Transportation Technical Analysis

American University 2011 Campus Plan

Washington, DC

March 11, 2011

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INTRODUCTION

This report contains the Transportation Technical Analysis in support of the American University 2011 Campus Plan. American University is located at the intersection of Massachusetts Avenue and Nebraska Avenue at Ward Circle in Northwest, Washington, D.C. The University has approximately 10,800 students and 1,700 faculty/staff.

The primary objective of this analysis is to identify the impacts of the 2011 American University Campus Plan. This report accomplishes that by evaluating vehicular and pedestrian capacity and delay in a future scenario without development of the 2011 Plan to a scenario with development of the 2011 Plan. This report focuses on the existing transportation network within the vicinity of the site, the transportation elements of the proposed 2011 Plan, and the possible impacts to the transportation network. The report also outlines short- and long-term recommendations to mitigate potential impacts of the 2011 Campus Plan.

Report Organization and Summary

This report is organized into two parts; the first part of the report focuses on the American University Main Campus, while the second part focuses on the Tenley Campus. For each campus, the report is comprised of three sections: the first section summarizes the existing conditions of University transportation facilities and services, the second section analyses the future conditions without the proposed 2011 Plan, and the third section analyses the future conditions with the proposed 2011 Plan.

The findings of this technical report were used in the development of the 2011 American University Campus Plan and the recommendations detailed in the *Transportation Report* that accompanies the Campus Plan submittal.

Report Scope

Gorove/Slade took the following actions as part of this study:

- Established a scope of work during meetings with the University;
- Reviewed University and neighborhood transportation studies compiled since 2000;
- Met with the University to identify existing conditions, concerns, and opportunities;
- Conducted several campus visits to establish existing conditions, concerns, and opportunities;
- Conducted field reconnaissance of existing roadway and intersection geometrics, traffic controls, speed limits and operations;
- Performed morning and afternoon peak period turning movement counts at the study intersections;
- Determined the existing levels of service at the study intersections;
- Compiled parking usage surveys to determine the parking demand;
- Assembled list of concerns and opportunities;
- Aided the Campus Plan team in refining plan alternatives and the selected 2011 Plan;
- Constructed a traffic model of campus based on available data and observations to evaluate and refine the recommendations of the 2011 Plan;

- Analyzed future conditions with and without the 2011 Plan to determine potential impacts due to development on the Main Campus, East Campus, and Tenley Campus;
- Analyzed existing Transportation Demand Management (TDM) program and recommended future steps to be included in the TDM program; and
- Compiled Transportation Report and Technical Analysis.

DETAILED CAPACITY ANALYSIS – MAIN CAMPUS

Existing Conditions

Site Location and Major Transportation Features

American University is located in the northwest portion of Washington, DC, in Ward 3. The University is located in an area of the District that is primarily residential, with a few private and public developments and transportation projects located nearby.

The location of the University Main Campus, as shown in Figure 1, is primarily bounded by Massachusetts Avenue on the north, Rockwood Parkway on the south, University Avenue on the west, and Nebraska Avenue on the east. (For the purpose of this analysis, Nebraska Avenue is assumed to have a north-south alignment, and Massachusetts Avenue is assumed to have an east-west alignment.) The Main Campus is served by several arterials including Massachusetts Avenue, Nebraska Avenue, and Wisconsin Avenue. Major collector roadways include Van Ness Street, 46th Street, and Glenbrook Parkway. The University is also served by several public transportation sources, including Metrorail and Metrobus. Additionally, the University also provides a free shuttle for students and faculty/staff that connects the Main Campus, Law School, Tenley Campus, and Metrorail station.

The Main Campus is also served by a pedestrian network consisting of sidewalks and crosswalks along the local streets surrounding the project site. In addition to pedestrian accommodations, the site is also served by the on- and off-street bicycle network, which consists of bike lanes and signed bicycle routes along local roadways.

Site Access and Existing Road Network

Regional access for the American University Main Campus is provided primarily by Massachusetts Avenue and Nebraska Avenue. Local access is also provided by 46th Street, Tilden Street, University Avenue, New Mexico Avenue, 45th Street, Rockwood Parkway, Newark Street, and Glenbrook Road. Figure 2 shows the street network hierarchy for the study area, as well as the average annual weekday traffic volumes for the heavily travelled roadways.

Gorove/Slade conducted field reconnaissance to obtain the existing lane usage and traffic controls at the intersections within the Main Campus study area. Figure 3, Figure 4, Figure 5, and Figure 6 present the roadway lane configurations and traffic control devices provided at the study intersections. Figure 7 presents the number of travel lanes on the roadways surrounding the AU Main Campus. For the purpose of this report, Nebraska Avenue is assumed to have a north-south orientation and Massachusetts Avenue is assumed to have an east-west orientation. The physical and service characteristics of the key roadways providing local site access are as follows:

- *Massachusetts Avenue*
  Massachusetts Avenue is a 4-lane arterial, which runs along the north side of the American University Main Campus. The roadway is classified by DDOT as a primary arterial with average annual weekday traffic of 20,900 vehicles. Within the limits of the study area, Massachusetts Avenue runs from 46th Street to Nebraska Avenue.

- *Nebraska Avenue*
  Nebraska Avenue is a 4-lane arterial, which runs along the east side of the American University Main Campus. The roadway is classified by DDOT as a primary arterial with average annual weekday traffic of 24,500 vehicles. Within the limits of the study area, Nebraska Avenue runs from Massachusetts Avenue to Rockwood Parkway.

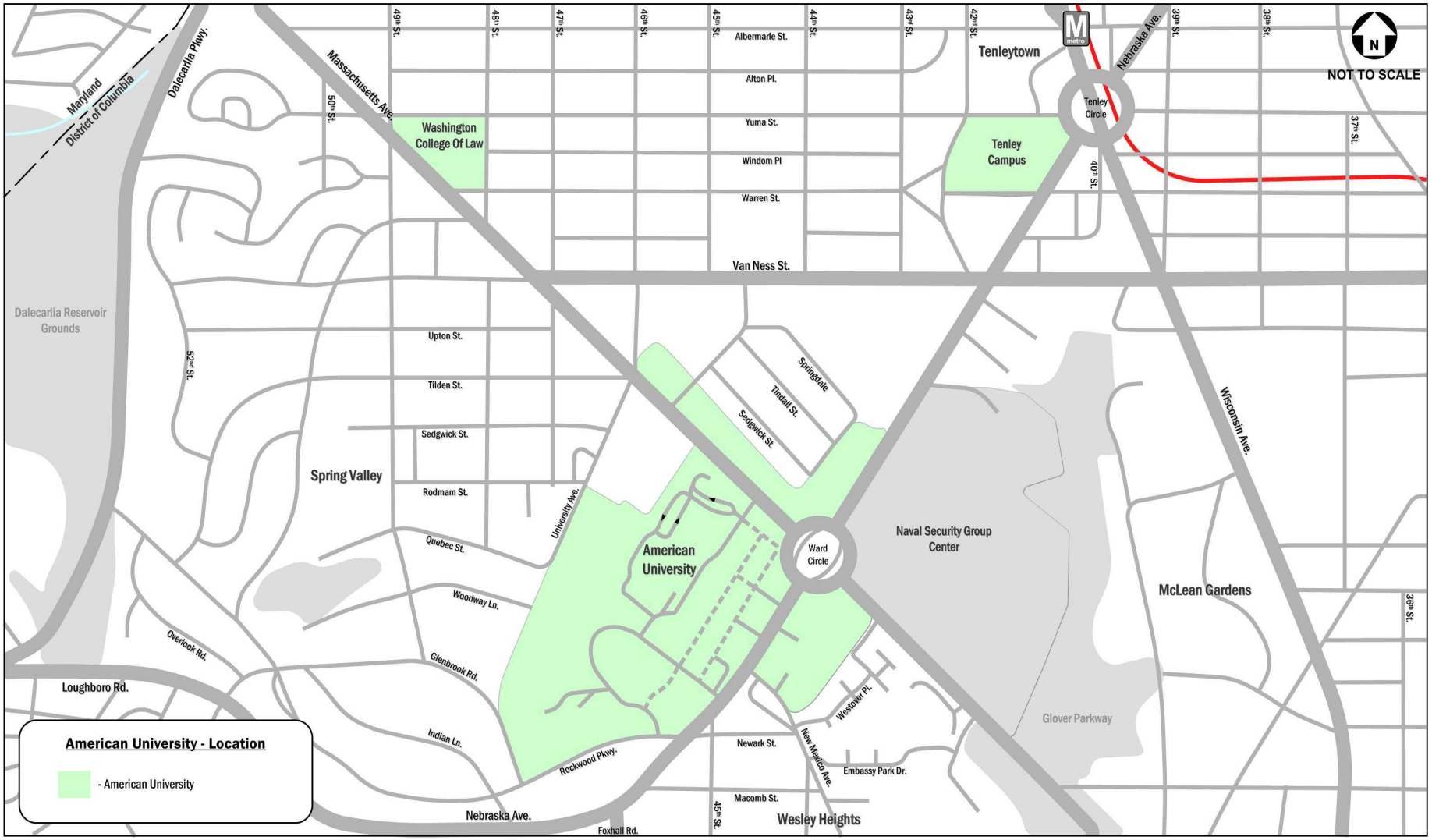

Figure 1: Campus Location

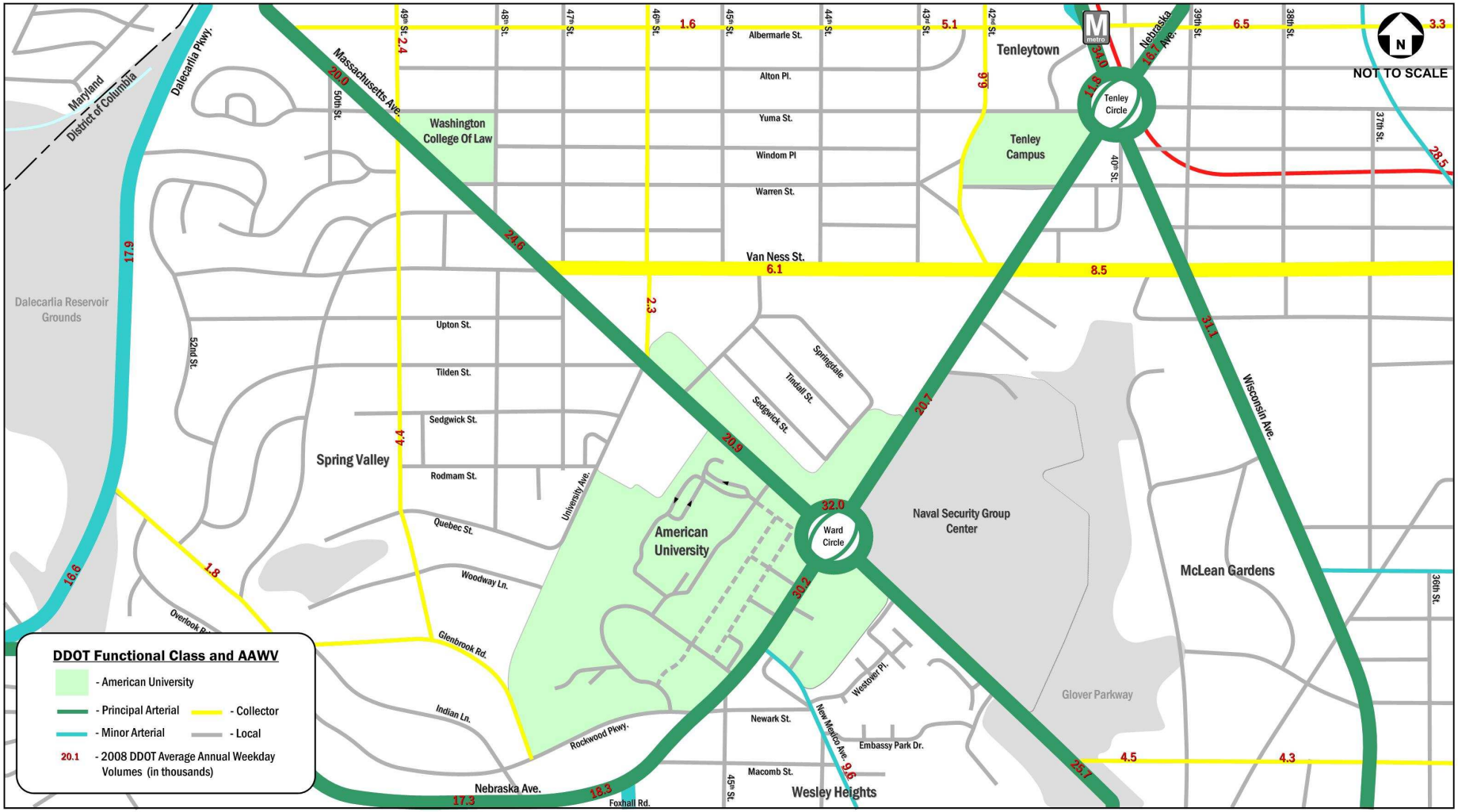

Figure 2: Functional Class and Average Annual Weekday Volumes

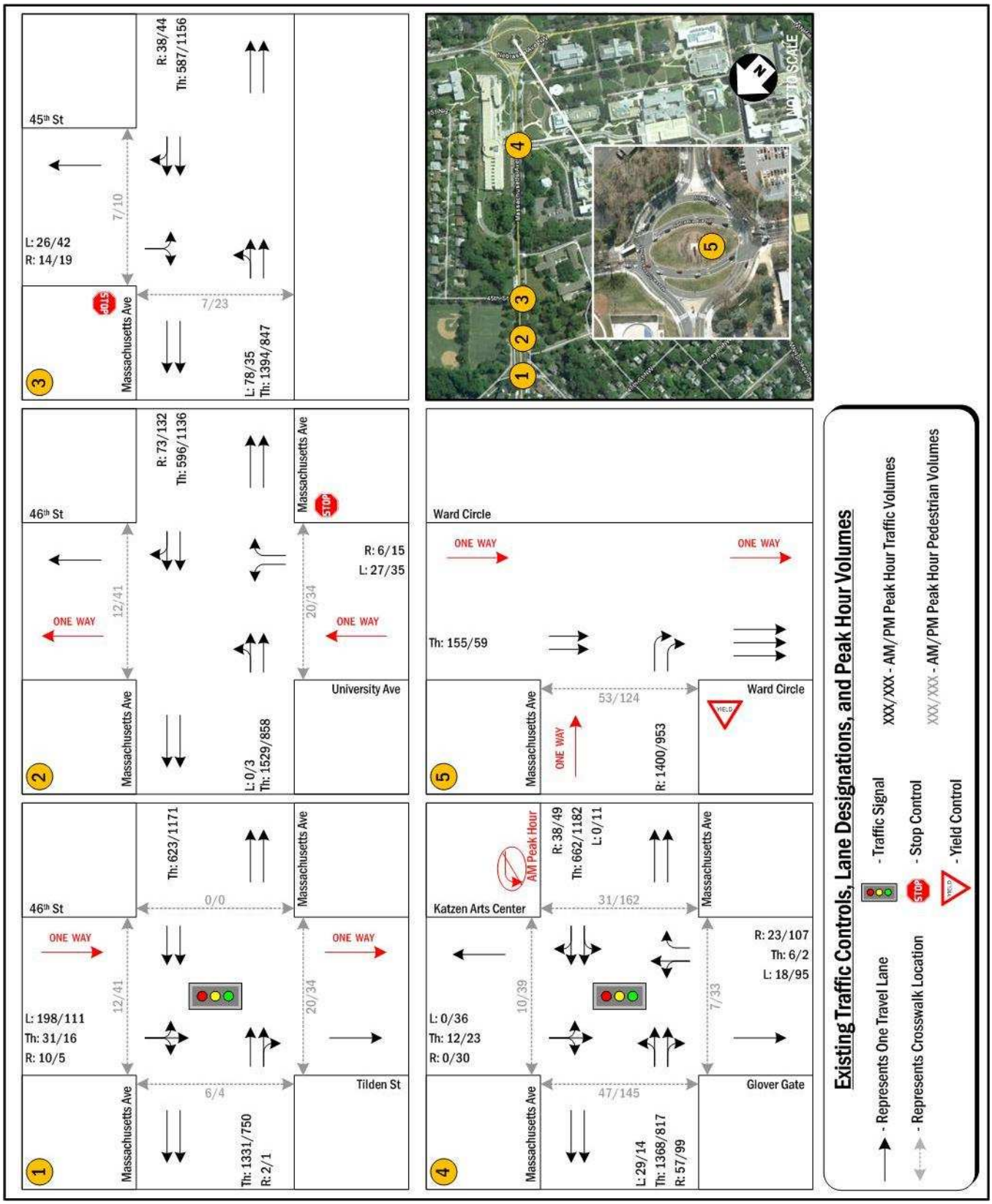

Figure 3: Main Campus – Existing Traffic Controls, Lane Designations, and Traffic Volumes (1 of 4)

