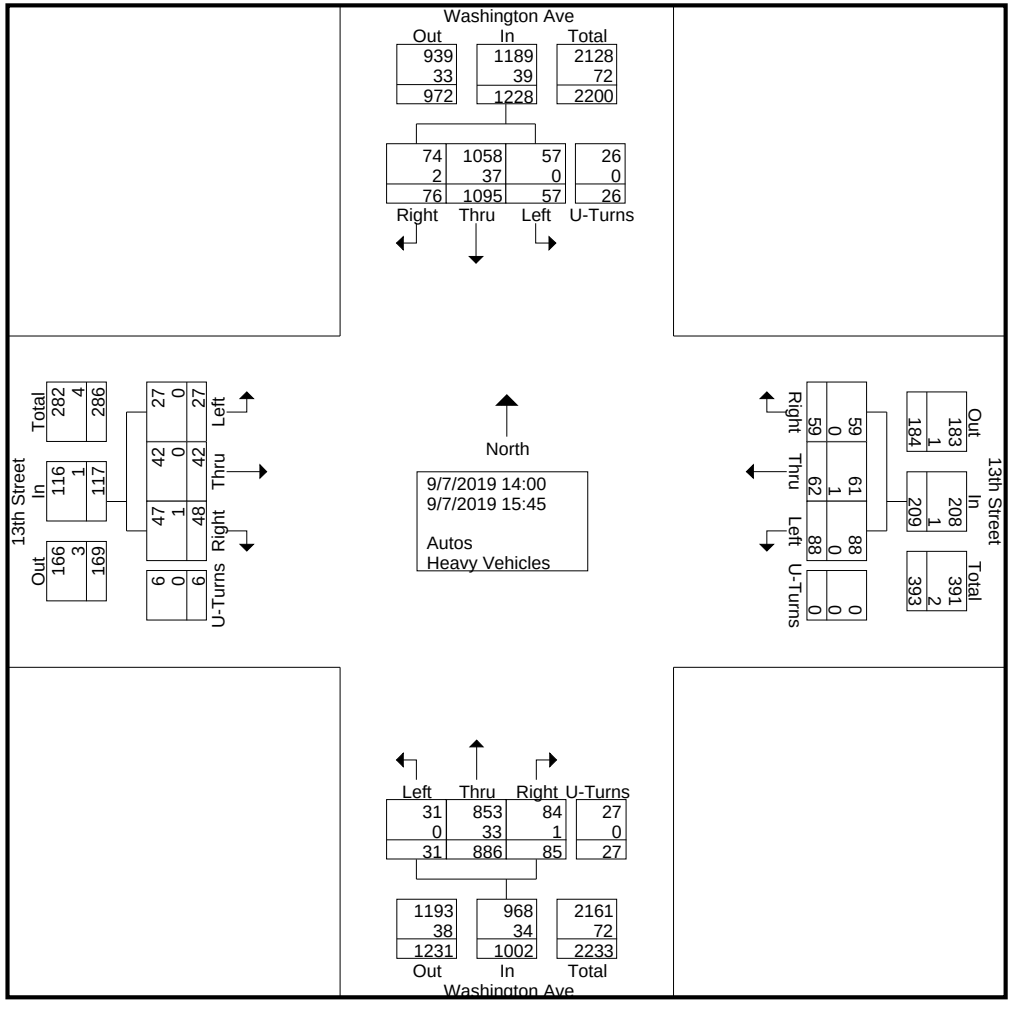
File Name : 2B- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/7/2019
Page No : 1

Groups Printed- Autos - Heavy Vehicles

	Washington Ave From North					13th Street From East					Washington Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
14:00	9	135	4	7	155	3	3	7	0	13	10	115	3	4	132	4	1	3	0	8	308
14:15	5	110	8	2	125	5	11	15	0	31	11	123	6	3	143	1	2	3	0	6	305
14:30	12	127	10	5	154	11	7	10	0	28	6	118	3	7	134	5	6	3	1	15	331
14:45	9	140	7	3	159	5	6	8	0	19	5	92	2	0	99	8	6	7	1	22	299
Total	35	512	29	17	593	24	27	40	0	91	32	448	14	14	508	18	15	16	2	51	1243
15:00	9	147	8	2	166	6	9	10	0	25	12	109	5	3	129	5	3	2	0	10	330
15:15	11	147	4	3	165	10	8	13	0	31	17	112	5	4	138	8	7	2	2	19	353
15:30	8	147	8	1	164	11	9	14	0	34	14	92	2	3	111	10	11	3	1	25	334
15:45	13	142	8	3	166	8	9	11	0	28	10	125	5	3	143	7	6	4	1	18	355
Total	41	583	28	9	661	35	35	48	0	118	53	438	17	13	521	30	27	11	4	72	1372
Grand Total	76	1095	57	26	1254	59	62	88	0	209	85	886	31	27	1029	48	42	27	6	123	2615
Apprch %	6.1	87.3	4.5	2.1		28.2	29.7	42.1	0		8.3	86.1	3	2.6		39	34.1	22	4.9		
Total %	2.9	41.9	2.2	1	48	2.3	2.4	3.4	0	8	3.3	33.9	1.2	1	39.3	1.8	1.6	1	0.2	4.7	
Autos	74	1058	57	26	1215	59	61	88	0	208	84	853	31	27	995	47	42	27	6	122	2540
% Autos	97.4	96.6	100	100	96.9	100	98.4	100	0	99.5	98.8	96.3	100	100	96.7	97.9	100	100	100	99.2	97.1
Heavy Vehicles																					
% Heavy Vehicles	2.6	3.4	0	0	3.1	0	1.6	0	0	0.5	1.2	3.7	0	0	3.3	2.1	0	0	0	0.8	2.9

Traf Tech Engineering Inc.

File Name : 2B- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/7/2019
Page No : 2



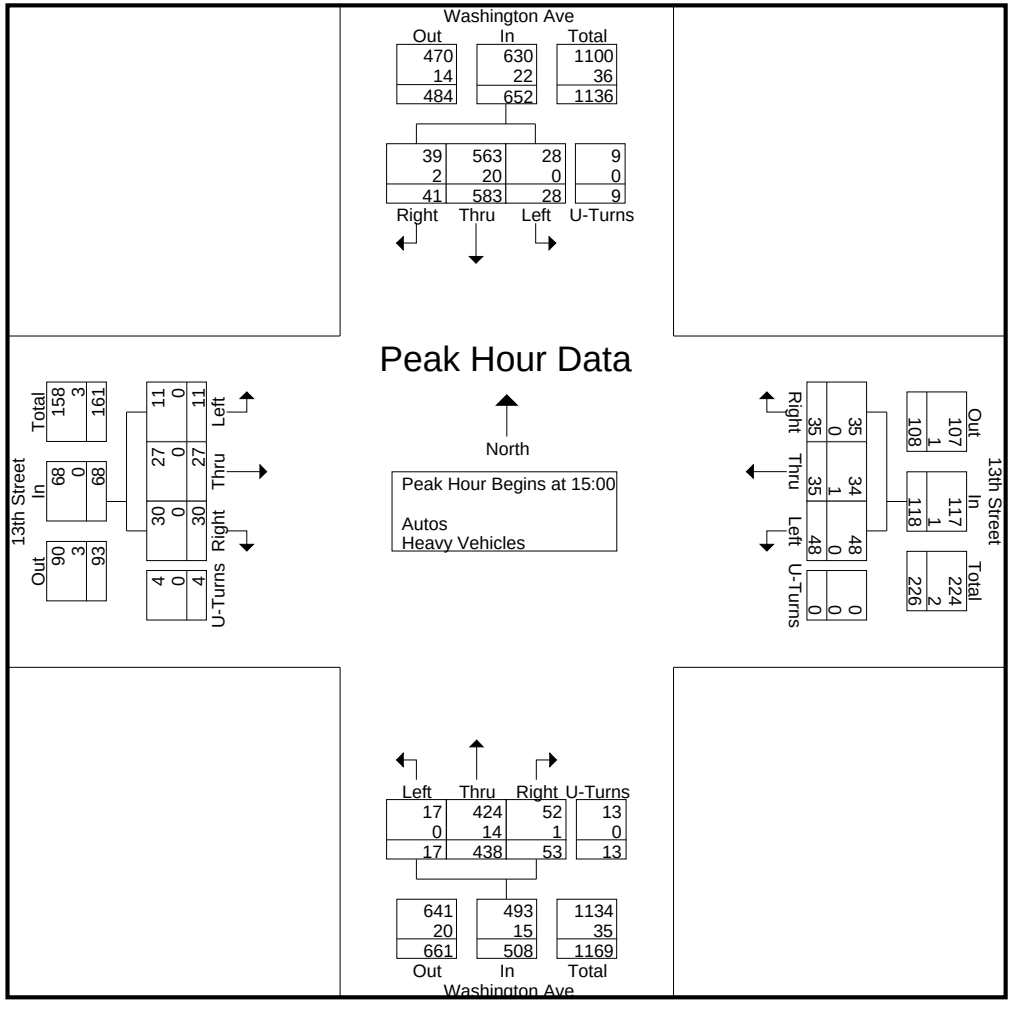
Traf Tech Engineering Inc.

File Name : 2B- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/7/2019
Page No : 3

	Washington Ave From North					13th Street From East					Washington Ave From South					13th Street From West					
Start Time	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Right	Thru	Left	U-Turns	App. Total	Int. Total
Peak Hour Analysis From 14:00 to 15:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	9	147	8	2	166	6	9	10	0	25	12	109	5	3	129	5	3	2	0	10	330
15:15	11	147	4	3	165	10	8	13	0	31	17	112	5	4	138	8	7	2	2	19	353
15:30	8	147	8	1	164	11	9	14	0	34	14	92	2	3	111	10	11	3	1	25	334
15:45	13	142	8	3	166	8	9	11	0	28	10	125	5	3	143	7	6	4	1	18	355
Total Volume	41	583	28	9	661	35	35	48	0	118	53	438	17	13	521	30	27	11	4	72	1372
% App. Total	6.2	88.2	4.2	1.4		29.7	29.7	40.7	0		10.2	84.1	3.3	2.5		41.7	37.5	15.3	5.6		
PHF	.788	.991	.875	.750	.995	.795	.972	.857	.000	.868	.779	.876	.850	.813	.911	.750	.614	.688	.500	.720	.966
Autos	39	563	28	9	639	35	34	48	0	117	52	424	17	13	506	30	27	11	4	72	1334
% Autos	95.1	96.6	100	100	96.7	100	97.1	100	0	99.2	98.1	96.8	100	100	97.1	100	100	100	100	100	97.2
Heavy Vehicles																					
% Heavy Vehicles	4.9	3.4	0	0	3.3	0	2.9	0	0	0.8	1.9	3.2	0	0	2.9	0	0	0	0	0	2.8

Traf Tech Engineering Inc.

File Name : 2B- Washington Ave & 13th St
Site Code : 00000000
Start Date : 9/7/2019
Page No : 4



APPENDIX D

Peak Season Conversion Factors and Historical Traffic Data

2018 PEAK SEASON FACTOR CATEGORY REPORT - REPORT TYPE: COUNTY
CATEGORY: 8700 MIAMI-DADE NORTH

MOCF: 0.98

WEEK	DATES	SF	PSCF
1	01/01/2018 - 01/06/2018	1.03	1.05
2	01/07/2018 - 01/13/2018	1.03	1.05
3	01/14/2018 - 01/20/2018	1.04	1.06
4	01/21/2018 - 01/27/2018	1.02	1.04
5	01/28/2018 - 02/03/2018	1.01	1.03
* 6	02/04/2018 - 02/10/2018	0.99	1.01
* 7	02/11/2018 - 02/17/2018	0.98	1.00
* 8	02/18/2018 - 02/24/2018	0.98	1.00
* 9	02/25/2018 - 03/03/2018	0.98	1.00
*10	03/04/2018 - 03/10/2018	0.97	0.99
*11	03/11/2018 - 03/17/2018	0.97	0.99
*12	03/18/2018 - 03/24/2018	0.97	0.99
*13	03/25/2018 - 03/31/2018	0.97	0.99
*14	04/01/2018 - 04/07/2018	0.97	0.99
*15	04/08/2018 - 04/14/2018	0.97	0.99
*16	04/15/2018 - 04/21/2018	0.97	0.99
*17	04/22/2018 - 04/28/2018	0.98	1.00
*18	04/29/2018 - 05/05/2018	0.99	1.01
19	05/06/2018 - 05/12/2018	1.00	1.02
20	05/13/2018 - 05/19/2018	1.01	1.03
21	05/20/2018 - 05/26/2018	1.01	1.03
22	05/27/2018 - 06/02/2018	1.01	1.03
23	06/03/2018 - 06/09/2018	1.01	1.03
24	06/10/2018 - 06/16/2018	1.01	1.03
25	06/17/2018 - 06/23/2018	1.01	1.03
26	06/24/2018 - 06/30/2018	1.02	1.04
27	07/01/2018 - 07/07/2018	1.02	1.04
28	07/08/2018 - 07/14/2018	1.02	1.04
29	07/15/2018 - 07/21/2018	1.02	1.04
30	07/22/2018 - 07/28/2018	1.02	1.04
31	07/29/2018 - 08/04/2018	1.01	1.03
32	08/05/2018 - 08/11/2018	1.01	1.03
33	08/12/2018 - 08/18/2018	1.00	1.02
34	08/19/2018 - 08/25/2018	1.00	1.02
35	08/26/2018 - 09/01/2018	1.00	1.02
36	09/02/2018 - 09/08/2018	1.01	1.03
37	09/09/2018 - 09/15/2018	1.01	1.03
38	09/16/2018 - 09/22/2018	1.00	1.02
39	09/23/2018 - 09/29/2018	1.00	1.02
40	09/30/2018 - 10/06/2018	1.00	1.02
41	10/07/2018 - 10/13/2018	0.99	1.01
42	10/14/2018 - 10/20/2018	0.99	1.01
43	10/21/2018 - 10/27/2018	1.00	1.02
44	10/28/2018 - 11/03/2018	1.00	1.02
45	11/04/2018 - 11/10/2018	1.01	1.03
46	11/11/2018 - 11/17/2018	1.01	1.03
47	11/18/2018 - 11/24/2018	1.02	1.04
48	11/25/2018 - 12/01/2018	1.02	1.04
49	12/02/2018 - 12/08/2018	1.02	1.04
50	12/09/2018 - 12/15/2018	1.03	1.05
51	12/16/2018 - 12/22/2018	1.03	1.05
52	12/23/2018 - 12/29/2018	1.03	1.05
53	12/30/2018 - 12/31/2018	1.04	1.06

* PEAK SEASON

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2018 HISTORICAL AADT REPORT

COUNTY: 87 - MIAMI-DADE

SITE: 8414 - WASHINGTON AVE, 200 FT N OF 12 ST (2011 OFF SYSTEM CYCLE)

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2018	20400 C	N 11500	S 8900	9.00	54.30	2.50
2017	20200 C	N 9200	S 11000	9.00	59.30	2.40
2016	20800 C	N 9800	S 11000	9.00	56.10	1.90
2015	20300 C	N 9800	S 10500	9.00	57.40	17.50
2014	21000 C	N 10000	S 11000	9.00	59.30	13.90
2013	18700 F	N 9200	S 9500	9.00	58.90	16.20
2012	18700 C	N 9200	S 9500	9.00	59.70	16.00