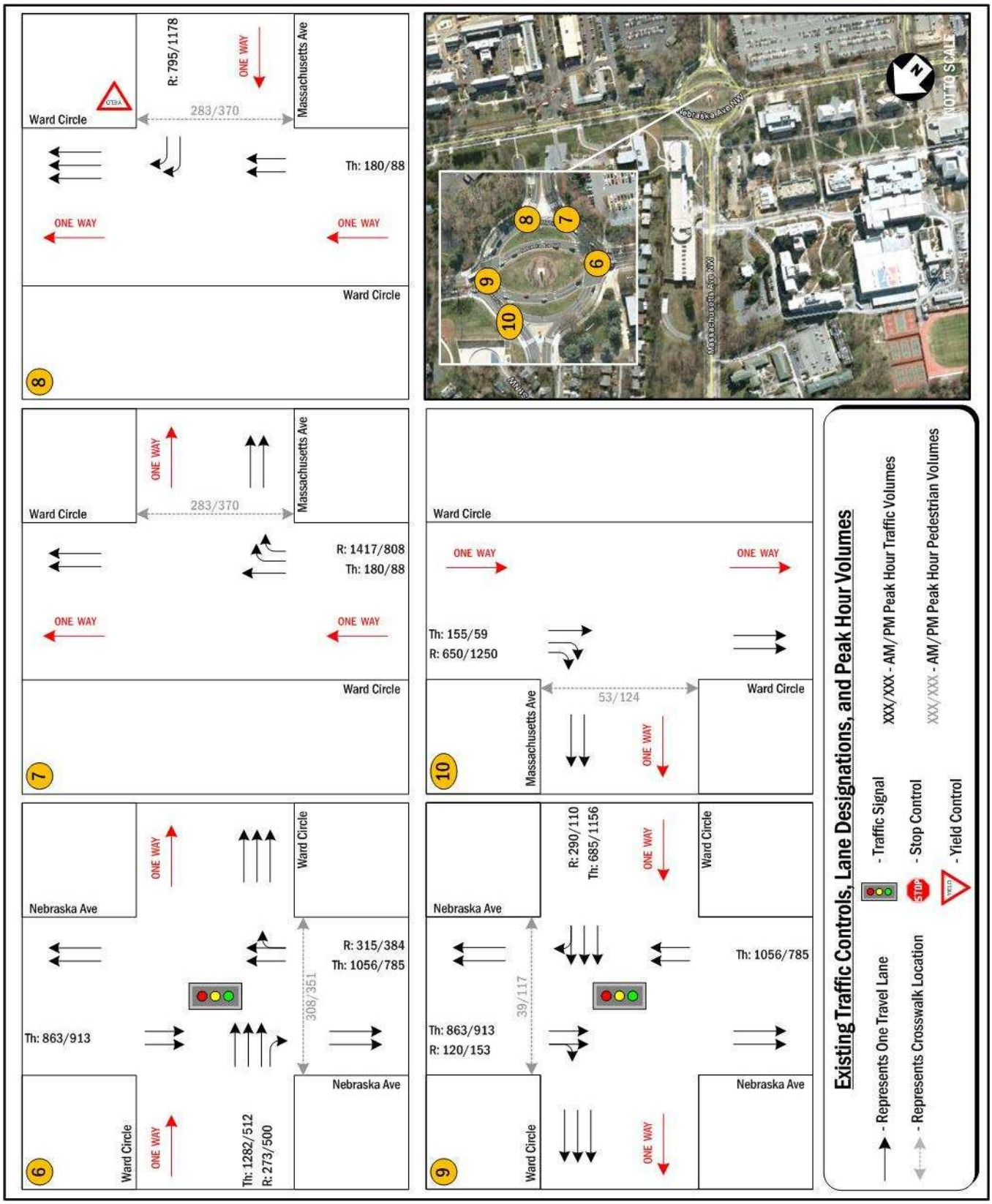

Figure 4: Main Campus – Existing Traffic Controls, Lane Designations, and Traffic Volumes (2 of 4)

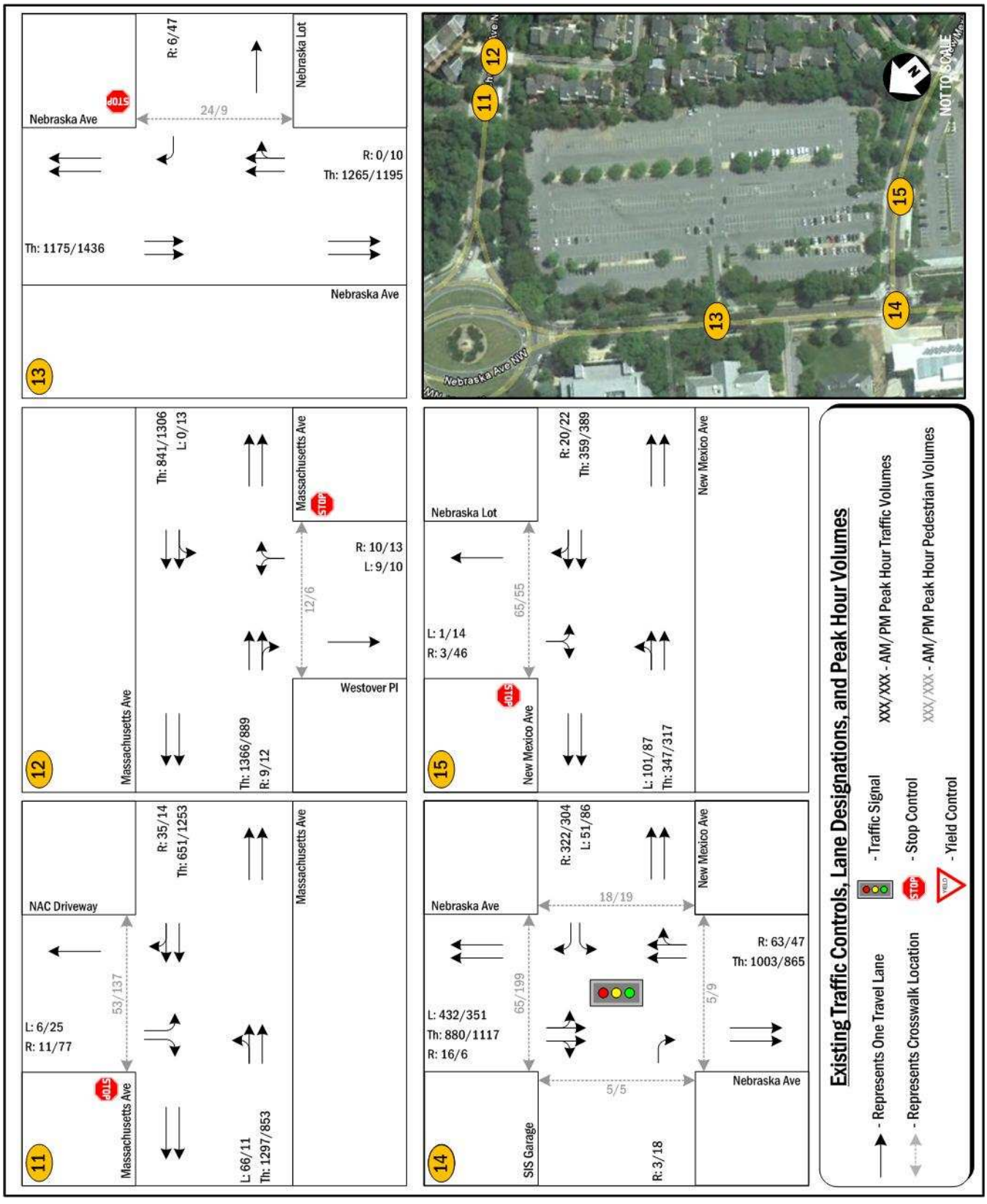

Figure 5: Main Campus – Existing Traffic Controls, Lane Designations, and Traffic Volumes (3 of 4)

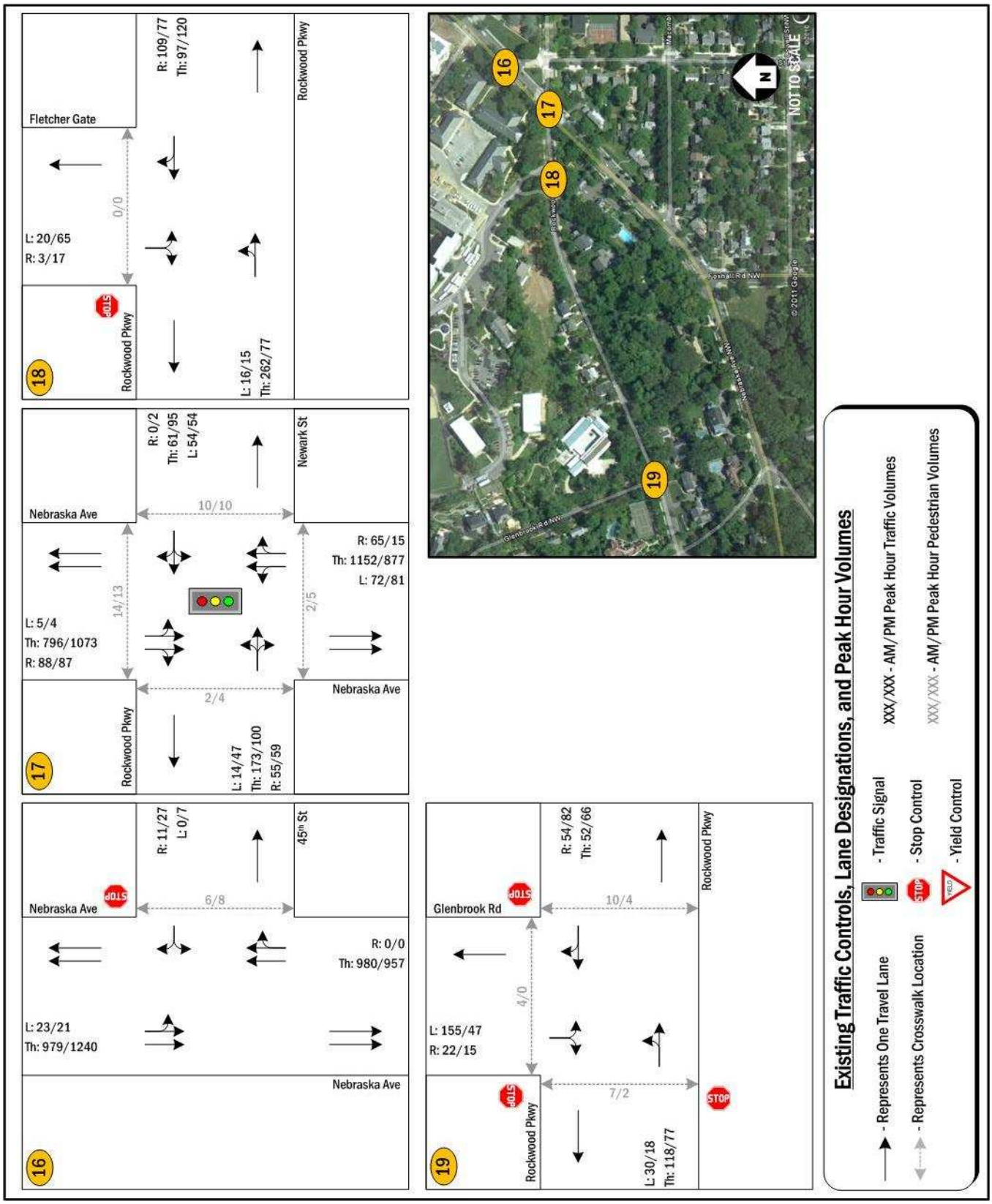

Figure 6: Main Campus – Existing Traffic Controls, Lane Designations, and Traffic Volumes (4 of 4)

Figure 7: Main Campus – Existing Number of Travel Lanes

- *46th Street*

  North of the American University Main Campus, 46th Street is a 2-lane roadway. The roadway is classified by DDOT as a collector with average annual weekday traffic of 2,300 vehicles. Within the limits of the study area, 46th Street intersects Massachusetts Avenue on the northwest corner of the Main Campus.

- *Tilden Street*

  Tilden Street is a 2-lane roadway, west of the American University Main Campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Tilden Street intersects Massachusetts Avenue on the northwest corner of the Main Campus.

- *University Avenue*

  University Avenue is a 2-lane roadway, west of the American University Main Campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, University Avenue intersects Massachusetts Avenue on the northwest corner of the Main Campus.

- *New Mexico Avenue*

  New Mexico Avenue is a 4-lane roadway, east of the American University Main Campus. The roadway is classified by DDOT as a minor arterial with average annual weekday traffic of 9,600 vehicles. Within the limits of the study area, New Mexico Avenue intersects Nebraska Avenue on the southeast side of the Main Campus.

- *45th Street*

  South of the American University Main Campus, 45th Street is a 2-lane roadway. The roadway is classified by DDOT as a local road. Within the limits of the study area, 45th Street intersects Nebraska Avenue on the southeast corner of the Main Campus.

- *Rockwood Parkway*

  Rockwood Parkway is a 2-lane roadway, south of the American University Main Campus. The roadway is classified by DDOT as a collector with average annual weekday traffic of 1,800 vehicles. Within the limits of the study area, Rockwood Parkway runs from Glenbrook Road to Nebraska Avenue.

- *Newark Street*

  Newark Street is a 2-lane roadway, south of the American University Main Campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Newark Street intersects Nebraska Avenue on the southeast corner of the Main Campus.

- *Glenbrook Road*

  Glenbrook road is a 2-lane roadway, west of the American University Main Campus. The roadway is classified by DDOT as a collector. Within the limits of the study area, Glenbrook Road intersects Rockwood Parkway on the southwest corner of the Main Campus.

Site access for the Main Campus is provided by three gates that provide direct access to campus, as well as two access points to the Nebraska Avenue Parking Lot and one access point to the SIS Parking Garage. Figure 8 shows the primary access points on the AU Main Campus.

Figure 8: Main Campus – Site Access Locations

The primary access for the AU Main Campus is Glover Gate, which is located on the north side of the American University Main Campus, along Massachusetts Avenue. Glover Gate intersects Massachusetts Avenue at a signalized intersection, across from access to the Katzen Arts Center and parking garage. Secondary access to the Main Campus is Fletcher Gate, which is located on the south side of the American University Main Campus, along Rockwood Parkway. Fletcher Gate intersects Rockwood Parkway at an unsignalized intersection. Woods Gate along the east side of the Main Campus provides access to a small parking lot but not the remainder of campus. All other campus gates are closed to vehicular traffic. Access to the Nebraska Avenue Parking Lot is provided by a right-in, right-out intersection on Nebraska Avenue and a full access unsignalized intersection on New Mexico Avenue. Access to the SIS Parking Garage is provided by a right-in, right-out driveway at the intersection of Nebraska Avenue and New Mexico Avenue.

Existing Traffic Volumes

Traffic counts, including vehicular and pedestrian volumes, were conducted by Gorove/Slade at the key study intersections between the hours of 6:00 to 9:00 AM and 3:00 to 7:00 PM on Thursday, September 23, 2010 and Tuesday, September 28, 2010. These count dates represent a typical weekday when classes are in session for the University. The results of the traffic counts are included in the Technical Attachments. The morning and afternoon peak hours for the system of intersections studied occur between 7:45 and 8:45 am and 5:15 and 6:15 pm, respectively. The majority of the intersections contained in the vehicular capacity analysis contain data collected by Gorove/Slade. However, data for a few of the study intersections was obtained from Kimley-Horn and Associates, Inc. from the *Transportation Study* performed for the U.S. Department of Homeland Security Nebraska Avenue Complex Master Plan "Draft Environmental Impact Statement" issued on January 14, 2011. Peak hour traffic volumes are shown on Figure 3, Figure 4, Figure 5, and Figure 6.

Field Observations

Observations of the study intersections were performed by Gorove/Slade in order to determine the lane configurations and signal timings. During these observation periods, remarks were noted in regards to signal operation. These observations were used to confirm the capacity analysis results for the existing conditions. The following observations were recorded for the intersections within the study area where data was collected by Gorove/Slade:

- *Massachusetts Avenue and Tilden Street/46th Street*

  During the morning peak period, the intersection operated under acceptable conditions. The intersection was most heavily trafficked by vehicles traveling eastbound on Massachusetts Avenue. Vehicles arrived mostly in platoons from an upstream intersection. Eastbound progression along Massachusetts Avenue was timed well, with platoons arriving as the signal turned to a green phase. Traffic traveling westbound on Massachusetts Avenue was not as heavy. Vehicles traveling westbound also arrived in platoons from an upstream intersection. The east- and westbound movements experienced short queue development of 3-4 vehicles. The majority of vehicles traveling southbound from 46th Street turned left onto Massachusetts Avenue eastbound. Southbound vehicles incurred an acceptable amount of delay, though long queues of 8-10 vehicles developed during the east- and westbound green time.

  During the afternoon peak period, the intersection also operated under acceptable conditions. The intersection was most heavily trafficked by vehicles traveling westbound on Massachusetts Avenue. Traffic traveling eastbound on Massachusetts Avenue was significant but not as heavy. The east- and westbound movements experienced short queue development of 3-4 vehicles. Southbound vehicles incurred an acceptable amount of delay, with queues of 4-6 vehicles developing during the east- and westbound green time.

Very little pedestrian activity was observed during the morning and afternoon peak periods.

- *Massachusetts Avenue and University Avenue/46th Street*

  During the morning peak period, the intersection operated under acceptable conditions. East- and westbound traffic free-flowed through the intersection, incurring little to no delay. A small amount of traffic was observed traveling northbound. Vehicles were able to turn on to Massachusetts Avenue due to large gaps in east- and westbound traffic. However, vehicles frequently waited for an unacceptable amount of time for an acceptable gap.

  During the afternoon peak period, similar traffic conditions were observed. East- and westbound traffic free-flowed through the intersection, and a small amount of traffic was observed traveling northbound. Vehicles did not experience an unacceptable amount of delay.

  Very little pedestrian activity was observed during the morning and afternoon peak periods.

- *Massachusetts Avenue and Glover Gate/Katzen Arts Center*

  The intersection operated under acceptable conditions during the morning peak period. The majority of traffic was traveling eastbound on Massachusetts Avenue. The eastbound approach experienced a small amount of delay during the north- and southbound green time. The westbound approach had a high volume of vehicles as well, with a small amount of delay incurred during the north- and southbound green time. East- and westbound queues of 3-4 vehicles developed. Only a small number of vehicles were observed traveling north- and southbound.

  The intersection operated under similar conditions during the afternoon peak period. However, the majority of traffic was traveling westbound on Massachusetts Avenue. East- and westbound queues of 3-4 vehicles developed during the north- and southbound green time. An increase in north- and southbound vehicular traffic was observed, with vehicles exiting the campus. North- and southbound queues of approximately 3-4 vehicles developed.

  The green time allocated to the north- and southbound approaches appeared to be provided for pedestrian traffic. There were few vehicles observed during the morning and afternoon peak hours on the north- and southbound approaches of the intersection. However, the signal remained green in order to provide adequate time for pedestrians to cross Massachusetts Avenue. The majority of pedestrians observed during the morning and afternoon peak periods appeared to travel across Massachusetts Avenue from the bus stop adjacent to the intersection. Some east- and westbound pedestrians were observed. Most of the pedestrians appeared to utilize the crosswalks and pedestrian signals.

- *Ward Circle – Massachusetts Avenue and Nebraska Avenue*

  Ward Circle experienced an acceptable amount of delay during the morning peak period. The east- and westbound approaches at the yield-controlled intersections of Massachusetts Avenue with the Circle experienced a small amount of delay due to heavy traffic volumes within the Circle. Eastbound queues of 4-6 vehicles and queues of approximately 2-3 vehicles developed. The north- and southbound approaches at the signalized intersections of Nebraska Avenue with the Circle incurred a higher amount of delay due to vehicles stuck within the through movement of the Circle. The vehicles within the Circle cleared the intersection during the allotted north- and southbound green time. Queues of 6-8 vehicles developed for the north- and southbound approaches. Near the end of the morning peak period, a high amount of delay was observed for the northbound approach of Nebraska Avenue. This was due to vehicles parked along the northbound lanes, constricting the roadway from 2 lanes to 1

lane north of Ward Circle. In addition to the roadway constriction, an event was observed at the Japanese Embassy on Nebraska Avenue north of Massachusetts Avenue, which caused traffic to back up behind vehicles turning left into the Embassy.

Ward Circle operated near capacity during the afternoon peak period. The east- and westbound approaches (yield to traffic in circle) appeared to experience a small amount of delay due to heavy traffic volumes within the circle. East- and westbound queues of 4-6 vehicles developed. The north- and southbound approaches appeared to incur a higher amount of delay due to vehicles stuck within the through movement of the circle, which caused queues of 8-10 vehicles to develop. Additionally, the westbound approach of Massachusetts Avenue experienced an unacceptable amount of delay due to heavy volumes of conflicting vehicles and pedestrians, resulting in queues of approximately 8-10 vehicles.

Few pedestrians were observed in Ward Circle during the morning peak period. The majority crossed Nebraska Avenue going westbound on Massachusetts Avenue from the commuter parking lot toward campus. A larger number of pedestrians were observed during the afternoon peak period. The majority crossed Nebraska Avenue going eastbound on Massachusetts Avenue from campus toward the commuter parking lot. Due to heavy traffic volumes, pedestrians appeared to utilize both crosswalks and pedestrian signals during both the peak hours.

- *Nebraska Avenue and the Nebraska Avenue Parking Lot*

  The intersection experienced little to no delay during the morning peak period. Due to the right-in/right-out configuration of the intersection, southbound traffic did not incur any delay. Very little traffic entered the parking lot from the northbound approach. During the observation, no traffic was observed exiting the parking lot.

  The intersection also experienced little to no delay during the afternoon peak period. Very little traffic entered the parking lot from the northbound approach. Traffic exiting the parking lot experienced some delay, with queues of 3-4 vehicles developing. Occasional northbound queues from Ward Circle extended back to the intersection, blocking exiting traffic.

  Some pedestrian activity was observed, with the majority of pedestrians traveling southbound on Nebraska Avenue. Although pedestrians are prohibited from crossing Nebraska Avenue at the intersection, some crossings were observed, with pedestrians weaving in between stopped vehicles.

- *Nebraska Avenue and New Mexico Avenue*

  The intersection experienced an acceptable amount of delay during the morning peak hour. The majority of traffic was traveling northbound on Nebraska Avenue. The northbound approach did not experience a significant amount of delay during the peak period. However, near the end of the morning peak period, northbound vehicles experienced delay extending from Ward Circle. This caused a long northbound queue to develop of 8-10 vehicles. Due to the southbound leading left-turn, the southbound movement was able to clear the intersection during the majority of the green time. Some southbound queuing was observed with 8-10 vehicles waiting to make the southbound left-turn. Only a small number of vehicles were observed traveling westbound. Due to pedestrians and northbound queues extending from Ward Circle, some queuing developed in the westbound right-turn lane of approximately 3-4 vehicles.

  The intersection experienced an acceptable amount of delay during the afternoon peak hour as well. The majority of traffic was traveling north- and southbound on Nebraska Avenue. The northbound approach did not experience a significant amount of delay. Significant southbound queuing was observed of 8-10 vehicles, which was caused by

vehicles waiting to make the southbound left-turn. Occasional northbound queues from Ward Circle extended back to the intersection, blocking vehicles turning right from New Mexico Avenue. Due to pedestrians and northbound queues extending from Ward Circle, some queuing developed in the westbound right-turn lane of 3-4 vehicles. Overall, westbound queues developed of 4-6 vehicles per cycle.

A significant number of pedestrians were observed during both the morning and afternoon peak periods, with the majority crossing westbound and eastbound, respectively, between the Main Campus and the Nebraska Avenue Parking Lot and an adjacent bus stop. Most of the pedestrians appeared to utilize the crosswalks and pedestrians signals due to heavy traffic volumes along the north- and southbound approaches.

- *New Mexico Avenue and the Nebraska Avenue Parking Lot*

  The intersection experienced little to no delay during the morning peak hour. The majority of traffic entering the parking lot was traveling eastbound on New Mexico Avenue, with very little traffic entering from the westbound approach. Some queuing was observed for the eastbound left-turn movement, with 3-4 vehicles yielding to pedestrians in the crosswalk. During the observation, no traffic was observed exiting the parking lot.

  Similar to the morning peak period, the intersection experienced little to no delay during the afternoon peak hour. The majority of traffic exiting the parking lot turned right and traveled westbound on New Mexico Avenue. During the observation, no traffic was observed entering the parking lot.

  Some pedestrian activity was observed during the morning and afternoon peak periods, with the majority of pedestrians traveling westbound and eastbound, respectively, on New Mexico Avenue between the Main Campus and the parking lot.

- *Nebraska Avenue and 45th Street*

  During the morning peak period, the intersection experienced little to no delay. Minor queuing was observed for the southbound left-turn movement on Nebraska Avenue, with 2-3 vehicles yielding to opposing northbound traffic. The northbound approach was heavily trafficked, but did not incur any delay. During the observation, very little traffic was observed on 45th Street.

  During the afternoon peak period, the intersection also experienced little to no delay. The north- and southbound approaches of Nebraska Avenue and the westbound approach of 45th Street was observed to operate similar to the morning peak period.

  No pedestrian traffic was observed during the morning and afternoon peak periods.

- *Nebraska Avenue and Rockwood Parkway*

  The intersection experienced an acceptable amount of delay during the morning peak period. The majority of traffic was traveling northbound on Nebraska Avenue. The southbound approach had a high volume of vehicles as well. North- and southbound queues of 1-2 vehicles and east- and westbound queues of 3-4 vehicles developed. Only a small number of vehicles were observed traveling east- and westbound, with a majority of those vehicles turning onto Nebraska Avenue.

  The intersection experienced an acceptable amount of delay during the afternoon peak period as well. The majority of traffic was traveling north- and southbound on Nebraska Avenue. North- and southbound queues of 6-8 vehicles and east- and westbound queues of 4-6 vehicles developed. Occasional northbound queues extended

from the intersection of Nebraska Avenue and New Mexico Avenue. Only a small number of vehicles were observed traveling east- and westbound, with a majority of those vehicles turning onto Nebraska Avenue.

Very little pedestrian traffic was observed during the morning and afternoon peak periods. Most of the pedestrians appeared to utilize the crosswalks and pedestrian signals.

- *Rockwood Parkway and Fletcher Gate*

  The intersection did not experience any delay during the morning peak period. The majority of traffic was traveling on Rockwood Parkway toward Nebraska Avenue. Only a small number of vehicles were observed turning into Fletcher Gate. A small number of vehicles were also observed exiting campus from Fletcher Gate, with little to no queue development.

  The intersection did not experience any delay during the afternoon peak period as well. The majority of traffic was also traveling on Rockwood Parkway toward Nebraska Avenue. A small number of vehicles were observed exiting campus from Fletcher Gate, with queue development of 2-3 vehicles.

  Very few pedestrians were observed during both the morning and afternoon peak periods, although all appeared to be travelling to and from campus via the Fletcher Gate.

- *Rockwood Parkway and Glenbrook Road*

  The intersection did not experience any delay during the morning peak hour. The majority of traffic appeared to be traveling on Rockwood Parkway toward Nebraska Avenue. Only a small number of vehicles were observed on Glenbrook Road, with little to no queue development.

  The intersection did not experience any delay during the afternoon peak hour as well. The majority of traffic was traveling on Rockwood Parkway toward Nebraska Avenue. Only a small number of vehicles were observed on Glenbrook Road, with little to no queue development.

  Very few pedestrians were observed during the morning and afternoon peak periods.

Existing Vehicular Capacity Analysis

Intersection capacity analyses were performed for the existing conditions at the intersections contained within the study area during the morning and afternoon peak hours. *Synchro, Version 7.0* was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. The majority of the intersections contained in the vehicular capacity analysis contain data collected by Gorove/Slade. However, data for a few of the study intersections was obtained from Kimley-Horn and Associates, Inc. from the *Transportation Study* performed for the U.S. Department of Homeland Security Nebraska Avenue Complex Master Plan "Draft Environmental Impact Statement" issued on January 14, 2011.

The results of the capacity analyses are expressed in level of service (LOS) and delay (seconds per vehicle) for each approach. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS E is typically used as the acceptable LOS threshold in the District; although LOS F is sometimes accepted in urbanized areas.

The existing LOS capacity analyses were based on: (1) the existing lane use and traffic controls; (2) the peak hour turning movement volumes; and (3) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). An average delay (of each approach) and LOS is shown for the signalized intersections, as well as an overall average delay and intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled

intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments.

Table 1 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds). The capacity analysis results are also shown on Figure 9, Figure 10, Figure 11, and Figure 12. The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours.

Table 1: Main Campus – Existing Vehicular Levels of Service

Intersection	Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/Tilden St	**Overall**	**16.0**	**B**	**10.0**	**A**
	Eastbound	17.3	B	7.8	A
	Westbound	8.0	A	8.7	A
	Southbound	29.4	C	34.3	C
Massachusetts Ave & 46th St/University Ave	Eastbound Left	0.0	A	0.2	A
	Northbound	99.4	F	23.2	C
Massachusetts Ave & 45th St	Eastbound Left	2.4	A	2.0	A
	Southbound	16.1	C	33.0	D
Massachusetts Ave & Glover Gate/Katzen Arts Center	**Overall**	**10.2**	**B**	**12.5**	**B**
	Eastbound	7.2	A	6.0	A
	Westbound	14.8	B	11.1	B
	Northbound	29.5	C	39.5	D
	Southbound	29.2	C	38.4	D
Ward Circle:					
Massachusetts Ave & Ward Circle (West side)	Eastbound Right	29.7	D	17.8	C
Nebraska Ave & Ward Circle (South side)	**Overall**	**59.0**	**E**	**37.0**	**D**
	Eastbound	15.7	B	34.8	C
	Northbound	137.8	F	58.8	E
	Southbound	11.5	B	11.5	B
Massachusetts Ave & Ward Circle (East side)	Westbound Right	47.2	E	276.5	F
Nebraska Ave & Ward Circle (North side)	**Overall**	**18.1**	**B**	**23.4**	**C**
	Westbound	13.6	B	16.9	B
	Northbound	15.0	B	11.6	B
	Southbound	25.9	C	39.7	D
Massachusetts Ave & NAC Driveway	Eastbound Left	2.3	A	1.0	A
	Southbound	25.0	C	51.3	F
Massachusetts Ave & Westover Place	Westbound Left	0.0	A	0.6	A
	Northbound	52.4	F	52.3	F
Nebraska Ave & Commuter Lot (RIRO)	Westbound Right	9.5	A	9.7	A
Nebraska Ave & New Mexico Ave	**Overall**	**21.5**	**C**	**19.1**	**B**
	Eastbound	36.1	D	35.4	D
	Westbound	28.7	C	28.9	C
	Northbound	14.4	B	15.3	B
	Southbound	25.2	C	18.6	B
New Mexico Ave & Commuter Lot	Eastbound Left	4.7	A	4.5	A
	Southbound	13.7	B	14.4	B

Intersection	Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Nebraska Ave & 45th St	Southbound Left	1.0	A	0.8	A
	Westbound	9.2	A	12.2	B
Nebraska Ave & Rockwood Pkwy	**Overall**	**12.9**	**B**	**12.3**	**B**
	Eastbound	40.9	D	39.8	D
	Westbound	38.6	D	38.6	D
	Northbound	12.6	B	11.2	B
	Southbound	2.2	A	5.0	A
Rockwood Pkwy & Fletcher Gate	Eastbound Left	0.6	A	1.3	A
	Southbound	11.5	B	10.6	B
Rockwood Pkwy & Glenbrook Rd	**Overall**	**8.7**	**A**	**7.7**	**A**
	Eastbound	8.7	A	7.8	A
	Westbound	7.9	A	7.6	A
	Southbound	9.1	A	7.9	A

For the purpose of this analysis, it is desirable to achieve a level of service (LOS) of "E" or better on each approach. As stated previously, all study area intersections operate at acceptable levels of service during the morning and afternoon peak hours. However, several approaches operate with unacceptable levels of service during one or more peak hours. The results from the capacity analyses confirm what was observed in the field.

- All of the study intersections operate (overall LOS grade) at acceptable conditions during both the morning and afternoon peak hours.
- The northbound approach of University Avenue at Massachusetts Avenue and 46th Street operates under unacceptable conditions during the morning peak period. This was observed in the field, with vehicles travelling northbound on University Avenue waiting for long periods for an acceptable gap in east- and westbound vehicular traffic.
- The northbound approach of Nebraska Avenue at Ward Circle operates above capacity during the morning peak period and near capacity during the afternoon peak period. This was observed in the field, with northbound vehicles queuing at Ward Circle due to heavy traffic volumes and vehicles stuck within the Circle.
- The westbound approach of Massachusetts Avenue at Ward Circle operates at capacity during the morning peak period and above capacity during the afternoon peak period. This was observed in the field, with vehicles waiting to enter Ward Circle due to heavy pedestrian volumes and conflicting vehicles.
- The southbound approach of the NAC Driveway at Massachusetts Avenue operates at an unacceptable level of service during the afternoon peak period. This condition was also noted for the existing conditions in the Nebraska Avenue Complex (NAC) *Transportation Study* performed by Kimley-Horn.
- The northbound approach of Westover Place at Massachusetts Avenue operates at an unacceptable level of service during the morning and afternoon peak periods.

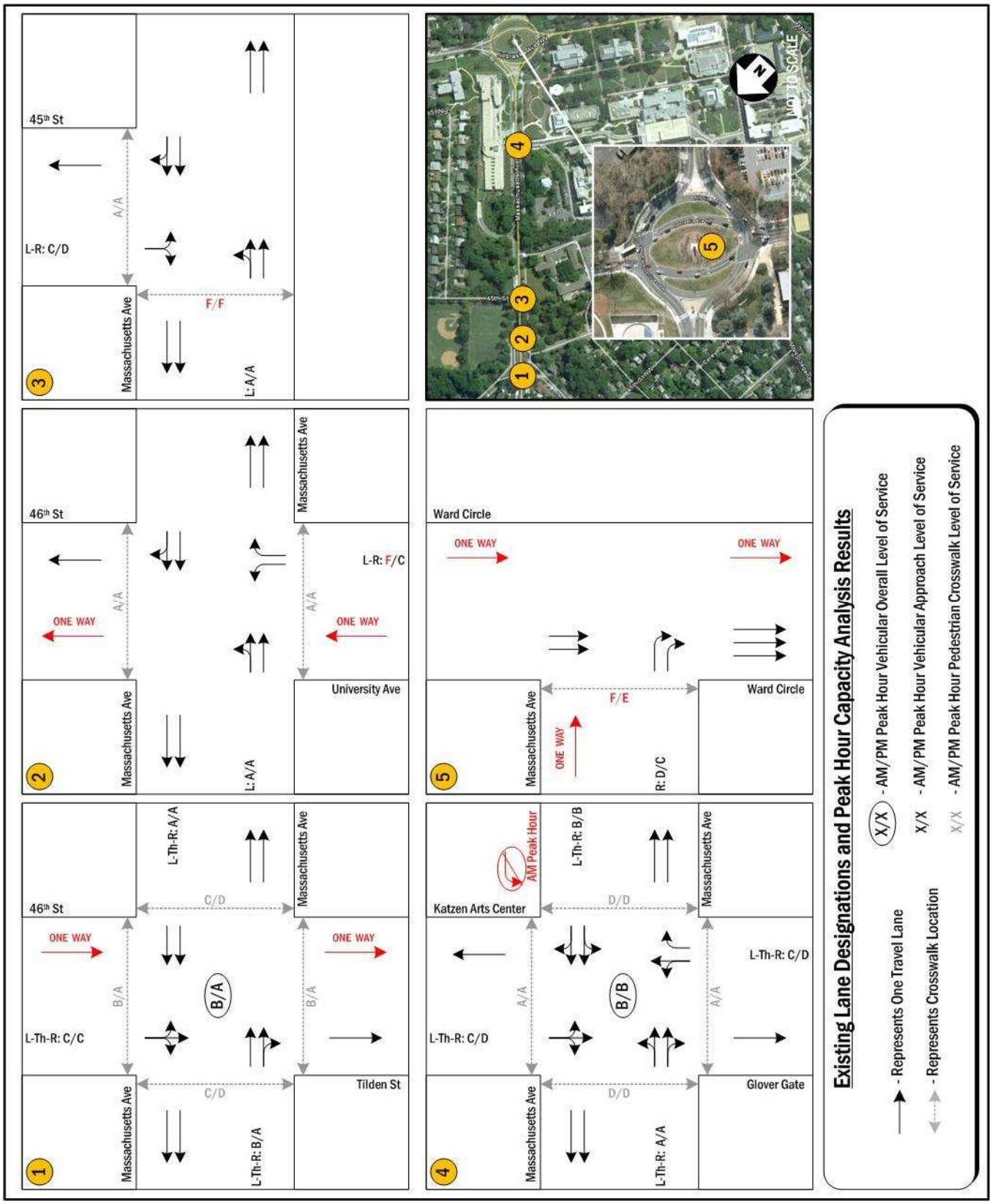

Figure 9: Main Campus – Existing Lane Configurations and Capacity Analysis Results (1 of 4)