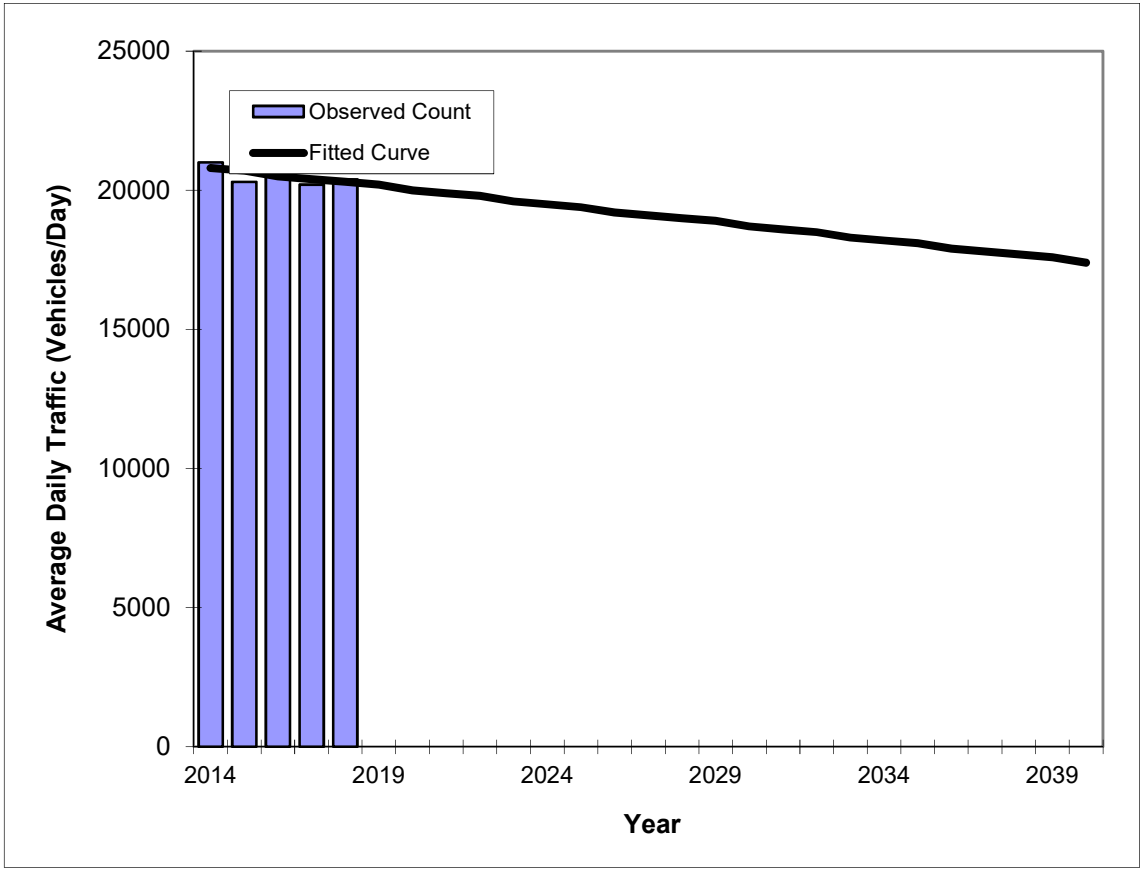
AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

Traffic Trends - V2.0

WASHINGTON AVE -- 200 FT N OF 12 ST

PIN#	0
Location	1

County:	MIAMI-DADE
Station #:	8414
Highway:	WASHINGTON AVE



Year	Traffic (ADT/AADT) Count*	Trend**
2014	21000	20800
2015	20300	20700
2016	20800	20500
2017	20200	20400
2018	20400	20300
2019 Opening Year Trend		
2019	N/A	20200
2020 Mid-Year Trend		
2020	N/A	20000
2022 Design Year Trend		
2022	N/A	19800
TRANPLAN Forecasts/Trends		

**** Annual Trend Increase:**	-130
Trend R-squared:	35.81%
Trend Annual Historic Growth Rate:	-0.60%
Trend Growth Rate (2018 to Design Year):	-0.62%
Printed:	14-Sep-19

Straight Line Growth Option

***Axle-Adjusted**

APPENDIX E

Future Turning Movement Volumes

FUTURE TURNING MOVEMENT VOLUME ANALYSIS

Washington Avenue and 13th Street
Friday Peak Hour

Description	Washington Avenue Northbound			Washington Avenue Southbound			13th Street Eastbound			13th Street Westbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing Traffic (9/6/2019)	29	446	17	31	575	38	13	20	24	37	26	32
Season Adjustment Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
2019 Peak Season Traffic	30	459	18	32	592	39	13	21	25	38	27	33
Annual Growth Rate	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Committed Developments:												
2022 Background Traffic	30	466	18	32	601	40	14	21	25	39	27	33
1234 Washington												
2022 Total Traffic	**30**	**466**	**18**	**32**	**601**	**40**	**14**	**21**	**25**	**39**	**27**	**33**

Traf Tech
ENGINEERING, INC.

FUTURE TURNING MOVEMENT VOLUME ANALYSIS

Washington Avenue and 13th Street
Saturday Peak Hour

Description	Washington Avenue Northbound			Washington Avenue Southbound			13th Street Eastbound			13th Street Westbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing Traffic (9/7/2019)	30	438	53	37	583	41	15	27	30	48	35	35
Season Adjustment Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
2019 Peak Season Traffic	31	451	55	38	600	42	15	28	31	49	36	36
Annual Growth Rate	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Committed Developments:												
2022 Background Traffic	31	458	55	39	610	43	16	28	31	50	37	37
1234 Washington	2					3	1		1			
2022 Total Traffic	**33**	**458**	**55**	**39**	**610**	**46**	**17**	**28**	**32**	**50**	**37**	**37**

Traf Tech
ENGINEERING, INC.

FUTURE TURNING MOVEMENT VOLUME ANALYSIS

Drexel Avenue and 13th Street
Friday Peak Hour

Description	Drexel Avenue Northbound			Drexel Avenue Southbound			13th Street Eastbound			13th Street Westbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing Traffic (9/6/2019)	24	9	13				28	48			78	29
Season Adjustment Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
2019 Peak Season Traffic	25	9	13	0	0	0	29	49	0	0	80	30
Annual Growth Rate	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Committed Developments:												
2022 Background Traffic	25	9	14	0	0	0	29	50	0	0	82	30
1234 Washington												
2022 Total Traffic	**25**	**9**	**14**	**0**	**0**	**0**	**29**	**50**	**0**	**0**	**82**	**30**

Traf Tech
ENGINEERING, INC.

FUTURE TURNING MOVEMENT VOLUME ANALYSIS

Drexel Avenue and 13th Street
Saturday Peak Hour

Description	Drexel Avenue Northbound			Southbound			13th Street Eastbound			13th Street Westbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Existing Traffic (9/7/2019)	15	8	19				13	56			62	13
Season Adjustment Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
2019 Peak Season Traffic	15	8	20	0	0	0	13	58	0	0	64	13
Annual Growth Rate	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Committed Developments:												
2022 Background Traffic	16	8	20	0	0	0	14	59	0	0	65	14
1234 Washington	1		3					3				
2022 Total Traffic	**17**	**8**	**23**	**0**	**0**	**0**	**14**	**62**	**0**	**0**	**65**	**14**

Traf Tech
ENGINEERING, INC.