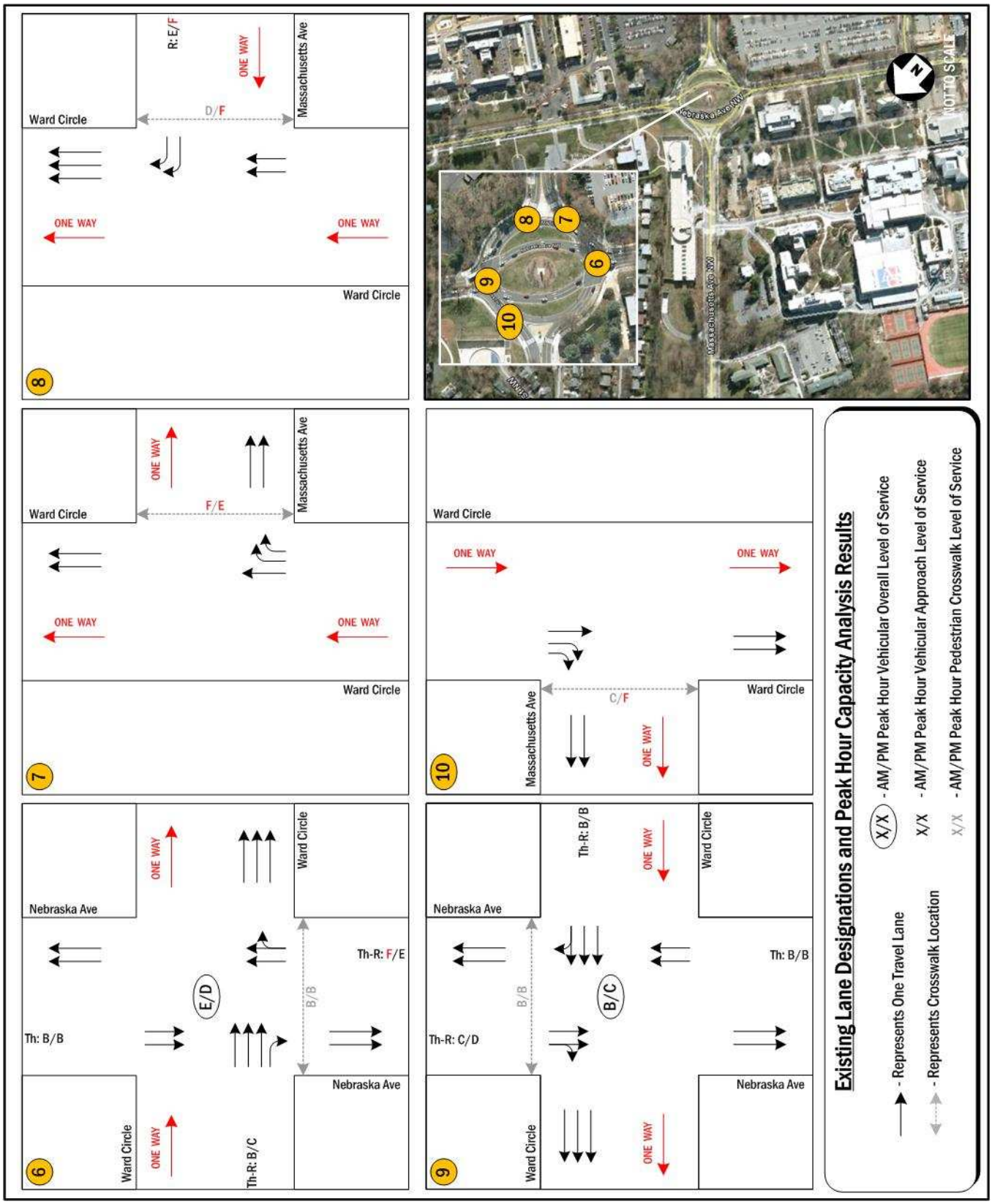

Figure 10: Main Campus – Existing Lane Configurations and Capacity Analysis Results (2 of 4)

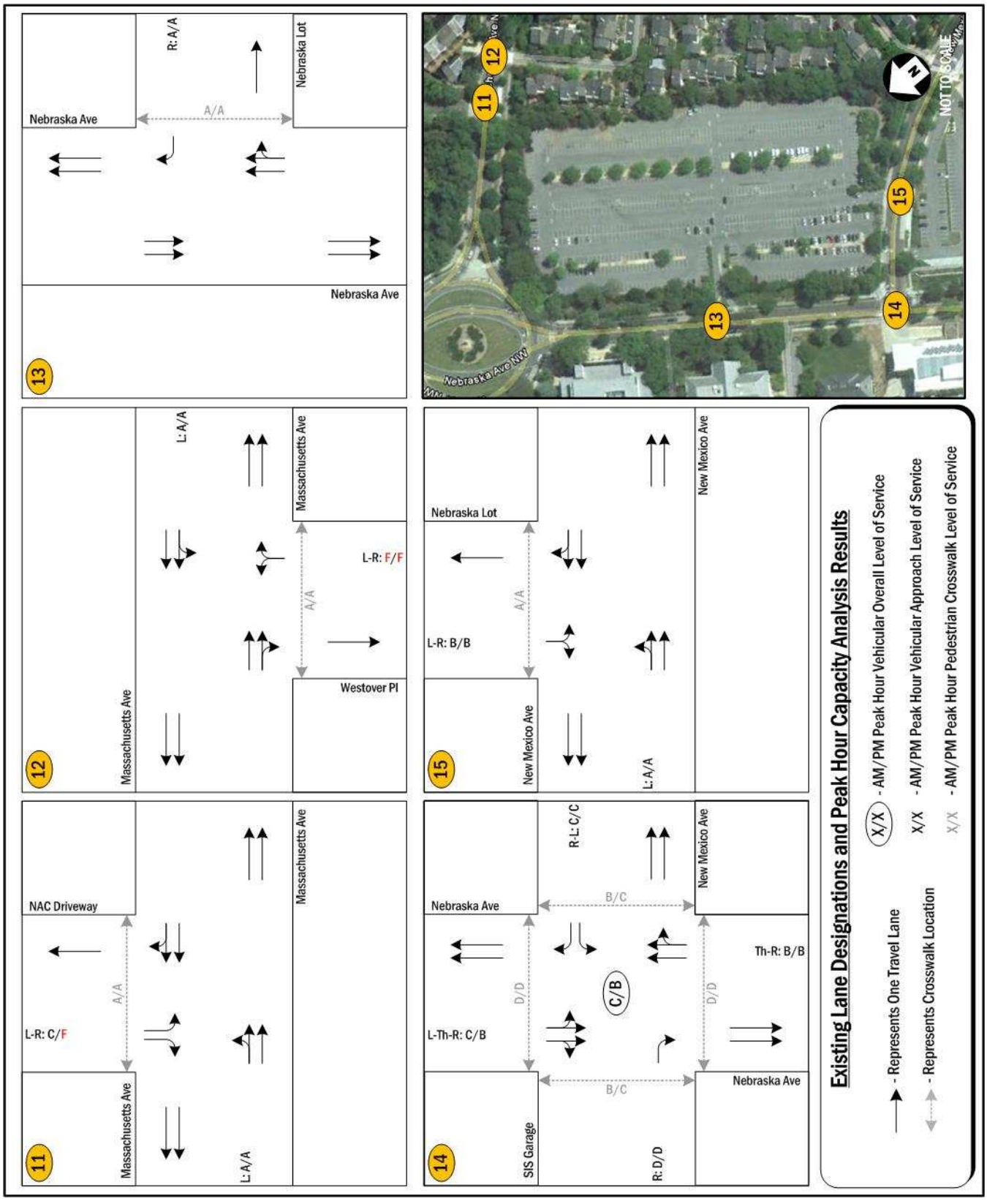

Figure 11: Main Campus – Existing Lane Configurations and Capacity Analysis Results (3 of 4)

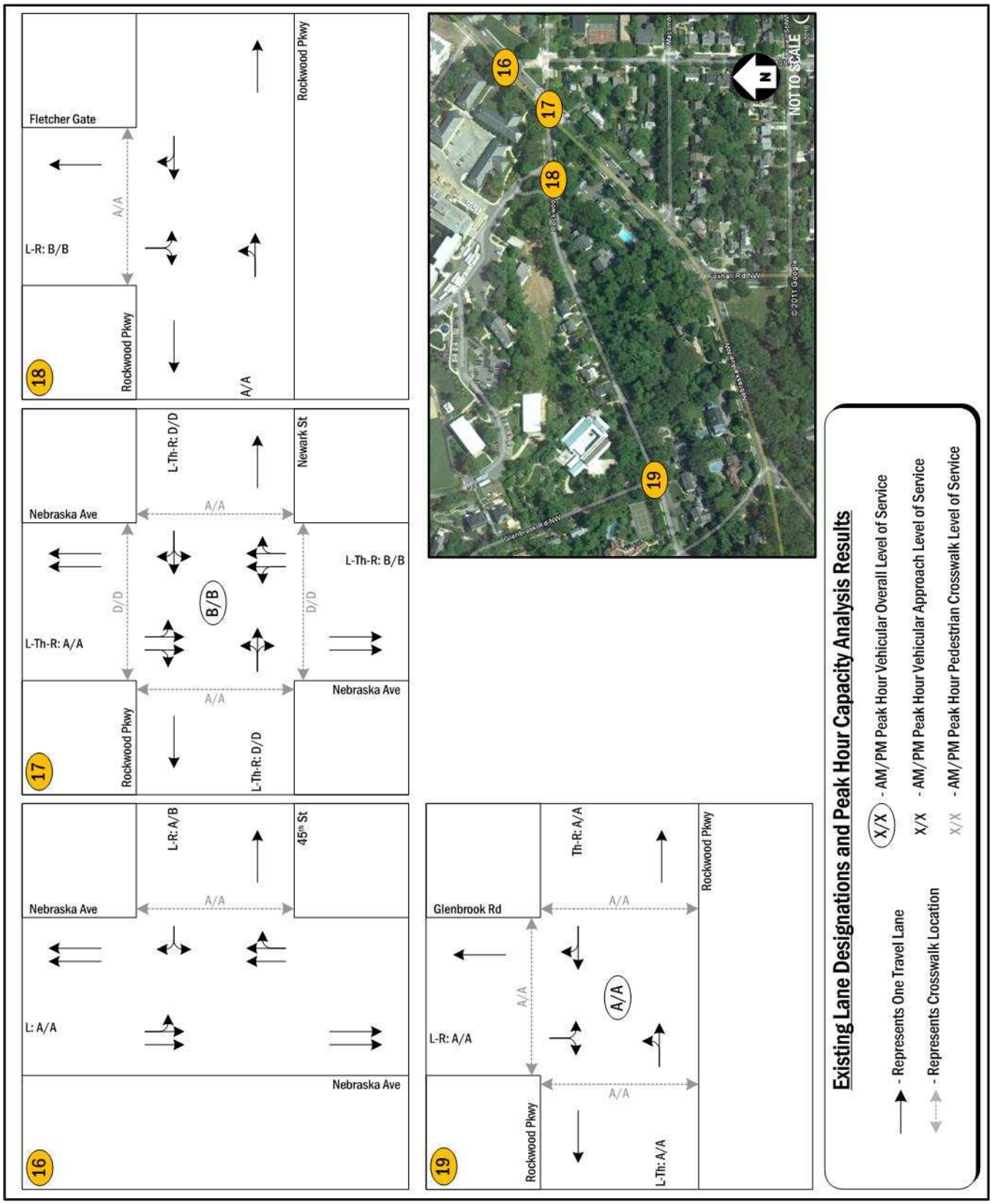

Figure 12: Main Campus – Existing Lane Configurations and Capacity Analysis Results (4 of 4)

Comparison of 2010 and 2000 Capacity Analysis Results

The results of the existing capacity analysis show some notable changes from the capacity analysis performed for the 2000 Campus Plan, as shown in Table 2. The intersections of Nebraska Avenue & Rockwood Parkway and of Rockwood Parkway & Fletcher Gate did not experience any significant changes in level of service between the 2000 and 2010 capacity analyses. The following changes in level of service were observed between the 2000 and 2010 capacity analyses:

- *Massachusetts Avenue & 46th Street/Tilden*
  Morning peak hour overall LOS improved from LOS C in 2000 to LOS B in 2010, and afternoon peak hour overall LOS improved from LOS B to LOS A.

- *Massachusetts Avenue & Glover Gate/Katzen Arts Center*
  Morning peak hour overall LOS degraded from LOS A in 2000 to LOS B in 2010.

- *Massachusetts Avenue & Nebraska Avenue (Ward Circle)*
  Morning/afternoon peak hour LOS improved from LOS E/F and E/C in 2000 to LOS E/D and B/C in 2010 at the southern and northern signalized intersections within Ward Circle, respectively.

- *Nebraska Avenue & Commuter Lot*
  Morning and afternoon peak hour LOS improved from LOS B/C in 2000 to LOS A/A in 2010 for the westbound right-turn.

- *Nebraska Avenue & New Mexico Avenue*
  Morning peak hour overall LOS degraded from LOS B in 2000 to LOS C in 2010, and afternoon peak hour LOS improved from LOS C in 2000 to LOS B in 2010.

- *New Mexico Avenue & Commuter Lot*
  Morning and afternoon peak hour LOS for the southbound approach improved from LOS C/C in 2000 to LOS B/B in 2010.

Table 2: Main Campus – Level of Service Results from 2000 Campus Plan

Intersection	Approach	Campus Plan (2000)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/Tilden St	**Overall**	**21.2**	**C**	**14.0**	**B**
	Eastbound	22.9	C	10.0	B
	Westbound	17.6	B	15.4	B
	Southbound	22.8	C	26.9	C
Massachusetts Ave & 46th St/University Ave	Northbound	60.1	F	51.0	F
Massachusetts Ave & Glover Gate/Katzen Arts Center	**Overall**	**9.3**	**A**	**12.6**	**B**
	Eastbound	10.0	A	10.1	B
	Westbound	5.6	A	12.4	B
	Northbound	30.5	C	26.6	C
	Southbound	--	--	--	--

Intersection	Approach	Campus Plan (2000)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Ward Circle:					
Nebraska Ave & Ward Circle	**Overall**	**67.2**	**E**	**80.1**	**F**
	Eastbound	17.1	B	15.6	B
	Northbound	151.8	F	135.4	F
	Southbound	46.4	D	85.5	F
Nebraska Ave & Ward Circle	**Overall**	**62.5**	**E**	**33.1**	**C**
	Westbound	14.5	B	17.9	B
	Northbound	37.1	D	38.8	D
	Southbound	125.1	F	51.4	D
Nebraska Ave & Commuter Lot (RIRO)	Westbound Right	14.7	B	16.3	C
Nebraska Ave & New Mexico Ave	**Overall**	**16.4**	**B**	**22.7**	**C**
	Westbound	15.9	B	21.7	C
	Northbound	26.6	C	26.3	C
	Southbound	7.2	A	20.8	C
New Mexico Ave & Commuter Lot	Eastbound Left	8.4	A	8.7	A
	Southbound	16.3	C	15.2	C
Nebraska Ave & Rockwood Pkwy	**Overall**	**15.4**	**B**	**16.5**	**B**
	Eastbound	38.1	D	48.8	D
	Westbound	30.6	D	38.1	D
	Northbound	12.7	B	11.5	B
	Southbound	9.2	A	10.4	B
Rockwood Pkwy & Fletcher Gate	Eastbound Left	8.1	A	8.0	A
	Southbound	13.6	B	12.5	B

Changes in LOS between the 2000 and 2010 capacity analyses are due to several factors, including changes in traffic volumes and traffic patterns, as well as changes to signal timings. Volume increases are generally shown along Nebraska Avenue south of Ward Circle, New Mexico Avenue east of Nebraska Avenue, and Rockwood Parkway east of Nebraska Avenue. Volume decreases are generally shown along Massachusetts Avenue west of Ward Circle and Rockwood Parkway west of Nebraska Avenue. Changes in LOS between the capacity analyses could also be due to improvements in the software used to estimate the delays and levels of service of the study area intersections. Overall, signal timing changes have had the largest impact.

Comparison of 2010 and 2005 Capacity Analysis Results

The results of the existing capacity analysis show some changes from the capacity analyses performed for the 2005 School of International Services (SIS) Parking Study. The SIS Parking Study consisted of 4 study intersections near campus. There were no changes in level of service at the intersection of Nebraska Avenue & Commuter Lot. The following changes in level of service were observed between the 2005 and 2010 capacity analyses:

- *Massachusetts Avenue & Glover Gate/Katzen Arts Center*
  Morning peak hour overall LOS degraded from LOS A in 2005 to LOS B in 2010.

- *Nebraska Avenue & New Mexico Avenue*
  Morning peak hour overall LOS degraded from LOS B in 2005 to LOS C in 2010.

- *Nebraska Avenue & Rockwood Parkway*
  Afternoon peak hour overall LOS improved from LOS C in 2005 to LOS B in 2010.

Changes in LOS between the 2005 and 2010 capacity analyses could be due to several factors, including changes in traffic volumes and traffic patterns, as well as changes to signal timings. Similar to the capacity analysis performed for the 2000 Campus Plan, the LOS at Massachusetts Avenue and Glover Gate/Katzen Arts Center degraded in the morning peak hour from LOS A in 2005 (and 2000) to LOS B in 2010. This is most likely due to the construction of the Katzen Arts Center Parking Garage. Also similar to the 2000 capacity analysis, LOS at the intersection of Nebraska Avenue and New Mexico Avenue for the morning and afternoon peak hours degraded from LOS B in 2005 (LOS B in 2000) to LOS C in 2010, which could be due to volume increases on Nebraska Avenue and New Mexico Avenue and the construction of the SIS Garage on the western side of the intersection.

Existing Pedestrian Analysis Results

Pedestrian analyses were performed for the existing conditions at the intersections contained within the study area during the morning and afternoon peak hours. The analysis was based on "Chapter 13: Pedestrians" of the Highway Capacity Manual (HCM).

The methodology for signalized intersections was used in order to estimate the average delay experienced by a pedestrian at a signalized crosswalk (the amount of time waiting for a "Walk" sign). This calculation is based on the effective green time programmed for pedestrians and the cycle length and rated by the amount of delay experienced. As stated in the HCM, pedestrian delay is not constrained by capacity, even when pedestrian flow rates reach 5,000 pedestrians per hour (pph). The results of the signalized intersection analyses are expressed in level of service (LOS) and delay (seconds) for each crosswalk. LOS results range from "A" being the best to "F" being the worst. The delay and LOS show the likelihood that a pedestrian will not comply with a traffic-control device (i.e. jaywalking).

The methodology for unsignalized intersections was used in order to estimate the average delay experienced by a pedestrian at an uncontrolled crosswalk. This methodology applies to unsignalized intersections with a pedestrian crossing against a free-flowing traffic stream or an approach not controlled by a stop-sign. The unsignalized intersection methodology does not apply to zebra-striped crossings at unsignalized intersections or at crossings against a traffic stream controlled by a stop-sign because pedestrians have the right-of-way and therefore experience no delay. It should be noted that in the District, pedestrians have the right-of-way at all crosswalks, including those against a free-flowing traffic stream, and therefore, theoretically experience no delay. However, the analysis was performed at pedestrian crossings against free-flowing traffic streams and yield-controlled approaches in order to evaluate the theoretical delay experienced by pedestrians. The calculation for average pedestrian delay at an unsignalized crossing is based on the average pedestrian walking speed, crosswalk length, assumed pedestrian lost time (start-up and end clearance time), and conflicting vehicular flow rate. The results of the unsignalized intersection analyses are expressed in level of service (LOS) and delay (seconds) for each crosswalk. LOS results range from "A" being the best to "F" being the worst. The delay and LOS show the likelihood that a pedestrian will engage in risk-taking behavior (i.e. accepting a short gap between vehicles).

Table 3 and Table 4 show the results of the capacity analyses, including LOS and average delay (in seconds). The capacity analysis results are also shown on Figure 9, Figure 10, Figure 11, and Figure 12.

Table 3: Main Campus – Existing Pedestrian Levels of Service for Signalized Intersections

Intersection	Parallel Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/Tilden St	Eastbound	12.0	B	8.0	A
	Westbound	12.0	B	8.0	A
	Northbound	27.4	C	34.4	D
	Southbound	27.4	C	34.4	D
Massachusetts Ave & Glover Gate/Katzen Arts Center	Eastbound	7.6	A	5.8	A
	Westbound	8.0	A	6.1	A
	Northbound	35.3	D	39.6	D
	Southbound	35.3	D	39.6	D
Ward Circle:					
Nebraska Ave & Ward Circle	Eastbound	16.2	B	16.8	B
Nebraska Ave & Ward Circle	Westbound	16.2	B	16.8	B
Nebraska Ave & New Mexico Ave	Eastbound	39.6	D	39.6	D
	Westbound	39.6	D	39.6	D
	Northbound	19.8	B	21.1	C
	Southbound	19.8	B	21.1	C
Nebraska Ave & Rockwood Pkwy	Eastbound	37.8	D	37.8	D
	Westbound	37.8	D	37.8	D
	Northbound	8.8	A	8.8	A
	Southbound	8.8	A	8.8	A

Table 4: Main Campus – Existing Pedestrian Levels of Service for Unsignalized Intersections

Intersection	Parallel Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/University Ave	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
Massachusetts Ave & 45th St	Westbound	N/A - Stop controlled crossing, LOS A			
	Southbound	34,359.3	F	31,382.1	F
Ward Circle:					
Massachusetts Ave & Ward Circle	Southbound	106.4	F	37.7	E
Massachusetts Ave & Ward Circle	Northbound	159.1	F	34.2	E
Massachusetts Ave & Ward Circle	Northbound	25.5	D	64.0	F
Massachusetts Ave & Ward Circle	Southbound	17.4	C	75.5	F
Massachusetts Ave & NAC Driveway	Westbound	N/A - Stop controlled crossing, LOS A			
Massachusetts Ave & Westover Place	Eastbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & Commuter Lot (RIRO)	Northbound	N/A - Stop controlled crossing, LOS A			
New Mexico Ave & Commuter Lot	Westbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & 45th St	Northbound	N/A - Stop controlled crossing, LOS A			
Rockwood Pkwy & Tilden Gate	Westbound	N/A - Stop controlled crossing, LOS A			
Rockwood Pkwy & Fletcher Gate	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			

The analysis results indicate that all signalized crosswalks in the study area operate at acceptable levels of service during both the morning and afternoon peak hours. This indicates a low (LOS A and B) to moderate (LOS C and D) likelihood of non-compliance by pedestrians, which is reflected by pedestrians jaywalking across the intersection.

The analysis results also indicate that the majority of the unsignalized crosswalks in the study area operate at unacceptable levels of service during one or more peak hours. This indicates a moderate (LOS C and D) to very high (LOS E and F) likelihood of risk-taking behavior for pedestrians, which is reflected in pedestrians dashing between vehicles during short gaps in traffic. As stated previously, pedestrians have the right-of-way in all crosswalks in the District, so vehicles must yield to pedestrians in the crosswalk at the study intersections listed in Table 4. However, the LOS E and F calculated for the unsignalized approaches of Ward Circle and at the intersection of Massachusetts Avenue and 45th Street during the morning and afternoon peak hours indicate an unfriendly and intimidating environment for pedestrians. The short term recommendations in the *Transportation Report* address this condition at Ward Circle and Massachusetts Avenue.

Future Conditions without 2011 Campus Plan

The American University 2011 Campus Plan projects the future growth and development on the campus for 2011-2020. In order to determine the impact of the proposed development on campus, the future conditions without development are investigated as a benchmark.

Future without 2011 Campus Plan Traffic Volumes

The future conditions without the proposed 2011 Plan include the traffic generated by background developments located near the University and inherent growth on the roadways. Growth from these two sources is added to the existing traffic volumes in order to determine the traffic projections for the future without the 2011 Plan. The background developments included are the Wesley Theological Seminary Expansion, the Wisconsin Avenue Giant Planned Unit Development (PUD), and the DHS Nebraska Avenue Complex Master Plan, as agreed upon during a scoping meeting with the District Department of Transportation (DDOT) on April 29, 2010.

Future site-generated traffic volumes for the Wisconsin Avenue Giant were obtained from the *Transportation Impact Study* performed by Wells & Associates, Inc. in May 2008. Future site-generated traffic volumes for the DHS Nebraska Avenue Complex (NAC) Master Plan were obtained from the *Transportation Study* performed by Kimley-Horn and Associates, Inc. in November 2010. Future site-generated traffic volumes for the Wesley Theological Seminary Expansion are not included because it is not anticipated to generate any additional vehicular trips on the adjacent street network since no additional parking will be available on-site. This is consistent with the NAC study performed by Kimley-Horn.

Other traffic increases due to inherent growth were accounted for with a 1% growth rate over the 10-year period of analysis (2010 to 2020). This rate was obtained from the Kimley-Horn report for the NAC, which determined the growth factor by reviewing the Metropolitan Washington Council of Governments (MWCOG) regional travel demand model forecasts contained in the *2009 Constrained Long Range Plan, Version 2.2* for the years 2010, 2020, and 2030. The traffic model review showed that the traffic volumes in the vicinity of NAC are expected to remain stable between 2010 and 2030, with an estimated increase of 1 percent. This is equal to a yearly traffic growth rate of less than 0.1 percent per year. As a result, a traffic growth factor of 1 percent from 2010 to 2020 was assumed for the NAC study, which was also applied for the analysis contained in this report. This growth rate was applied to all turning movements, with the exception of the movements entering and exiting the NAC and the University.

The traffic volumes generated by the Wisconsin Avenue Giant, the NAC, and the inherent growth were added to the existing (2010) traffic volumes in order to establish the future (2020) traffic volumes without the proposed 2011 Plan. The traffic volumes for the future conditions without the 2011 Plan are shown on Figure 13, Figure 14, Figure 15, and Figure 16 for the morning peak hour and on Figure 17, Figure 18, Figure 19, and Figure 20 for the afternoon peak hour.

Future without 2011 Campus Plan Vehicular Capacity Analysis

Intersection capacity analyses were performed for the future conditions without the 2011 Plan at the intersections contained within the study area during the morning and afternoon peak hours, following the methodology outlined previously. The capacity analyses for the future conditions without development were based on: (1) the existing lane use and traffic controls; (2) the addition of a protected right-turn movement for vehicles exiting Ward Circle on to Nebraska Avenue and the corresponding lane marking changes; (3) the peak hour turning movement volumes described previously; and (4) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments.

The addition of a protected right-turn movement for vehicles exiting Ward Circle was assumed in order to separate vehicles and pedestrians at the northern and southern intersections of Nebraska Avenue and Ward Circle, which was discussed with DDOT to be included in future scenarios. This protected turn was added, and the signal timing was optimized. Additionally, the shared through/right-turn lane exiting Ward Circle onto Nebraska Avenue northbound was assumed to be restriped as a right-turn only lane. No other infrastructure improvements are assumed for the future conditions without the 2011 Plan. As stated in the *Transportation Report*, the draft final recommendations for the Rock Creek West II (RCW2) Livability Study were also consulted. However, no infrastructure improvements are included in the study area for the Main campus.

Table 5 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds). The capacity analysis results are also shown on Figure 21, Figure 22, Figure 23, and Figure 24. The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours.

Table 5: Main Campus – Future Background Vehicular Levels of Service

Intersection	Approach	Future Background Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/Tilden St	**Overall**	**18.1**	**B**	**10.0**	**A**
	Eastbound	17.9	B	7.8	A
	Westbound	14.4	B	8.7	A
	Southbound	29.5	C	34.3	C
Massachusetts Ave & 46th St/University Ave	Eastbound Left	0.0	A	0.2	A
	Northbound	118.0	F	23.2	C
Massachusetts Ave & 45th St	Eastbound Left	2.5	A	2.0	A
	Southbound	16.2	C	33.0	D
Massachusetts Ave & Glover Gate/Katzen Arts Center	**Overall**	**12.4**	**B**	**12.5**	**B**
	Eastbound	7.3	A	6.0	A
	Westbound	21.5	C	11.1	B
	Northbound	29.5	C	39.5	D
	Southbound	29.2	C	38.4	D
Ward Circle:					
Massachusetts Ave & Ward Circle (West side)	Eastbound Right	33.9	D	19.5	C
Nebraska Ave & Ward Circle (South side)	**Overall**	**25.0**	**C**	**26.2**	**C**

Intersection	Approach	Future Background Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
	Eastbound	32.7	C	32.2	C
	Northbound	29.5	C	36.3	D
	Southbound	3.6	A	6.3	A
Massachusetts Ave & Ward Circle (East side)	Westbound Right	54.8	F	321.9	F
Nebraska Ave & Ward Circle (North side)	**Overall**	**13.4**	**B**	**23.8**	**C**
	Westbound	23.5	C	27.3	C
	Northbound	6.9	A	8.0	A
	Southbound	10.3	B	31.0	C
Massachusetts Ave & NAC Driveway	Eastbound Left	2.4	A	1.1	A
	Southbound	24.9	C	73.6	F
Massachusetts Ave & Westover Place	Westbound Left	0.0	A	0.6	A
	Northbound	57.1	F	60.0	F
Nebraska Ave & Commuter Lot (RIRO)	Westbound Right	9.5	A	9.7	A
Nebraska Ave & New Mexico Ave	**Overall**	**21.7**	**C**	**22.1**	**C**
	Eastbound	36.1	D	35.4	D
	Westbound	29.0	C	29.1	C
	Northbound	15.1	B	15.4	B
	Southbound	25.1	C	24.3	C
New Mexico Ave & Commuter Lot	Eastbound Left	4.7	A	4.5	A
	Southbound	13.8	B	14.5	B
Nebraska Ave & 45th St	Southbound Left	1.0	A	0.8	A
	Westbound	9.2	A	12.3	B
Nebraska Ave & Rockwood Pkwy	**Overall**	**13.3**	**B**	**12.5**	**B**
	Eastbound	41.2	D	40.0	D
	Westbound	39.2	D	38.9	D
	Northbound	13.3	B	11.6	B
	Southbound	2.4	A	5.1	A
Rockwood Pkwy & Fletcher Gate	Eastbound Left	0.5	A	1.3	A
	Southbound	11.6	B	10.6	B
Rockwood Pkwy & Glenbrook Rd	**Overall**	**8.7**	**A**	**7.8**	**A**
	Eastbound	8.7	A	7.9	A
	Westbound	8.0	A	7.6	A
	Southbound	9.2	A	7.9	A

For the purpose of this analysis, it is desirable to achieve a level of service (LOS) of "E" or better on each approach. As stated previously, all study area intersections operate at acceptable levels of service during the morning and afternoon peak hours. However, several approaches operate with unacceptable levels of service during one or more peak hours. The LOS results show that:

- All of the study intersections (overall LOS grade) operate at acceptable conditions during both the morning and afternoon peak hours.
- The following approaches continue to operate with unacceptable LOS during one or more peak hours:

- The northbound approach of University Avenue at Massachusetts Avenue and 46th Street operates under unacceptable conditions during the morning peak period.
- The westbound approach of Massachusetts Avenue at Ward Circle operates at capacity during the morning peak period and above capacity during the afternoon peak period.
- The southbound approach of the NAC Driveway at Massachusetts Avenue operates at an unacceptable level of service during the afternoon peak period.
- The northbound approach of Westover Place at Massachusetts Avenue operates at an unacceptable level of service during the morning and afternoon peak periods.

- The westbound approach of Massachusetts Avenue at Ward Circle operates above capacity during the morning peak period.
- Due to the signal timing changes explained previously, the northbound approach of Nebraska Avenue at Ward Circle no longer operates under unacceptable conditions for the morning peak hour.

Future without 2011 Campus Plan Pedestrian Analysis Results

Pedestrian analyses were performed for the future without the 2011 Plan conditions at the intersections contained within the study area during the morning and afternoon peak hours. The analysis was based on "Chapter 13: Pedestrians" of the Highway Capacity Manual (HCM), as outlined previously.

Table 6 and Table 7 show the results of the capacity analyses, including LOS and average delay (in seconds). The capacity analysis results are also shown on Figure 21, Figure 22, Figure 23, and Figure 24.

The analysis results indicate that all signalized crosswalks in the study area operate at acceptable levels of service during both the morning and afternoon peak hours. This indicates a low (LOS A and B) to moderate (LOS C and D) likelihood of non-compliance by pedestrians, which is reflected by pedestrians jaywalking across the intersection.

The analysis results also indicate that the majority of the unsignalized crosswalks in the study area operate at unacceptable levels of service during one or more peak hours. This indicates a moderate (LOS C and D) to very high (LOS F) likelihood of risk-taking behavior for pedestrians, which is reflected in pedestrians dashing between vehicles during short gaps in traffic. As stated previously, pedestrians have the right-of-way in all crosswalks in the District, so vehicles must yield to pedestrians in the crosswalk at the study intersections listed in Table 4. However, the LOS E and F calculated for the unsignalized approaches of Ward Circle and at the intersection of Massachusetts Avenue and 45th Street during the morning and afternoon peak hours indicate an unfriendly and intimidating environment for pedestrians. These unacceptable LOS are continued from the existing conditions pedestrian analysis. No new unacceptable LOS are observed for the future without the 2011 Plan scenario.

Table 6: Main Campus – Future Background Pedestrian Levels of Service for Signalized Intersections

Intersection	Parallel Approach	Future Background Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/Tilden St	Eastbound	12.0	B	8.0	A
	Westbound	12.0	B	8.0	A
	Northbound	27.4	C	34.4	D
	Southbound	27.4	C	34.4	D
Massachusetts Ave & Glover Gate/Katzen Arts Center	Eastbound	7.6	A	5.8	A
	Westbound	8.0	A	6.1	A
	Northbound	35.3	D	39.6	D
	Southbound	35.3	D	39.6	D
Ward Circle:					
Nebraska Ave & Ward Circle	Eastbound	39.6	D	39.6	D
Nebraska Ave & Ward Circle	Westbound	39.6	D	39.6	D
Nebraska Ave & New Mexico Ave	Eastbound	39.6	D	39.6	D
	Westbound	39.6	D	39.6	D
	Northbound	19.8	B	21.1	C
	Southbound	19.8	B	21.1	C
Nebraska Ave & Rockwood Pkwy	Eastbound	37.8	D	37.8	D
	Westbound	37.8	D	37.8	D
	Northbound	8.8	A	8.8	A
	Southbound	8.8	A	8.8	A

Table 7: Main Campus – Future Background Pedestrian Levels of Service for Unsignalized Intersections

Intersection (Approach)	(Parallel Approach)	Future Background Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/University Ave	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
Massachusetts Ave & 45th St	Westbound	N/A - Stop controlled crossing, LOS A			
	Southbound	48,994.9	F	53,668.4	F
Ward Circle:					
Massachusetts Ave & Ward Circle	Southbound	117.9	F	42.1	E
Massachusetts Ave & Ward Circle	Northbound	173.1	F	38.1	E
Massachusetts Ave & Ward Circle	Northbound	27.5	D	76.4	F
Massachusetts Ave & Ward Circle	Southbound	18.6	C	87.1	F
Massachusetts Ave & NAC Driveway	Westbound	N/A - Stop controlled crossing, LOS A			
Massachusetts Ave & Westover Place	Eastbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & Commuter Lot (RIRO)	Northbound	N/A - Stop controlled crossing, LOS A			
New Mexico Ave & Commuter Lot	Westbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & 45th St	Northbound	N/A - Stop controlled crossing, LOS A			
Rockwood Pkwy & Tilden Gate	Westbound	N/A - Stop controlled crossing, LOS A			
Rockwood Pkwy & Fletcher Gate	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			