APPENDIX F

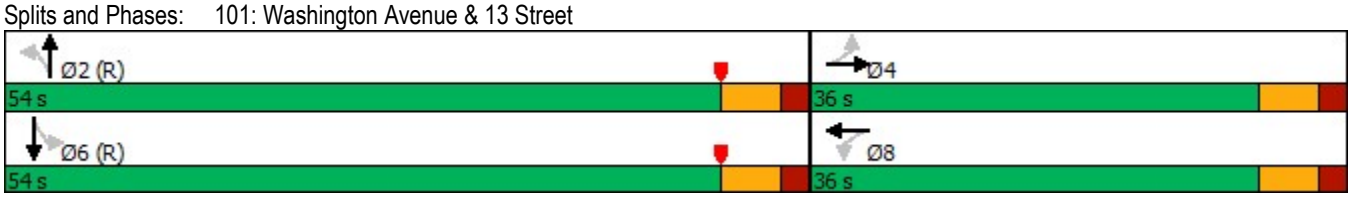
SYNCHRO Analyses

Timings
101: Washington Avenue & 13 Street

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	13	21	38	27	30	459	32	592
Future Volume (vph)	13	21	38	27	30	459	32	592
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	31.0	31.0	31.0	31.0	35.0	35.0	35.0	35.0
Total Split (s)	36.0	36.0	36.0	36.0	54.0	54.0	54.0	54.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	60.0%	60.0%	60.0%	60.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		11.2		11.2		70.6		70.6
Actuated g/C Ratio		0.12		0.12		0.78		0.78
v/c Ratio		0.36		0.62		0.26		0.33
Control Delay		28.4		41.6		4.3		4.6
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		28.4		41.6		4.3		4.6
LOS		C		D		A		A
Approach Delay		28.4		41.6		4.3		4.6
Approach LOS		C		D		A		A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 8.3	Intersection LOS: A
Intersection Capacity Utilization 77.1%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 101: Washington Avenue & 13 Street



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	62	103	534	698
v/c Ratio	0.36	0.62	0.26	0.33
Control Delay	28.4	41.6	4.3	4.6
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	28.4	41.6	4.3	4.6
Queue Length 50th (ft)	19	39	40	56
Queue Length 95th (ft)	53	86	79	108
Internal Link Dist (ft)	170	352	469	281
Turn Bay Length (ft)				
Base Capacity (vph)	415	396	2063	2089
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.15	0.26	0.26	0.33

Intersection Summary

HCM 2010 Signalized Intersection Summary
101: Washington Avenue & 13 Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	21	25	38	27	33	30	459	18	32	592	39
Future Volume (veh/h)	13	21	25	38	27	33	30	459	18	32	592	39
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.90		0.85	0.89		0.85	0.96		0.82	0.94		0.82
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Adj Sat Flow, veh/h/ln	1710	1676	1710	1710	1676	1710	1710	1676	1710	1710	1676	1710
Adj Flow Rate, veh/h	14	22	26	40	28	35	32	483	19	34	623	41
Adj No. of Lanes	0	1	0	0	1	0	0	2	0	0	2	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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	101	136	136	157	102	105	113	1564	61	96	1565	101
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.60	0.60	0.60	0.60	0.60	0.60
Sat Flow, veh/h	193	508	506	379	380	391	115	2614	102	87	2614	169
Grp Volume(v), veh/h	62	0	0	103	0	0	286	0	248	383	0	315
Grp Sat Flow(s),veh/h/ln	1206	0	0	1151	0	0	1502	0	1329	1571	0	1300
Q Serve(g_s), s	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	8.3	0.0	0.0	11.6
Cycle Q Clear(g_c), s	3.3	0.0	0.0	6.0	0.0	0.0	7.4	0.0	8.3	10.7	0.0	11.6
Prop In Lane	0.23		0.42	0.39		0.34	0.11		0.08	0.09		0.13
Lane Grp Cap(c), veh/h	373	0	0	364	0	0	943	0	795	984	0	778
V/C Ratio(X)	0.17	0.00	0.00	0.28	0.00	0.00	0.30	0.00	0.31	0.39	0.00	0.41
Avail Cap(c_a), veh/h	449	0	0	437	0	0	943	0	795	984	0	778
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	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	0.0	26.2	0.0	0.0	8.7	0.0	8.9	9.4	0.0	9.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.3	0.0	0.0	0.8	0.0	1.0	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	2.1	0.0	0.0	3.6	0.0	3.3	5.2	0.0	4.5
LnGrp Delay(d),s/veh	25.5	0.0	0.0	26.5	0.0	0.0	9.6	0.0	9.9	10.6	0.0	11.1
LnGrp LOS	C			C			A		A	B		B
Approach Vol, veh/h		62			103			534			698	
Approach Delay, s/veh		25.5			26.5			9.7			10.8	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		59.9		30.1		59.9		30.1
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		48.0		30.0		48.0		30.0
Max Q Clear Time (g_c+I1), s		10.3		5.3		13.6		8.0
Green Ext Time (p_c), s		1.3		0.2		1.7		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	12.2
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	9.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	49	0	0	80	30	25	9	13	0	0	0
Future Vol, veh/h	29	49	0	0	80	30	25	9	13	0	0	0
Conflicting Peds, #/hr	54	0	63	63	0	54	21	0	30	30	0	21
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	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	31	52	0	0	85	32	27	10	14	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	205	129	-	-	122	101	21	0	0
Stage 1	21	21	-	-	101	-	-	-	-
Stage 2	184	108	-	-	21	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.52	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	753	762	0	0	768	954	1595	-	-
Stage 1	-	-	0	0	811	-	-	-	-
Stage 2	818	806	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	639	712	-	-	717	927	1563	-	-
Mov Cap-2 Maneuver	639	712	-	-	717	-	-	-	-
Stage 1	-	-	-	-	774	-	-	-	-
Stage 2	690	769	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	11	10.6	3.9
HCM LOS	B	B	

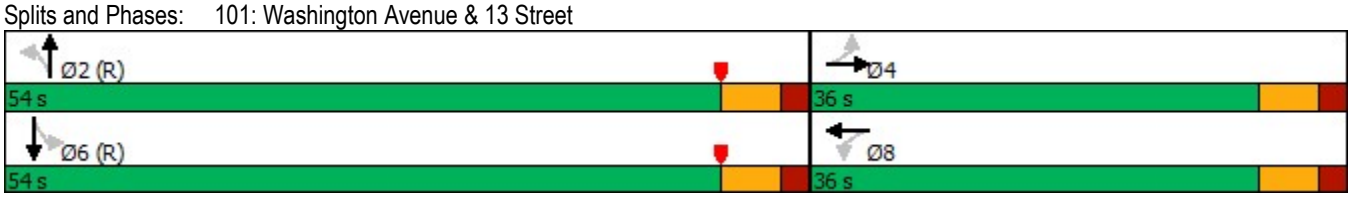
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1563	-	-	683	764
HCM Lane V/C Ratio	0.017	-	-	0.121	0.153
HCM Control Delay (s)	7.3	0	-	11	10.6
HCM Lane LOS	A	A	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.5

Timings
101: Washington Avenue & 13 Street

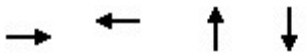
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	21	39	27	30	466	32	601
Future Volume (vph)	14	21	39	27	30	466	32	601
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	31.0	31.0	31.0	31.0	35.0	35.0	35.0	35.0
Total Split (s)	36.0	36.0	36.0	36.0	54.0	54.0	54.0	54.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	60.0%	60.0%	60.0%	60.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		11.4		11.4		70.4		70.4
Actuated g/C Ratio		0.13		0.13		0.78		0.78
v/c Ratio		0.37		0.62		0.26		0.34
Control Delay		28.5		41.9		4.3		4.8
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		28.5		41.9		4.3		4.8
LOS		C		D		A		A
Approach Delay		28.5		41.9		4.3		4.8
Approach LOS		C		D		A		A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 8.4	Intersection LOS: A
Intersection Capacity Utilization 77.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 101: Washington Avenue & 13 Street



Queues
101: Washington Avenue & 13 Street



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	63	104	542	709
v/c Ratio	0.37	0.62	0.26	0.34
Control Delay	28.5	41.9	4.3	4.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	28.5	41.9	4.3	4.8
Queue Length 50th (ft)	19	40	41	57
Queue Length 95th (ft)	53	87	82	112
Internal Link Dist (ft)	170	352	469	281
Turn Bay Length (ft)				
Base Capacity (vph)	413	396	2056	2083
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.15	0.26	0.26	0.34

Intersection Summary

HCM 2010 Signalized Intersection Summary
101: Washington Avenue & 13 Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	21	25	39	27	33	30	466	18	32	601	40
Future Volume (veh/h)	14	21	25	39	27	33	30	466	18	32	601	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.90		0.85	0.89		0.85	0.96		0.82	0.95		0.82
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Adj Sat Flow, veh/h/ln	1710	1676	1710	1710	1676	1710	1710	1676	1710	1710	1676	1710
Adj Flow Rate, veh/h	15	22	26	41	28	35	32	491	19	34	633	42
Adj No. of Lanes	0	1	0	0	1	0	0	2	0	0	2	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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	105	134	133	159	101	104	112	1567	60	95	1565	102
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.60	0.60	0.60	0.60	0.60	0.60
Sat Flow, veh/h	207	499	496	387	377	387	113	2619	100	85	2615	171
Grp Volume(v), veh/h	63	0	0	104	0	0	290	0	252	389	0	320
Grp Sat Flow(s),veh/h/ln	1202	0	0	1150	0	0	1503	0	1329	1572	0	1299
Q Serve(g_s), s	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	8.4	0.0	0.0	11.8
Cycle Q Clear(g_c), s	3.3	0.0	0.0	6.0	0.0	0.0	7.6	0.0	8.4	10.9	0.0	11.8
Prop In Lane	0.24		0.41	0.39		0.34	0.11		0.08	0.09		0.13
Lane Grp Cap(c), veh/h	372	0	0	364	0	0	944	0	796	984	0	778
V/C Ratio(X)	0.17	0.00	0.00	0.29	0.00	0.00	0.31	0.00	0.32	0.40	0.00	0.41
Avail Cap(c_a), veh/h	448	0	0	437	0	0	944	0	796	984	0	778
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	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	0.0	26.2	0.0	0.0	8.8	0.0	8.9	9.4	0.0	9.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.3	0.0	0.0	0.8	0.0	1.0	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	2.1	0.0	0.0	3.7	0.0	3.3	5.3	0.0	4.5
LnGrp Delay(d),s/veh	25.5	0.0	0.0	26.5	0.0	0.0	9.6	0.0	10.0	10.6	0.0	11.2
LnGrp LOS	C			C			A		A	B		B
Approach Vol, veh/h		63			104			542			709	
Approach Delay, s/veh		25.5			26.5			9.8			10.9	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		59.9		30.1		59.9		30.1
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		48.0		30.0		48.0		30.0
Max Q Clear Time (g_c+I1), s		10.4		5.3		13.8		8.0
Green Ext Time (p_c), s		1.3		0.2		1.7		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	12.3
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	9.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	50	0	0	82	30	25	9	14	0	0	0
Future Vol, veh/h	29	50	0	0	82	30	25	9	14	0	0	0
Conflicting Peds, #/hr	54	0	63	63	0	54	21	0	30	30	0	21
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	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	31	53	0	0	87	32	27	10	15	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	206	130	-	-	123	102	21	0	0
Stage 1	21	21	-	-	102	-	-	-	-
Stage 2	185	109	-	-	21	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.52	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	752	761	0	0	767	953	1595	-	-
Stage 1	-	-	0	0	811	-	-	-	-
Stage 2	817	805	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	636	711	-	-	716	926	1563	-	-
Mov Cap-2 Maneuver	636	711	-	-	716	-	-	-	-
Stage 1	-	-	-	-	774	-	-	-	-
Stage 2	687	768	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	11	10.6	3.8
HCM LOS	B	B	

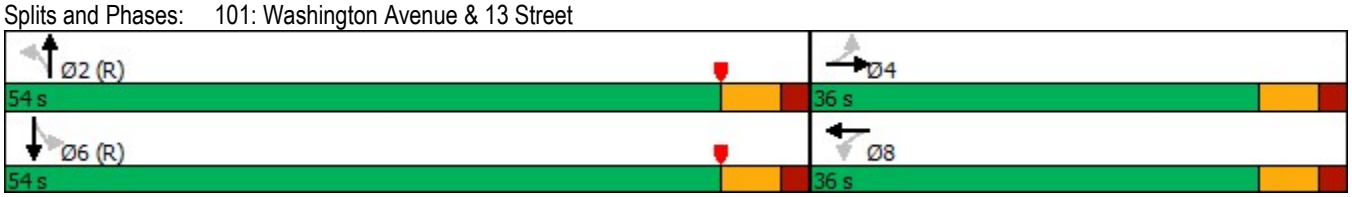
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1563	-	-	681	762
HCM Lane V/C Ratio	0.017	-	-	0.123	0.156
HCM Control Delay (s)	7.3	0	-	11	10.6
HCM Lane LOS	A	A	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.6

Timings
101: Washington Avenue & 13 Street

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	21	39	27	30	466	32	601
Future Volume (vph)	14	21	39	27	30	466	32	601
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	31.0	31.0	31.0	31.0	35.0	35.0	35.0	35.0
Total Split (s)	36.0	36.0	36.0	36.0	54.0	54.0	54.0	54.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	60.0%	60.0%	60.0%	60.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		11.4		11.4		70.4		70.4
Actuated g/C Ratio		0.13		0.13		0.78		0.78
v/c Ratio		0.37		0.62		0.26		0.34
Control Delay		28.5		41.9		4.3		4.8
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		28.5		41.9		4.3		4.8
LOS		C		D		A		A
Approach Delay		28.5		41.9		4.3		4.8
Approach LOS		C		D		A		A

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 30 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 8.4	Intersection LOS: A
Intersection Capacity Utilization 77.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 101: Washington Avenue & 13 Street



Queues
101: Washington Avenue & 13 Street

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	63	104	542	709
v/c Ratio	0.37	0.62	0.26	0.34
Control Delay	28.5	41.9	4.3	4.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	28.5	41.9	4.3	4.8
Queue Length 50th (ft)	19	40	41	57
Queue Length 95th (ft)	53	87	82	112
Internal Link Dist (ft)	58	352	469	281
Turn Bay Length (ft)				
Base Capacity (vph)	413	396	2056	2083
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.15	0.26	0.26	0.34