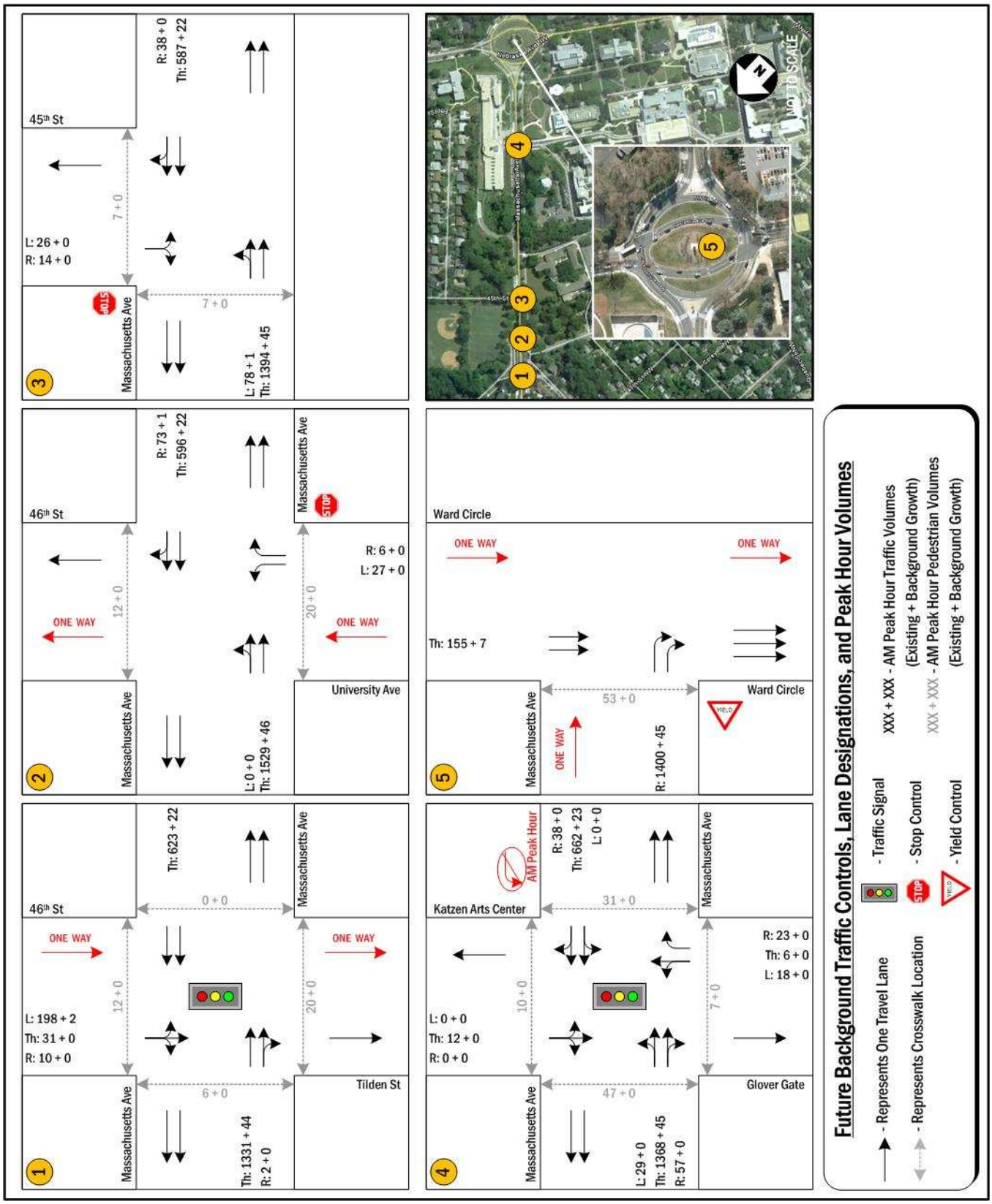

Figure 13: Main Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (1 of 4)

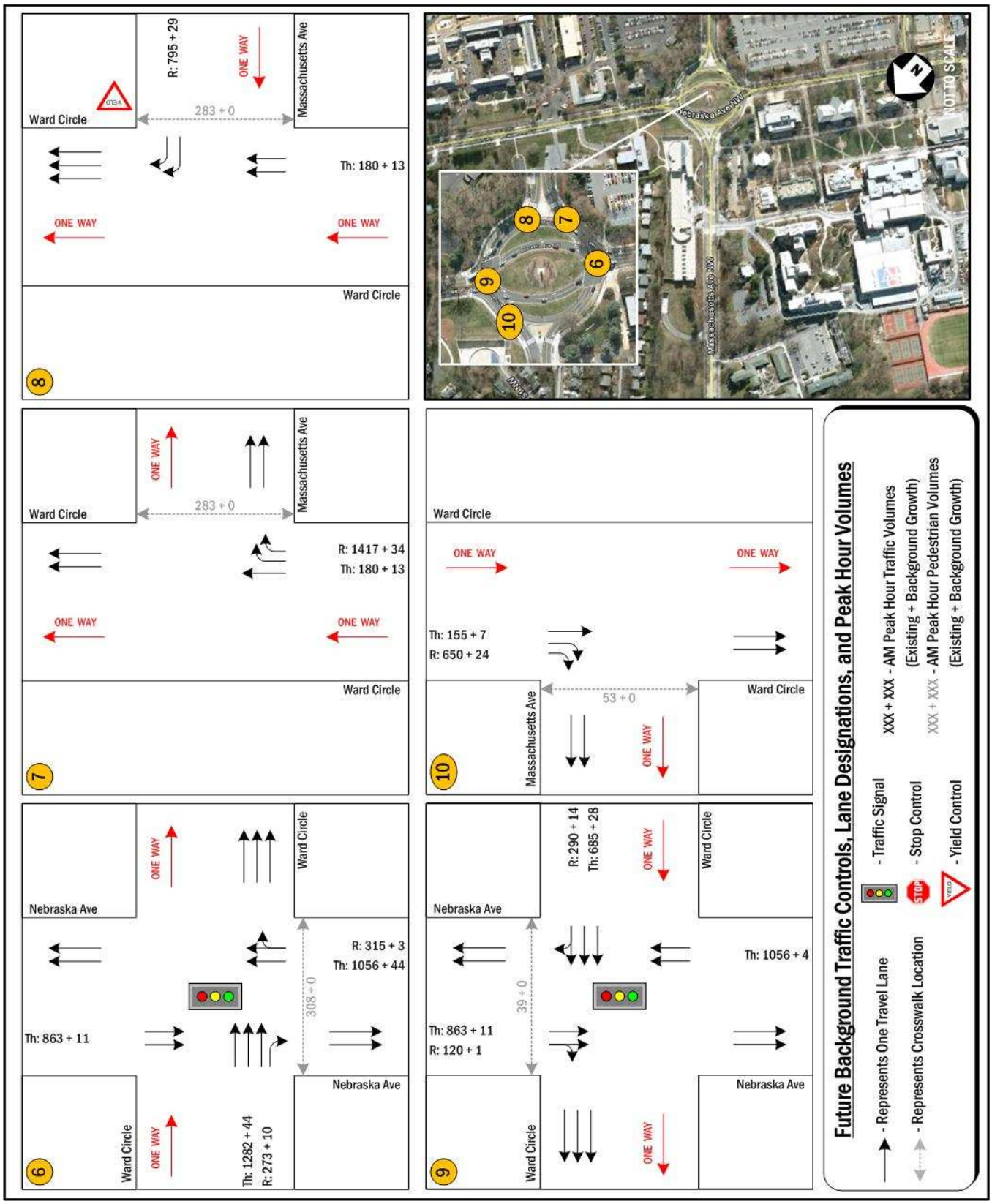

Figure 14: Main Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (2 of 4)

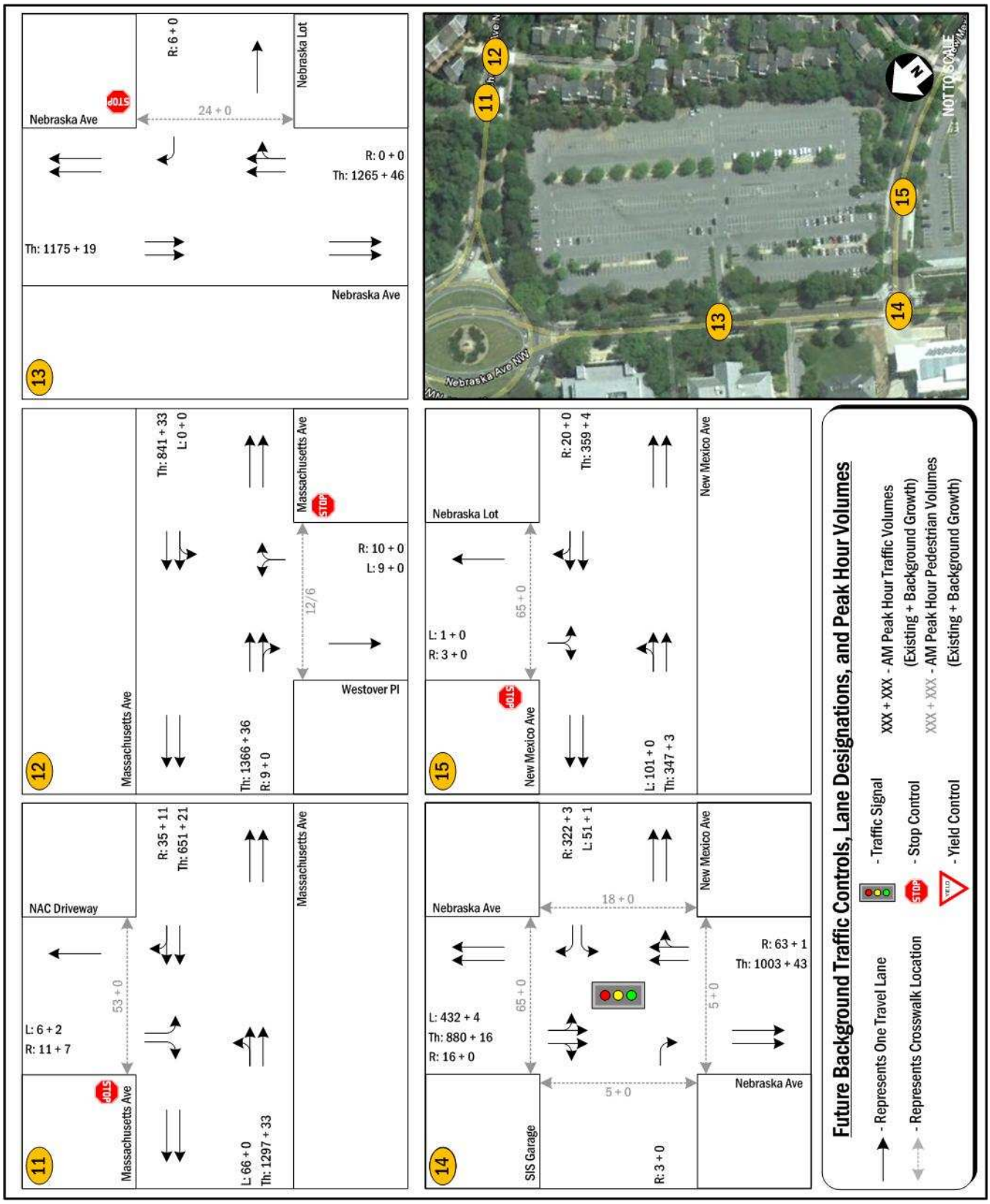

Figure 15: Main Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (3 of 4)

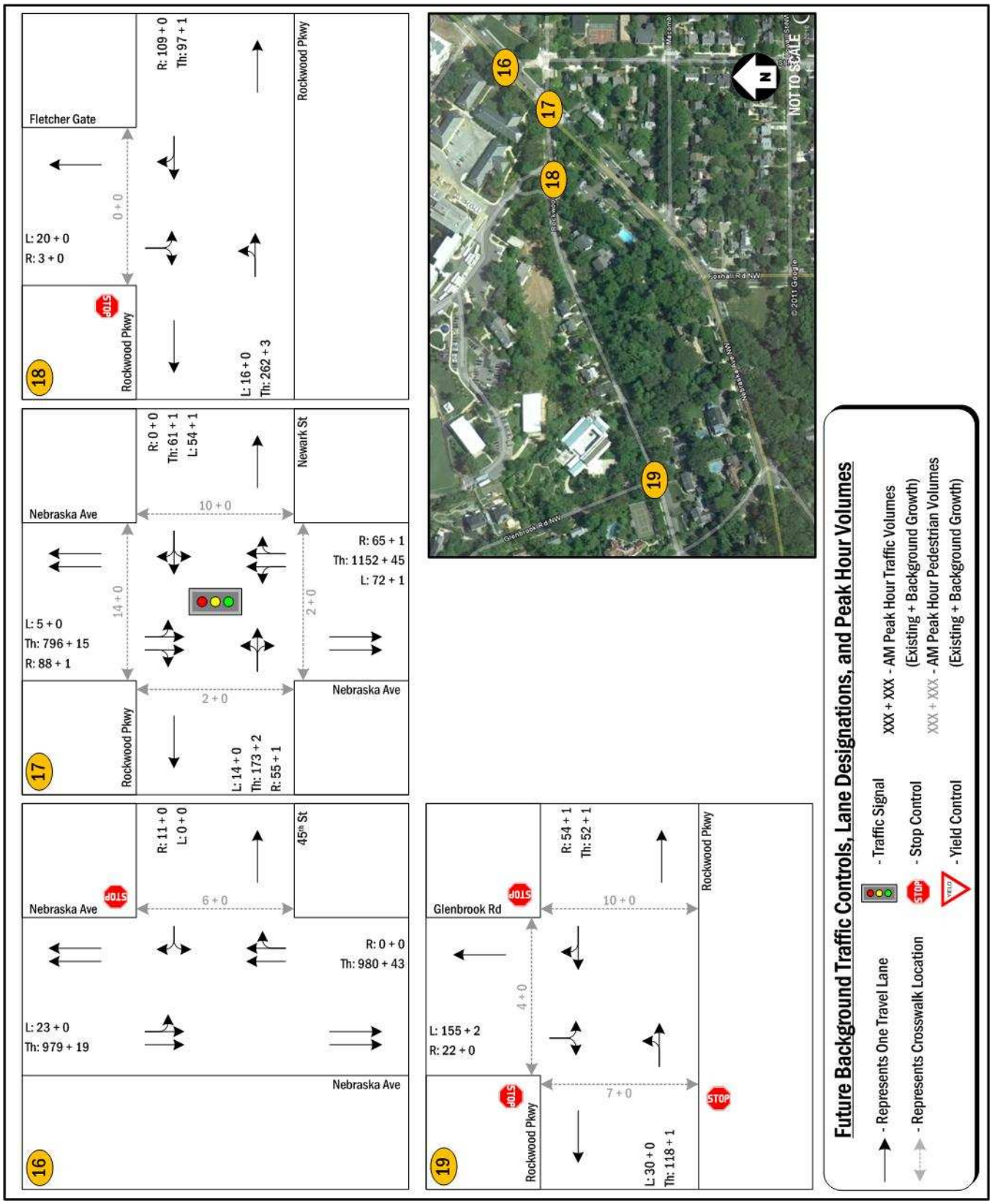

Figure 16: Main Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (4 of 4)

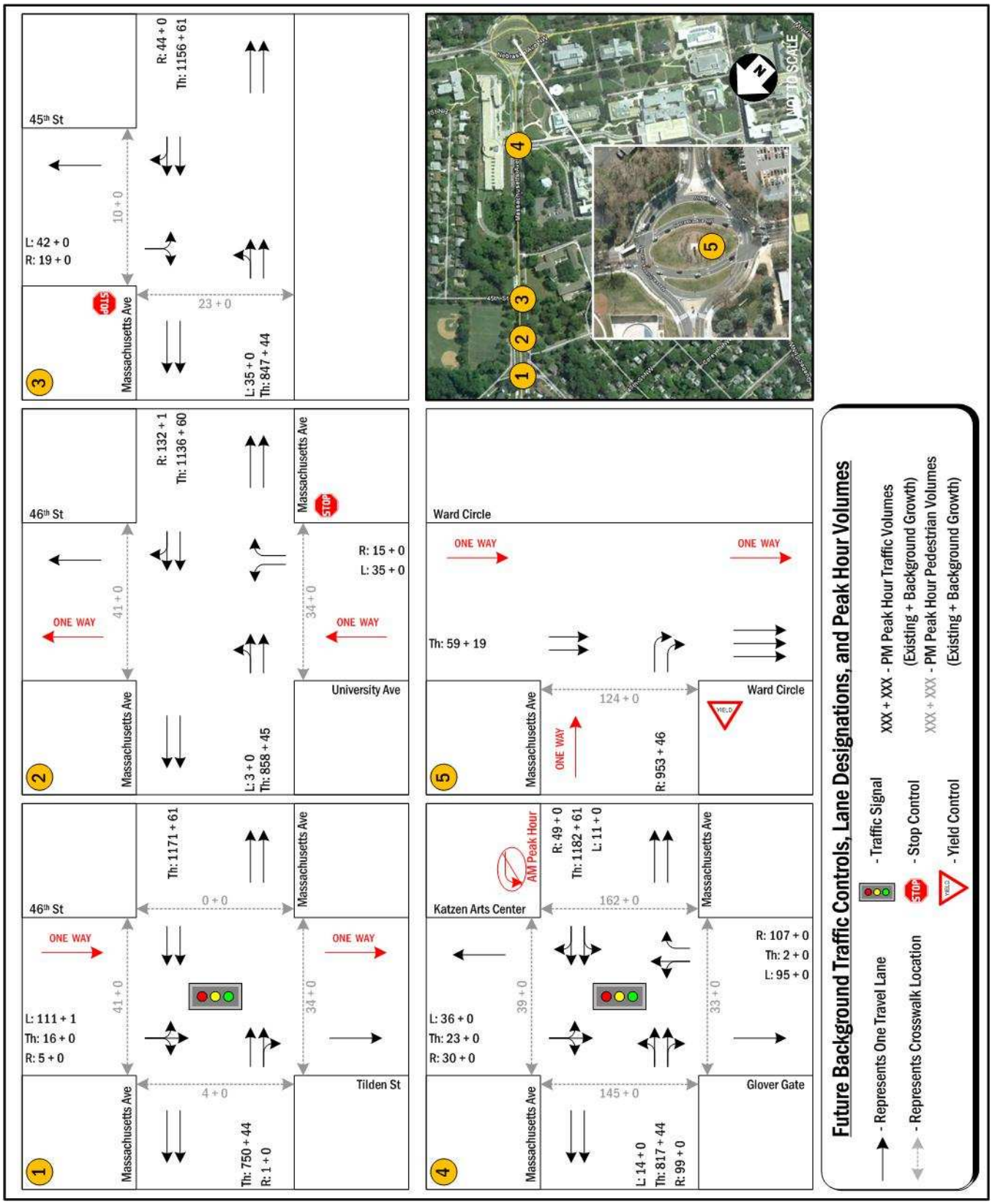

Figure 17: Main Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (1 of 4)

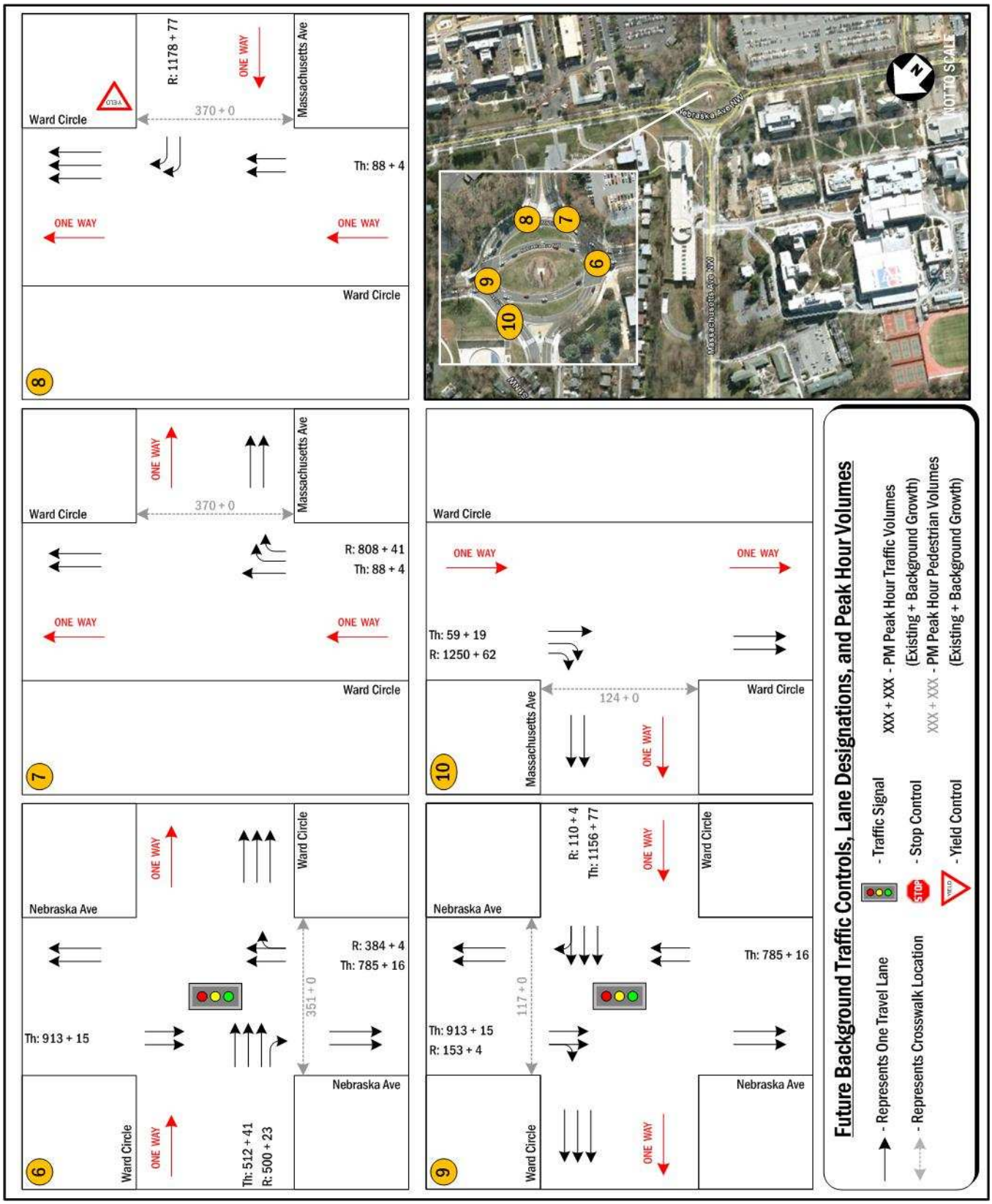

Figure 18: Main Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (2 of 4)

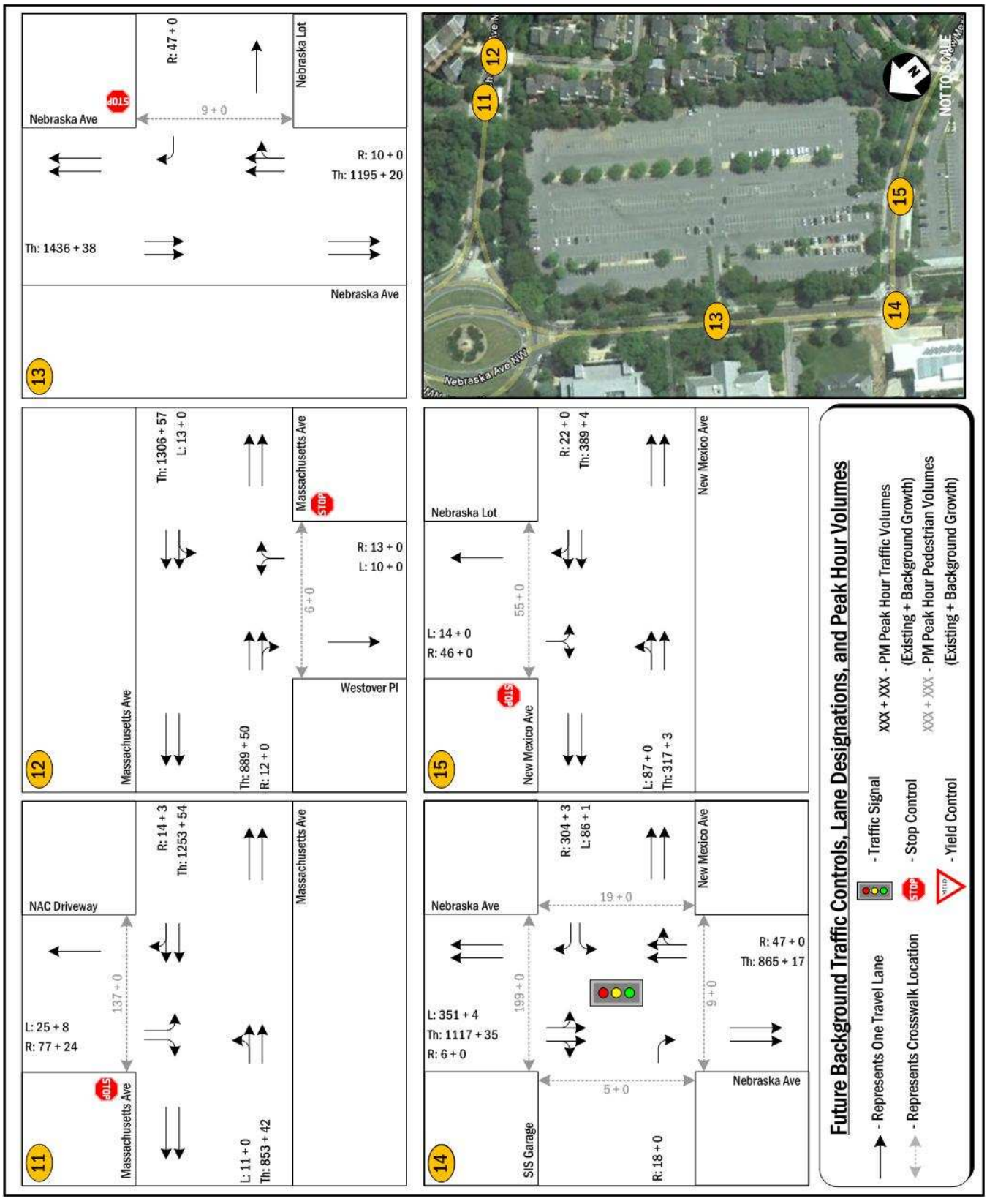

Figure 19: Main Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (3 of 4)

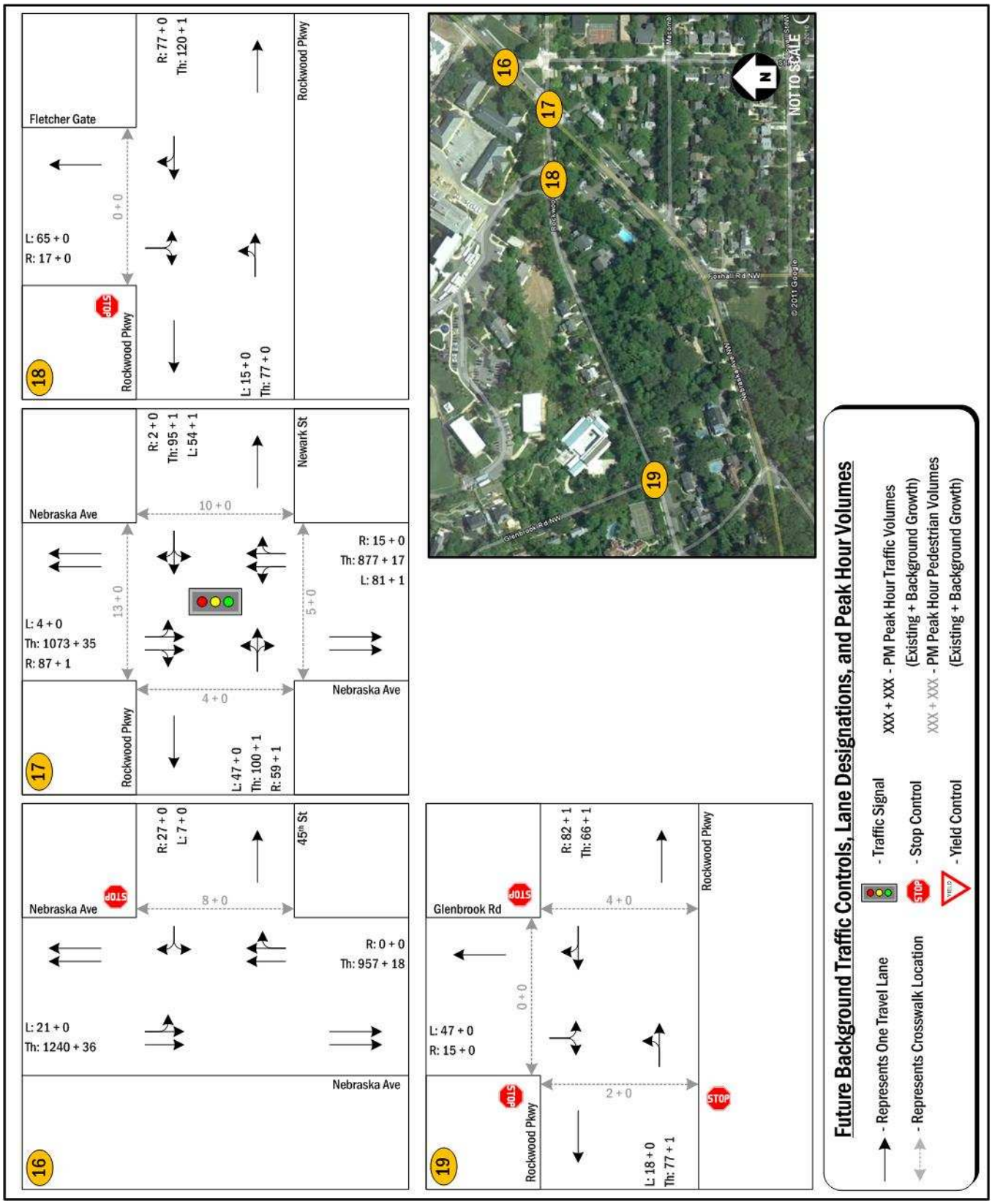

Figure 20: Main Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (4 of 4)

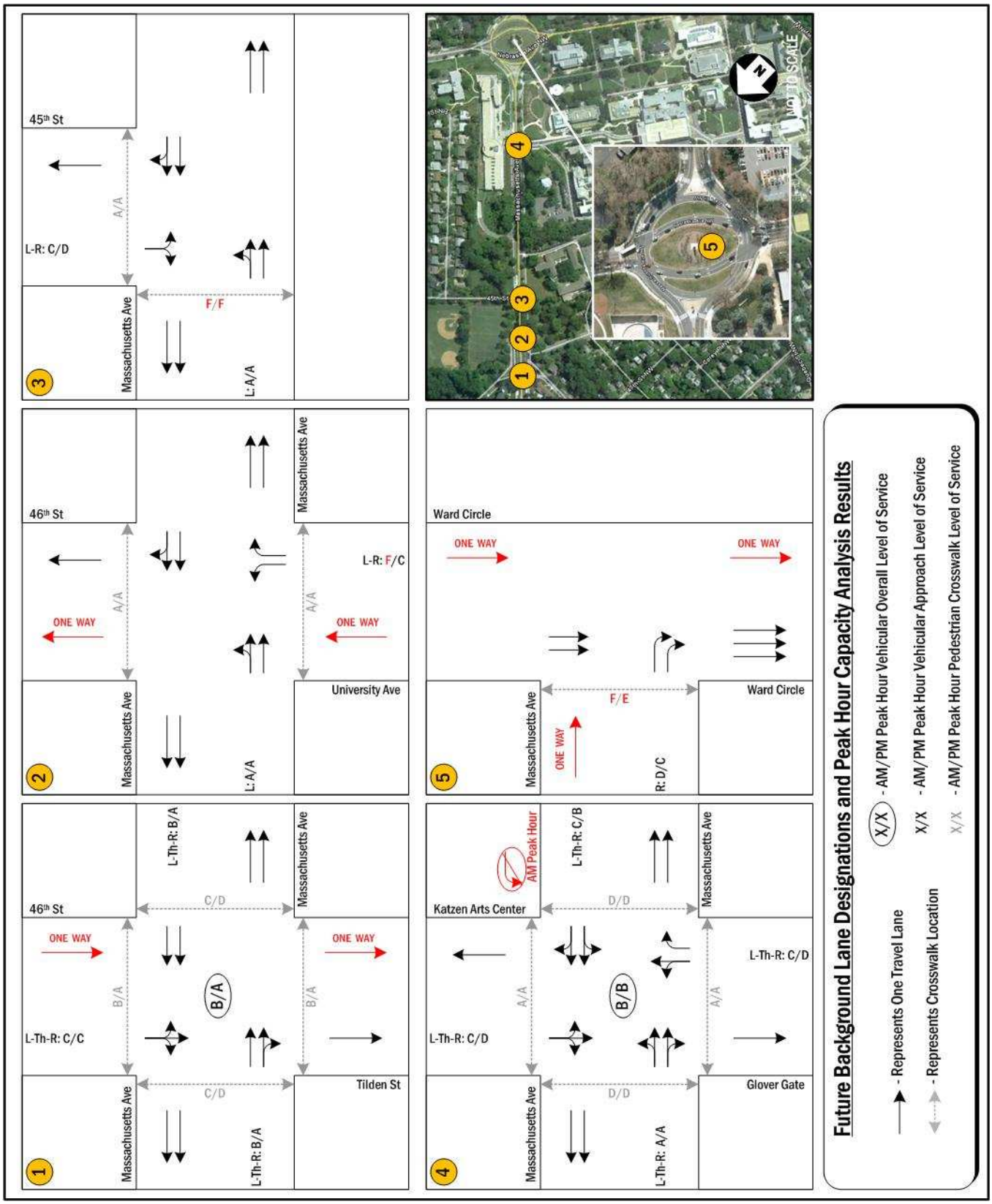

Figure 21: Main Campus – Future Background Lane Configurations and Capacity Analysis Results (1 of 4)

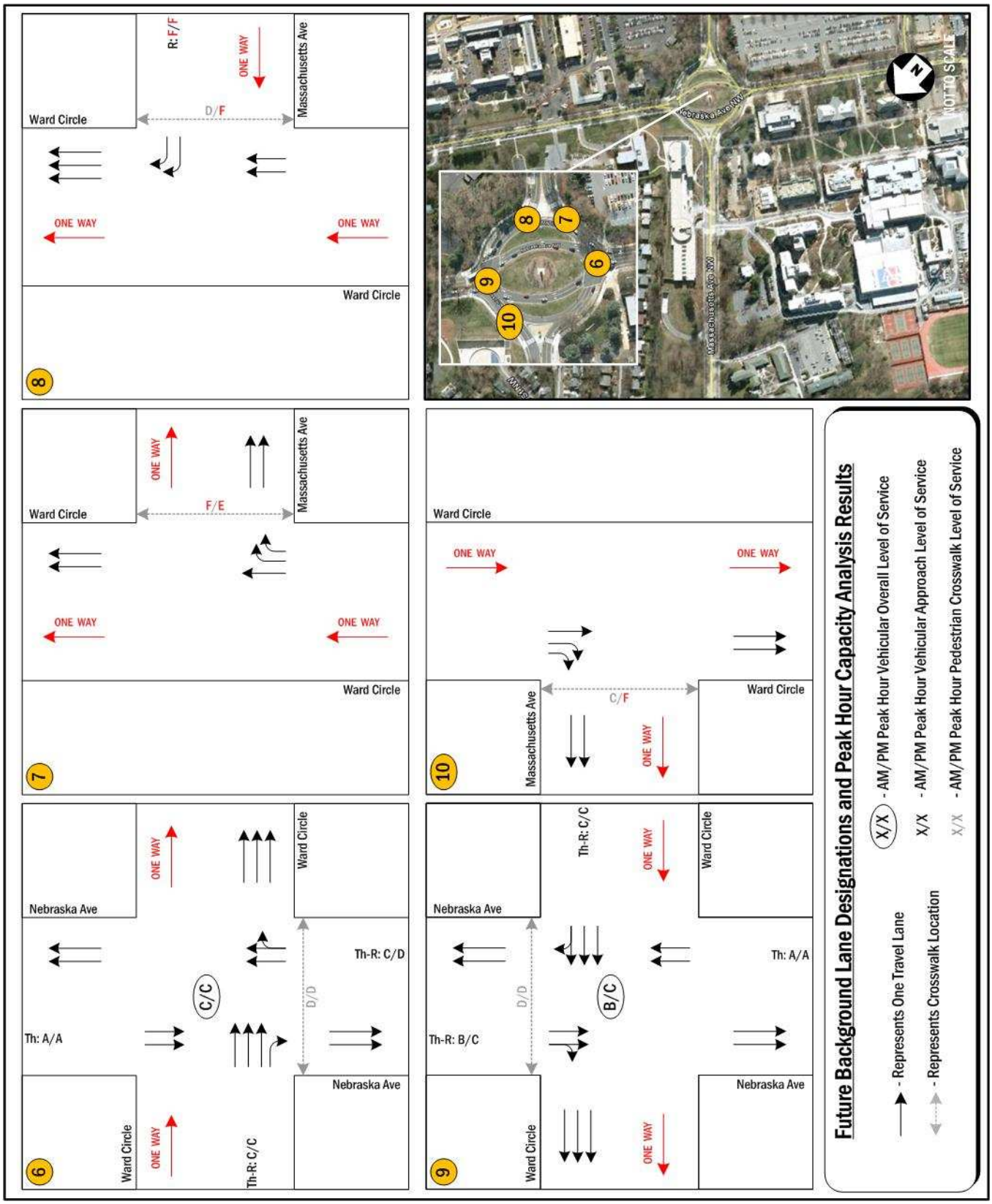

Figure 22: Main Campus – Future Background Lane Configurations and Capacity Analysis Results (2 of 4)