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	21	25	39	27	33	30	466	18	32	601	40
Future Volume (veh/h)	14	21	25	39	27	33	30	466	18	32	601	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.90		0.85	0.89		0.85	0.96		0.82	0.95		0.82
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Adj Sat Flow, veh/h/ln	1710	1676	1710	1710	1676	1710	1710	1676	1710	1710	1676	1710
Adj Flow Rate, veh/h	15	22	26	41	28	35	32	491	19	34	633	42
Adj No. of Lanes	0	1	0	0	1	0	0	2	0	0	2	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, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	105	134	133	159	101	104	112	1567	60	95	1565	102
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.60	0.60	0.60	0.60	0.60	0.60
Sat Flow, veh/h	207	499	496	387	377	387	113	2619	100	85	2615	171
Grp Volume(v), veh/h	63	0	0	104	0	0	290	0	252	389	0	320
Grp Sat Flow(s),veh/h/ln	1202	0	0	1150	0	0	1503	0	1329	1572	0	1299
Q Serve(g_s), s	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	8.4	0.0	0.0	11.8
Cycle Q Clear(g_c), s	3.3	0.0	0.0	6.0	0.0	0.0	7.6	0.0	8.4	10.9	0.0	11.8
Prop In Lane	0.24		0.41	0.39		0.34	0.11		0.08	0.09		0.13
Lane Grp Cap(c), veh/h	372	0	0	364	0	0	944	0	796	984	0	778
V/C Ratio(X)	0.17	0.00	0.00	0.29	0.00	0.00	0.31	0.00	0.32	0.40	0.00	0.41
Avail Cap(c_a), veh/h	448	0	0	437	0	0	944	0	796	984	0	778
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	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	0.0	26.2	0.0	0.0	8.8	0.0	8.9	9.4	0.0	9.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.3	0.0	0.0	0.8	0.0	1.0	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	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	2.1	0.0	0.0	3.7	0.0	3.3	5.3	0.0	4.5
LnGrp Delay(d),s/veh	25.5	0.0	0.0	26.5	0.0	0.0	9.6	0.0	10.0	10.6	0.0	11.2
LnGrp LOS	C			C			A		A	B		B
Approach Vol, veh/h		63			104			542			709	
Approach Delay, s/veh		25.5			26.5			9.8			10.9	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		59.9		30.1		59.9		30.1
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		48.0		30.0		48.0		30.0
Max Q Clear Time (g_c+I1), s		10.4		5.3		13.8		8.0
Green Ext Time (p_c), s		1.3		0.2		1.7		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	12.3
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	9.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	50	0	0	82	30	25	9	14	0	0	0
Future Vol, veh/h	29	50	0	0	82	30	25	9	14	0	0	0
Conflicting Peds, #/hr	54	0	63	63	0	54	21	0	30	30	0	21
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	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	31	53	0	0	87	32	27	10	15	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	206	130	-	-	123	102	21	0	0
Stage 1	21	21	-	-	102	-	-	-	-
Stage 2	185	109	-	-	21	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.52	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	752	761	0	0	767	953	1595	-	-
Stage 1	-	-	0	0	811	-	-	-	-
Stage 2	817	805	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	636	711	-	-	716	926	1563	-	-
Mov Cap-2 Maneuver	636	711	-	-	716	-	-	-	-
Stage 1	-	-	-	-	774	-	-	-	-
Stage 2	687	768	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	11	10.6	3.8
HCM LOS	B	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1563	-	-	681	762
HCM Lane V/C Ratio	0.017	-	-	0.123	0.156
HCM Control Delay (s)	7.3	0	-	11	10.6
HCM Lane LOS	A	A	-	B	B
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.6

Intersection	
Int Delay, s/veh	4.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	58	48	0	0	0
Future Vol, veh/h	0	58	48	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	-
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	63	52	0	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	52	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	1016	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	1016	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.8	0
HCM LOS	A	

Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	1016
HCM Lane V/C Ratio	-	0.062
HCM Control Delay (s)	-	8.8
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.2

Timings
101: Washington Avenue & 13 Street

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	15	28	49	36	31	451	38	600
Future Volume (vph)	15	28	49	36	31	451	38	600
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	31.0	31.0	31.0	31.0	35.0	35.0	35.0	35.0
Total Split (s)	38.0	38.0	38.0	38.0	62.0	62.0	62.0	62.0
Total Split (%)	38.0%	38.0%	38.0%	38.0%	62.0%	62.0%	62.0%	62.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		14.5		14.5		73.5		73.5
Actuated g/C Ratio		0.14		0.14		0.74		0.74
v/c Ratio		0.39		0.70		0.30		0.37
Control Delay		28.4		51.7		5.5		6.1
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		28.4		51.7		5.5		6.1
LOS		C		D		A		A
Approach Delay		28.4		51.7		5.5		6.1
Approach LOS		C		D		A		A

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 11.0	Intersection LOS: B
Intersection Capacity Utilization 83.0%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 101: Washington Avenue & 13 Street

Queues
101: Washington Avenue & 13 Street

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	77	127	559	709
v/c Ratio	0.39	0.70	0.30	0.37
Control Delay	28.4	51.7	5.5	6.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	28.4	51.7	5.5	6.1
Queue Length 50th (ft)	26	64	51	71
Queue Length 95th (ft)	64	116	100	135
Internal Link Dist (ft)	170	352	469	281
Turn Bay Length (ft)				
Base Capacity (vph)	400	374	1846	1914
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.19	0.34	0.30	0.37

Intersection Summary

HCM 2010 Signalized Intersection Summary
101: Washington Avenue & 13 Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	28	31	49	36	36	31	451	55	38	600	42
Future Volume (veh/h)	15	28	31	49	36	36	31	451	55	38	600	42
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.85		0.78	0.83		0.78	0.96		0.78	0.94		0.79
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Adj Sat Flow, veh/h/ln	1710	1676	1710	1710	1676	1710	1710	1676	1710	1710	1676	1710
Adj Flow Rate, veh/h	16	29	32	51	38	38	32	470	57	40	625	44
Adj No. of Lanes	0	1	0	0	1	0	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	86	129	122	146	99	83	109	1481	176	111	1598	111
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.63	0.63	0.63	0.63	0.63	0.63
Sat Flow, veh/h	170	519	490	385	397	334	110	2347	280	113	2531	175
Grp Volume(v), veh/h	77	0	0	127	0	0	308	0	251	387	0	322
Grp Sat Flow(s),veh/h/ln	1178	0	0	1116	0	0	1506	0	1231	1533	0	1286
Q Serve(g_s), s	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	9.4	0.0	0.0	12.3
Cycle Q Clear(g_c), s	4.9	0.0	0.0	8.8	0.0	0.0	8.3	0.0	9.4	11.1	0.0	12.3
Prop In Lane	0.21		0.42	0.40		0.30	0.10		0.23	0.10		0.14
Lane Grp Cap(c), veh/h	337	0	0	328	0	0	990	0	777	1007	0	812
V/C Ratio(X)	0.23	0.00	0.00	0.39	0.00	0.00	0.31	0.00	0.32	0.38	0.00	0.40
Avail Cap(c_a), veh/h	417	0	0	404	0	0	990	0	777	1007	0	812
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	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.1	0.0	0.0	31.3	0.0	0.0	8.3	0.0	8.5	8.8	0.0	9.1
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.6	0.0	0.0	0.8	0.0	1.1	1.1	0.0	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	1.7	0.0	0.0	3.0	0.0	0.0	4.0	0.0	3.4	5.4	0.0	4.6
LnGrp Delay(d),s/veh	30.3	0.0	0.0	31.9	0.0	0.0	9.2	0.0	9.6	9.9	0.0	10.5
LnGrp LOS	C			C			A		A	A		B
Approach Vol, veh/h		77			127			559			709	
Approach Delay, s/veh		30.3			31.9			9.4			10.2	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		69.1		30.9		69.1		30.9
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		56.0		32.0		56.0		32.0
Max Q Clear Time (g_c+I1), s		11.4		6.9		14.3		10.8
Green Ext Time (p_c), s		1.4		0.3		1.8		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	12.8
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	8.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	58	0	0	64	13	15	8	20	0	0	0
Future Vol, veh/h	13	58	0	0	64	13	15	8	20	0	0	0
Conflicting Peds, #/hr	36	0	66	66	0	36	22	0	23	23	0	20
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	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	70	0	0	77	16	18	10	24	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	163	115	-	-	103	81	22	0	0
Stage 1	22	22	-	-	81	-	-	-	-
Stage 2	141	93	-	-	22	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.52	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	802	775	0	0	787	979	1593	-	-
Stage 1	-	-	0	0	828	-	-	-	-
Stage 2	862	818	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	705	733	-	-	745	958	1560	-	-
Mov Cap-2 Maneuver	705	733	-	-	745	-	-	-	-
Stage 1	-	-	-	-	800	-	-	-	-
Stage 2	757	790	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	10.6	10.3	2.6
HCM LOS	B	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1560	-	-	728	774
HCM Lane V/C Ratio	0.012	-	-	0.118	0.12
HCM Control Delay (s)	7.3	0	-	10.6	10.3
HCM Lane LOS	A	A	-	B	B
HCM 95th %tile Q(veh)	0	-	-	0.4	0.4

Timings
101: Washington Avenue & 13 Street

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	16	28	50	37	31	458	39	610
Future Volume (vph)	16	28	50	37	31	458	39	610
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	31.0	31.0	31.0	31.0	35.0	35.0	35.0	35.0
Total Split (s)	38.0	38.0	38.0	38.0	62.0	62.0	62.0	62.0
Total Split (%)	38.0%	38.0%	38.0%	38.0%	62.0%	62.0%	62.0%	62.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		14.8		14.8		73.2		73.2
Actuated g/C Ratio		0.15		0.15		0.73		0.73
v/c Ratio		0.39		0.70		0.31		0.38
Control Delay		28.4		51.9		5.7		6.3
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		28.4		51.9		5.7		6.3
LOS		C		D		A		A
Approach Delay		28.4		51.9		5.7		6.3
Approach LOS		C		D		A		A

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 11.2	Intersection LOS: B
Intersection Capacity Utilization 84.1%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 101: Washington Avenue & 13 Street

Queues
101: Washington Avenue & 13 Street

Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	78	130	566	721
v/c Ratio	0.39	0.70	0.31	0.38
Control Delay	28.4	51.9	5.7	6.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	28.4	51.9	5.7	6.3
Queue Length 50th (ft)	26	66	53	74
Queue Length 95th (ft)	65	119	103	140
Internal Link Dist (ft)	170	352	469	281
Turn Bay Length (ft)				
Base Capacity (vph)	399	374	1839	1903
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.20	0.35	0.31	0.38

Intersection Summary

HCM 2010 Signalized Intersection Summary
101: Washington Avenue & 13 Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	28	31	50	37	37	31	458	55	39	610	43
Future Volume (veh/h)	16	28	31	50	37	37	31	458	55	39	610	43
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.85		0.78	0.83		0.78	0.96		0.78	0.94		0.79
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Adj Sat Flow, veh/h/ln	1710	1676	1710	1710	1676	1710	1710	1676	1710	1710	1676	1710
Adj Flow Rate, veh/h	17	29	32	52	39	39	32	477	57	41	635	45
Adj No. of Lanes	0	1	0	0	1	0	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	89	128	121	146	99	83	108	1486	174	111	1594	111
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.63	0.63	0.63	0.63	0.63	0.63
Sat Flow, veh/h	183	515	485	384	398	335	108	2354	276	114	2526	176
Grp Volume(v), veh/h	78	0	0	130	0	0	312	0	254	393	0	328
Grp Sat Flow(s),veh/h/ln	1183	0	0	1117	0	0	1506	0	1232	1530	0	1286
Q Serve(g_s), s	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	9.6	0.0	0.0	12.6
Cycle Q Clear(g_c), s	5.0	0.0	0.0	9.0	0.0	0.0	8.4	0.0	9.6	11.3	0.0	12.6
Prop In Lane	0.22		0.41	0.40		0.30	0.10		0.22	0.10		0.14
Lane Grp Cap(c), veh/h	338	0	0	328	0	0	991	0	778	1006	0	812
V/C Ratio(X)	0.23	0.00	0.00	0.40	0.00	0.00	0.31	0.00	0.33	0.39	0.00	0.40
Avail Cap(c_a), veh/h	418	0	0	404	0	0	991	0	778	1006	0	812
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	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.1	0.0	0.0	31.4	0.0	0.0	8.4	0.0	8.6	8.9	0.0	9.1
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.6	0.0	0.0	0.8	0.0	1.1	1.1	0.0	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	1.8	0.0	0.0	3.1	0.0	0.0	4.1	0.0	3.5	5.4	0.0	4.8
LnGrp Delay(d),s/veh	30.3	0.0	0.0	32.0	0.0	0.0	9.2	0.0	9.7	10.0	0.0	10.6
LnGrp LOS	C			C			A		A	B		B
Approach Vol, veh/h		78			130			566			721	
Approach Delay, s/veh		30.3			32.0			9.4			10.3	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		69.1		30.9		69.1		30.9
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		56.0		32.0		56.0		32.0
Max Q Clear Time (g_c+I1), s		11.6		7.0		14.6		11.0
Green Ext Time (p_c), s		1.4		0.3		1.8		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	12.9
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	8.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	59	0	0	65	14	16	8	20	0	0	0
Future Vol, veh/h	14	59	0	0	65	14	16	8	20	0	0	0
Conflicting Peds, #/hr	36	0	66	66	0	36	22	0	23	23	0	20
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	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	71	0	0	78	17	19	10	24	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	166	117	-	-	105	81	22	0	0
Stage 1	22	22	-	-	83	-	-	-	-
Stage 2	144	95	-	-	22	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.52	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	798	773	0	0	785	979	1593	-	-
Stage 1	-	-	0	0	826	-	-	-	-
Stage 2	859	816	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	699	731	-	-	743	958	1560	-	-
Mov Cap-2 Maneuver	699	731	-	-	743	-	-	-	-
Stage 1	-	-	-	-	798	-	-	-	-
Stage 2	752	788	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	10.7	10.3	2.7
HCM LOS	B	B	

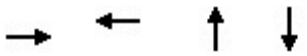
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1560	-	-	725	774
HCM Lane V/C Ratio	0.012	-	-	0.121	0.123
HCM Control Delay (s)	7.3	0	-	10.7	10.3
HCM Lane LOS	A	A	-	B	B
HCM 95th %tile Q(veh)	0	-	-	0.4	0.4

Timings
101: Washington Avenue & 13 Street

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	28	50	37	33	458	39	610
Future Volume (vph)	17	28	50	37	33	458	39	610
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	31.0	31.0	31.0	31.0	35.0	35.0	35.0	35.0
Total Split (s)	38.0	38.0	38.0	38.0	62.0	62.0	62.0	62.0
Total Split (%)	38.0%	38.0%	38.0%	38.0%	62.0%	62.0%	62.0%	62.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		6.0		6.0		6.0		6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		14.8		14.8		73.2		73.2
Actuated g/C Ratio		0.15		0.15		0.73		0.73
v/c Ratio		0.40		0.71		0.31		0.38
Control Delay		28.5		52.1		5.7		6.3
Queue Delay		0.0		0.0		0.0		0.0
Total Delay		28.5		52.1		5.7		6.3
LOS		C		D		A		A
Approach Delay		28.5		52.1		5.7		6.3
Approach LOS		C		D		A		A

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 11.2	Intersection LOS: B
Intersection Capacity Utilization 84.1%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 101: Washington Avenue & 13 Street



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	80	130	568	724
v/c Ratio	0.40	0.71	0.31	0.38
Control Delay	28.5	52.1	5.7	6.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	28.5	52.1	5.7	6.3
Queue Length 50th (ft)	27	66	53	74
Queue Length 95th (ft)	65	120	104	140
Internal Link Dist (ft)	58	352	469	281
Turn Bay Length (ft)				
Base Capacity (vph)	397	373	1826	1900
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.20	0.35	0.31	0.38

Intersection Summary

HCM 2010 Signalized Intersection Summary
101: Washington Avenue & 13 Street

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	28	32	50	37	37	33	458	55	39	610	46
Future Volume (veh/h)	17	28	32	50	37	37	33	458	55	39	610	46
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.85		0.78	0.83		0.78	0.96		0.78	0.94		0.79
Parking Bus, Adj	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90	1.00	1.00	0.90
Adj Sat Flow, veh/h/ln	1710	1676	1710	1710	1676	1710	1710	1676	1710	1710	1676	1710
Adj Flow Rate, veh/h	18	29	33	52	39	39	34	477	57	41	635	48
Adj No. of Lanes	0	1	0	0	1	0	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	92	125	121	146	99	84	114	1474	173	111	1586	118
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.63	0.63	0.63	0.63	0.63	0.63
Sat Flow, veh/h	191	502	487	384	399	336	117	2335	274	113	2512	187
Grp Volume(v), veh/h	80	0	0	130	0	0	312	0	256	395	0	329
Grp Sat Flow(s),veh/h/ln	1180	0	0	1119	0	0	1493	0	1233	1531	0	1280
Q Serve(g_s), s	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	9.7	0.0	0.0	12.7
Cycle Q Clear(g_c), s	5.1	0.0	0.0	9.0	0.0	0.0	8.4	0.0	9.7	11.4	0.0	12.7
Prop In Lane	0.22		0.41	0.40		0.30	0.11		0.22	0.10		0.15
Lane Grp Cap(c), veh/h	338	0	0	329	0	0	982	0	778	1006	0	808
V/C Ratio(X)	0.24	0.00	0.00	0.40	0.00	0.00	0.32	0.00	0.33	0.39	0.00	0.41
Avail Cap(c_a), veh/h	417	0	0	404	0	0	982	0	778	1006	0	808
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	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.1	0.0	0.0	31.4	0.0	0.0	8.4	0.0	8.6	8.9	0.0	9.2
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.6	0.0	0.0	0.8	0.0	1.1	1.2	0.0	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	1.8	0.0	0.0	3.1	0.0	0.0	4.1	0.0	3.5	5.5	0.0	4.8
LnGrp Delay(d),s/veh	30.4	0.0	0.0	32.0	0.0	0.0	9.2	0.0	9.7	10.1	0.0	10.7
LnGrp LOS	C			C			A		A	B		B
Approach Vol, veh/h		80			130			568			724	
Approach Delay, s/veh		30.4			32.0			9.4			10.3	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		69.1		30.9		69.1		30.9
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		56.0		32.0		56.0		32.0
Max Q Clear Time (g_c+I1), s		11.7		7.1		14.7		11.0
Green Ext Time (p_c), s		1.4		0.4		1.8		0.6

Intersection Summary		
HCM 2010 Ctrl Delay		12.9
HCM 2010 LOS		B

Intersection	
Int Delay, s/veh	8.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	62	0	0	65	14	17	8	23	0	0	0
Future Vol, veh/h	14	62	0	0	65	14	17	8	23	0	0	0
Conflicting Peds, #/hr	36	0	66	66	0	36	22	0	23	23	0	20
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	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	75	0	0	78	17	20	10	28	0	0	0

Major/Minor	Minor2			Minor1			Major1		
Conflicting Flow All	170	123	-	-	109	83	22	0	0
Stage 1	22	22	-	-	87	-	-	-	-
Stage 2	148	101	-	-	22	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	6.52	6.22	4.12	-	-
Critical Hdwy Stg 1	-	-	-	-	5.52	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	4.018	3.318	2.218	-	-
Pot Cap-1 Maneuver	794	767	0	0	781	976	1593	-	-
Stage 1	-	-	0	0	823	-	-	-	-
Stage 2	855	811	0	0	-	-	-	-	-
Platoon blocked, %								-	-
Mov Cap-1 Maneuver	695	725	-	-	738	955	1560	-	-
Mov Cap-2 Maneuver	695	725	-	-	738	-	-	-	-
Stage 1	-	-	-	-	794	-	-	-	-
Stage 2	747	783	-	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	10.7	10.3	2.6
HCM LOS	B	B	

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1
Capacity (veh/h)	1560	-	-	719	769
HCM Lane V/C Ratio	0.013	-	-	0.127	0.124
HCM Control Delay (s)	7.3	0	-	10.7	10.3
HCM Lane LOS	A	A	-	B	B
HCM 95th %tile Q(veh)	0	-	-	0.4	0.4

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	54	48	0	0	0
Future Vol, veh/h	0	54	48	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	-
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	59	52	0	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	52	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	1016	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	1016	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	8.8	0
HCM LOS	A	

Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	1016
HCM Lane V/C Ratio	-	0.058
HCM Control Delay (s)	-	8.8
HCM Lane LOS	-	A
HCM 95th %tile Q(veh)	-	0.2

APPENDIX G

Queuing Analysis – Valet

Queuing Analysis based on ITE Procedures

q = 61-16 parking sp. = 45 veh/hr (demand rate)

Q = 7.5 veh/hr (service rate)

$$p = \frac{q}{NQ} = 0.6 \text{ (N = 10 valet runners)}$$

$$Q_M = 0.1013$$

Using Acceptable Probability of 5% (95% Confidence Level)

$$M = \left(\frac{Ln\ (x > M) - Ln\ (Q_M)}{Ln\ (p)} \right) - 1$$

$$M = \left(\frac{Ln(0.05) - Ln(0.1013)}{Ln(0.6)} \right) - 1$$

$$M = \left(\frac{-2.9957 - (-2.2897)}{-0.5108} \right) - 1$$

M = 1.4 – 1 = 0.4, say 1 vehicle

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location, a 5% probability of back-up onto the adjacent street is judged to be acceptable. Demand on the system for design is expected to be 110 vehicles in a 45-minute period. Average service time was expected to be 2.2 minutes. Is the queue storage adequate?

Such problems can be quickly solved using Equation (8–9b) given in Table 8-10 and repeated below for convenience.

$$M = \left[\frac{\ln P(x > M) - \ln Q_M}{\ln \rho}\right] - 1$$

where:

M = queue length which is exceeded p percent of the time
N = number of service channels (drive-in positions)
Q = service rate per channel (vehicles per hour)
$\rho = \dfrac{\text{demand rate}}{\text{service rate}} = \dfrac{q}{NQ}$ = utilization factor
q = demand rate on the system (vehicles per hour)
Q_M = tabled values of the relationship between queue length, number of channels, and utilization factor (see Table 8.11)

TABLE 8-11
Table of Q_M Values

	$N = 1$	2	3	4	6	8	10
0.0	0.0000	0.0000	0.0000	0.0000			
0.1	.1000	.0182	.0037	.0008	.0000	0.0000	0.0000
.2	.2000	.0666	.0247	.0096	.0015	.0002	.0000
.3	.3000	.1385	.0700	.0370	.0111	.0036	.0011
.4	.4000	.2286	.1411	.0907	.0400	.0185	.0088
.5	.5000	.3333	.2368	.1739	.0991	.0591	.0360
.6	.6000	.4501	.3548	.2870	.1965	.1395	.1013
.7	.7000	.5766	.4923	.4286	.3359	.2706	.2218
.8	.8000	.7111	.6472	.5964	.5178	.4576	.4093
.9	.9000	.8526	.8172	.7878	.7401	.7014	.6687
1.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

$\rho = \dfrac{q}{NQ} = \dfrac{\text{arrival rate, total}}{(\text{number of channels})(\text{service rate per channel})}$

N = number of channels (service positions)

0.6000 = 0.1013

Solution

Step 1: $Q = \dfrac{60 \text{ min/hr}}{2.2 \text{ min/service}} = 27.3$ services per hour

Step 2: $q = (110 \text{ veh}/45 \text{ min}) \times (60 \text{ min/hr}) = 146.7$ vehicles per hour

Step 3: $\rho = \dfrac{q}{NQ} = \dfrac{146.7}{(6)(27.3)} = 0.8956$

Step 4: $Q_M = 0.7303$ by interpolation between 0.8 and 0.9 for $N = 6$ from the table of Q_M values (see Table 8-11).

Step 5: The acceptable probability of the queue, M, being longer than the storage, 18 spaces in this example, was stated to be 5%. $P(x > M) = 0.05$, and:

$$M = \left[\frac{\ln 0.05 - \ln 0.7303}{\ln 0.8956}\right] - 1 = \left[\frac{-2.996 - (-0.314)}{-0.110}\right] - 1$$

$$= 24.38 - 1 = 23.38, \text{ say } 23 \text{ vehicles.}$$