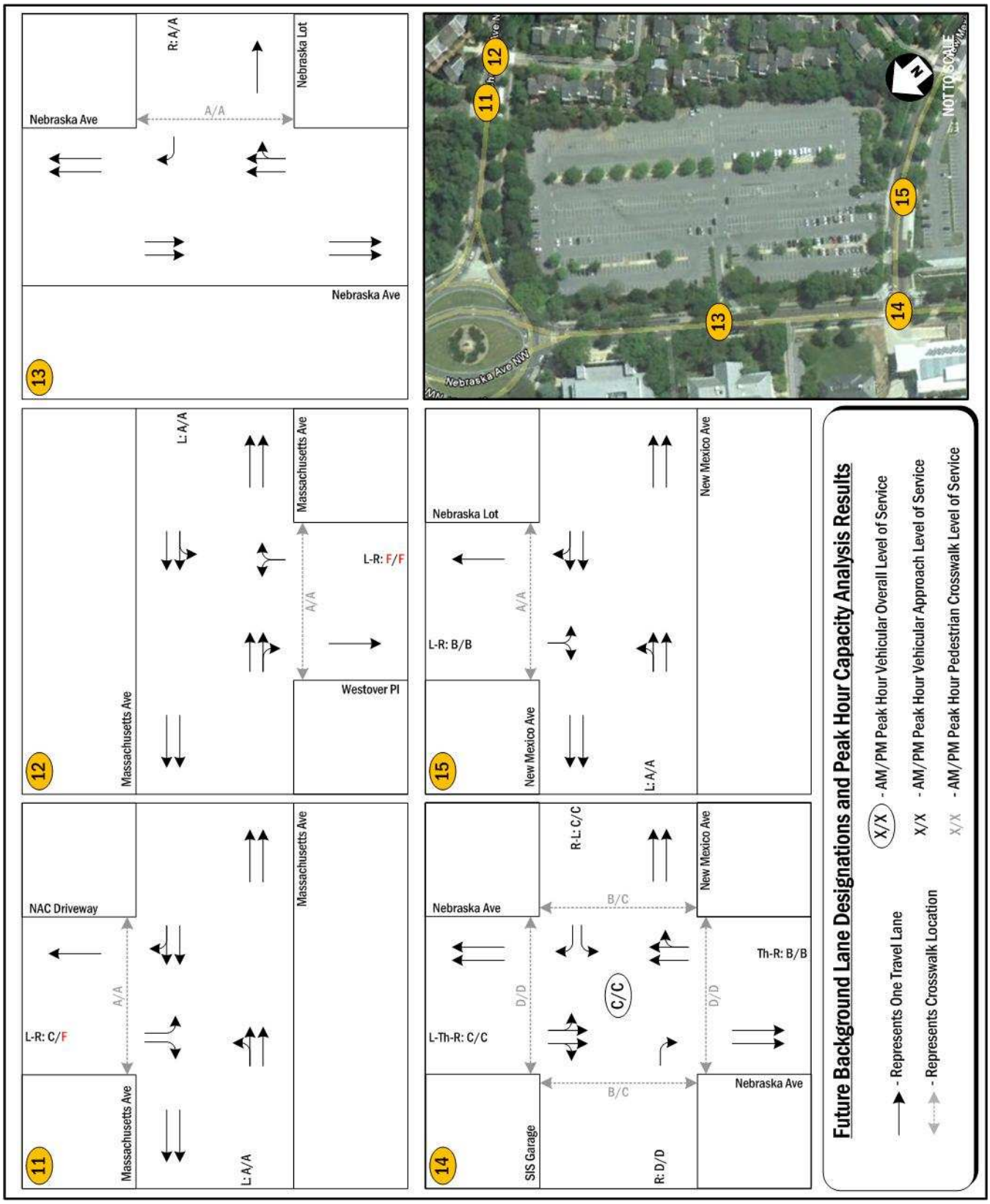

Figure 23: Main Campus – Future Background Lane Configurations and Capacity Analysis Results (3 of 4)

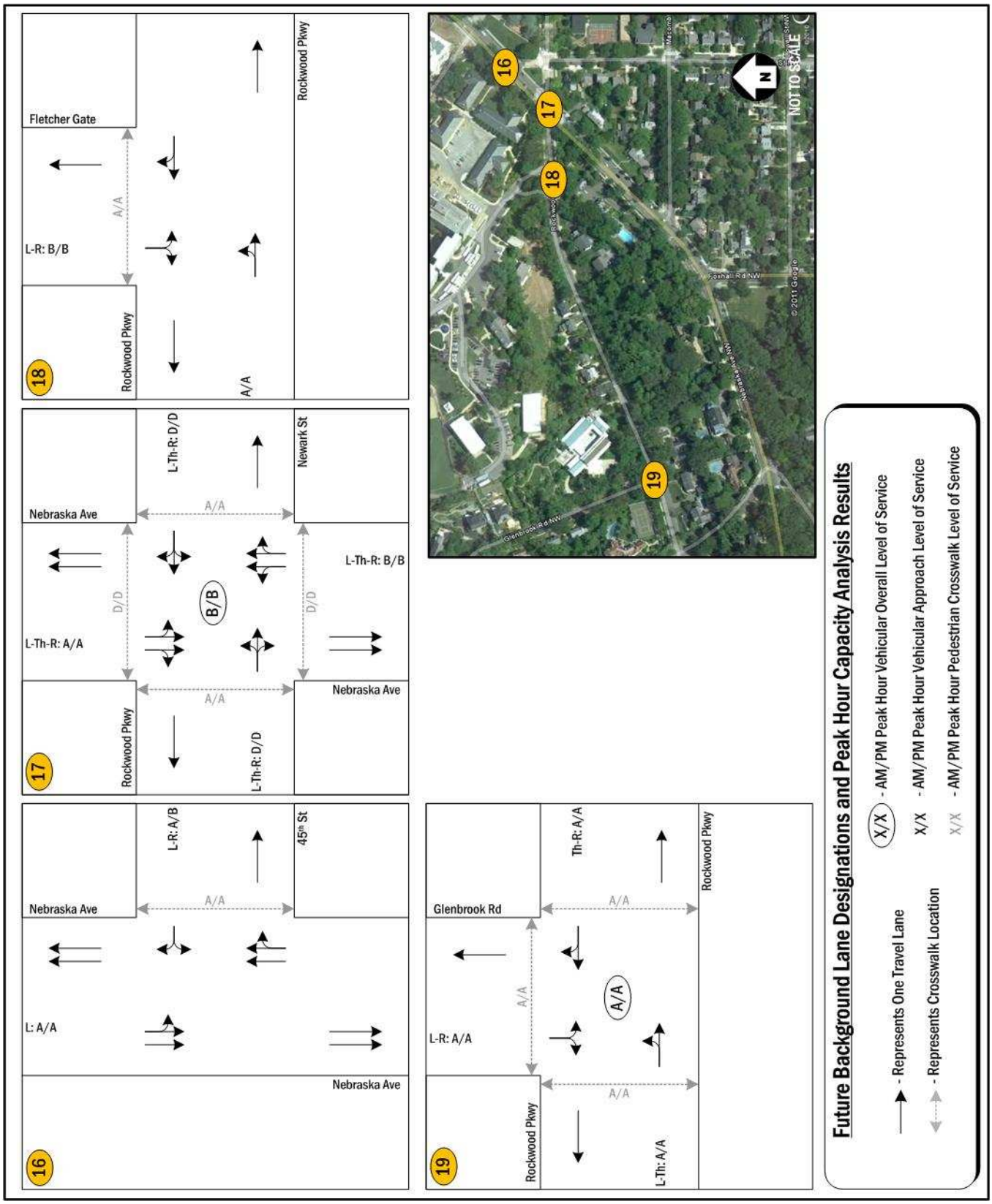

Figure 24: Main Campus – Future Background Lane Configurations and Capacity Analysis Results (4 of 4)

Future Conditions with 2011 Campus Plan

Analysis of the 2011 Campus Plan development conditions includes an assessment of the future transportation conditions for the year 2020. The American University 2011 Campus Plan update for the Main Campus includes an increase in students and faculty/staff. The 2011 Plan focuses on improving the University though the addition of:

- New campus housing;
- Recreation, dining, and activity space;
- More faculty offices;
- Improved science and research facilities;
- Enhanced athletic facilities;
- An admissions welcome center; and
- An Alumni Center.

The proposed transportation-related changes for the Main Campus include an overall reduction in approximately 429 parking spaces. These changes are accounted for by the vehicular following trip generation sources:

- Remove existing 903 parking spaces on Nebraska Avenue Lot;
- Remove approximately 26 parking spaces from the Main Campus due to construction of the Nebraska Hall extension; and
- Add 500 new parking spaces to the East Campus (Nebraska Avenue lot): 100 for on-campus students, 330 for commuter students, and 70 for faculty/staff.

Pedestrian trip generation sources include:

- Remove existing pedestrians crossing Nebraska Avenue at New Mexico Avenue due to existing parking spaces removed from Nebraska Avenue Lot;
- Add a total of 765 beds to the East Campus (Nebraska Avenue lot) in 4 new residence halls;
- Add 330 commuter-student spaces to the East Campus that would result in students crossing Nebraska Avenue;
- Add approximately 12,000 square feet of specialty retail to the East Campus; and
- Add a total of 125 beds to Nebraska Hall in an expansion to the existing residence hall.

The *Transportation Report* identifies the locations of development areas in the 2011 Plan. The *American University 2011 Campus Plan* provides a more detailed description of the proposed development.

Future with 2011 Campus Plan Traffic Volumes

The existing and future population projections are summarized in Table 8. As the table indicates, the student enrollment could potentially increase from 10,298 to 11,600, and the faculty/staff population could increase from 2,207 to 2,500 with the full potential growth allowed in the 2011 Plan.

Table 8: Main Campus – Population Projections

Population	Existing (2010)	Projection (2020)	Growth Rate (2010 to 2020)
Students	10,298	11,600	12.6%
Faculty/Staff	2,207	2,500	13.3%
Total	**12,505**	**14,100**	**12.8%**

In order to determine the impact of the proposed changes to the Main Campus, vehicular trips were generated based on changes due to growth of population. Although, as stated above, multiple development changes are proposed in the 2011 Plan, these sources are not expected to generate any additional vehicular trips. Instead, any change in vehicular trip generation will be due to the proposed population growth. Although the parking inventory of the Main Campus is planned to decrease, an increase in vehicular trips in assumed due to projected population growth.

The future net changes to the campus vehicular trip generation were assembled by removing all the existing trips and adding back the future trips, which are equal to the existing trips plus growth generated by the proposed population increase. This was done to account for the redistribution of trips between lots and access points.

Currently, the Main Campus generates approximately 463 trips during the morning peak hour (386 in and 77 out) and 865 trips during the afternoon peak hour (390 in and 475 out). These existing site-generated trips were subtracted from the study area intersections. Trip distributions were calculated for each parking source based on a review of the existing driveway counts and travel patterns in the study area. Table 9 shows the trips removed from the study area.

Table 9: Main Campus – Existing Vehicular Trips Removed

Source	Size	Existing Vehicular Trips (2010)			
		AM Peak Hour		*PM Peak Hour*	
		In	Out	In	Out
Main Campus	988 Spaces	182	64	202	284
Nebraska Avenue Lot	903 Spaces	121	10	119	107
SIS Garage	283 Spaces	16	3	6	18
Katzen Center	471 Spaces	67	0	63	66
Total	**2,645 Spaces**	**386**	**77**	**390**	**475**

Future trip generation was calculated based on the projected population increase shown in Table 8, which was applied to the existing trips shown in Table 9. An average 12.8 percent growth was applied to the existing trips to estimate the future trips generated by the 2011 Plan. Table 10 shows the resulting future trip generation added to the study area.

The site-generated trips for the future scenario were distributed through the study area intersections based on the existing trip distribution outlined previously. Additionally, site access changes are included for the East Campus Parking Lot. This includes the removal of the existing right-in/right-out driveway on Nebraska Avenue, and the construction of a new right-in/right-out driveway along Massachusetts Avenue aligned with the existing NAC driveway.

Table 10: Main Campus – Vehicular Trips Added

Source	Size	Future Vehicular Trips (2020)			
		AM Peak Hour		*PM Peak Hour*	
		In	Out	In	Out
Main Campus	962 Spaces	189	38	191	233
East Campus	500 Spaces	98	20	99	121
SIS Garage	283 Spaces	56	11	57	68
Katzen Center	471 Spaces	92	18	93	114
Total	**2,217 Spaces**	**435**	**87**	**440**	**536**
Net Difference	**-428 Spaces**	**49**	**10**	**50**	**61**

In addition to vehicular trips, the proposed 2011 Plan will generate additional pedestrian trips, as outlined previously. The proposed development for the Main Campus will include removing the existing pedestrians crossing Nebraska Avenue at New Mexico Avenue and adding future pedestrians generated by 765 total beds, 330 commuter-student spaces, and 12,000 square-feet of student-oriented retail on the East Campus and 125 beds added to Nebraska Hall.

Pedestrian trips generated by the new residence halls were based on trip generation rates developed by observing an existing residence hall, Leonard Hall, which was counted in Fall 2010. These rates developed were 0.24 trips per bed during the morning peak hour (0.01 inbound and 0.23 outbound) and 0.58 trips per bed during the afternoon peak hour (0.28 inbound and 0.30 outbound). Trips generated by the new retail uses were estimated using the methodology outlined in the Institute of Transportation Engineers' (ITE) *Trip Generation*, 8th Edition. The retail trips were estimated using the "Specialty Retail" trip generation rates. In order to calculate the trips generated by the parking spaces located on the East Campus, it was assumed that approximately 65 percent of the vehicular trips generated would result in pedestrian trips crossing between the East and Main Campuses. This 65 percent was determined based on assumption that the pedestrian trips would be generated by the 330 spaces provided for commuter students. The 100 spaces provided for on-campus students and 70 spaces for faculty/staff were assumed to generate trips that would remain on the East Campus.

Table 11 shows the pedestrian trips added to the East Campus, and Table 12 shows the other pedestrian trips added to the study area. Trip distribution for the pedestrian trips added by the East Campus was based on an approximate 75%/25% split of pedestrians between the New Mexico Avenue and Ward Circle crossings along Nebraska Avenue, respectively, due to the layout of the site. Pedestrians added by the Nebraska Hall extension were assumed to have an approximate 65%/35% split along Massachusetts Avenue between the western crosswalk at Ward Circle and the Katzen Center crossing to travel between the residence hall and Main Campus.

Table 11: Main Campus – Pedestrian Trips Added to the East Campus

Pedestrian Trips Added to East Campus (2020)			
Source	**Size**	**AM Peak Hour**	**PM Peak Hour**
East Campus Residence Hall 1	280 Beds	67	162
East Campus Residence Hall 2	108 Beds	26	62
East Campus Residence Hall 3	167 Beds	40	97
East Campus Residence Hall 4	195 Beds	47	114
Student-Oriented Retail	12,000 SF	13	50
East Campus Parking	330 Spaces	78	80
Total		**271**	**631**
Nebraska Lot Parking Removed	-903 Spaces	-65	-199
Net Total		**206**	**432**

Table 12: Main Campus – Other Pedestrian Trips Added

Other Pedestrian Trips Added (2020)			
Source	**Size**	**AM Peak Hour**	**PM Peak Hour**
Nebraska Hall	125 Beds	30	73
Total		**30**	**73**

The traffic volumes for the future conditions with the 2011 Plan were calculated by subtracting the existing trips generated by the University and adding the site-generated vehicular and pedestrian volumes to the future without the 2011 Plan traffic volumes. The future traffic volumes with the proposed development on the AU Main Campus are shown on Figure 25, Figure 26, Figure 27, and Figure 28 for the morning peak hour and Figure 29, Figure 30, Figure 31, and Figure 32 for the afternoon peak hour. The future pedestrian volumes added to the crosswalks affected by the 2011 Plan are shown in Table 13.

Table 13: Main Campus – Future Crosswalk Volumes due to Pedestrian Trips Added by 2011 Plan

Source	AM Peak Hour	PM Peak Hour
Existing Trips Crossing Nebraska Avenue at New Mexico Avenue	65	199
Trips Added due to East Campus (75% of Total)	203	473
Trips Removed due to Nebraska Lot Parking	-65	-199
Total Crossing Nebraska Avenue at New Mexico Avenue	**203**	**473**
Existing Trips Crossing Nebraska Avenue at Ward Circle	308	351
Pedestrian Trips Added by East Campus (25% of Total)	68	158
Total Crossing Nebraska Avenue at Ward Circle	**376**	**509**
Existing Trips Crossing Massachusetts Avenue at Ward Circle	53	124
Trips Added due to Nebraska Hall (65% of Total)	20	49
Total Crossing Massachusetts Avenue at Ward Circle	**73**	**173**
Existing Trips Crossing Massachusetts Avenue at Katzen Center	31	162
Trips Added due to Nebraska Hall (35% of Total)	10	24
Total Crossing Massachusetts Avenue at Katzen Center	**41**	**186**

Future with 2011 Campus Plan Vehicular Capacity Analysis

Intersection capacity analyses were performed for the future conditions with the 2011 Plan at the intersections contained within the study area during the morning and afternoon peak hours. *Synchro, Version 7.0* was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology, as outlined previously. The LOS capacity analyses for the future conditions with development were based on: (1) the future without the 2011 Plan lane use and traffic controls; (2) the removal of the existing right-in/right-out driveway for the Nebraska Avenue Lot along Nebraska Avenue; (3) the addition of a new right-in/right-out driveway for the East Campus along Massachusetts Avenue; (4) the peak hour turning movement volumes described previously and (5) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments.

Table 14 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds). The capacity analysis results are also shown on Figure 33, Figure 34, Figure 35, and Figure 36. The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours.

Table 14: Main Campus – Total Future Vehicular Levels of Service

Intersection	Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/Tilden St	**Overall**	**18.5**	**B**	**8.8**	**A**
	Eastbound	18.2	B	8.0	A
	Westbound	14.8	B	6.6	A
	Southbound	29.5	C	34.5	C
Massachusetts Ave & 46th St/University Ave	Eastbound Left	0.0	A	0.2	A
	Northbound	126.4	F	23.9	C
Massachusetts Ave & 45th St	Eastbound Left	2.5	A	2.1	A
	Southbound	16.1	C	34.7	D
Massachusetts Ave & Glover Gate/Katzen Arts Center	**Overall**	**12.7**	**B**	**14.7**	**B**
	Eastbound	7.9	A	6.3	A
	Westbound	21.3	C	14.7	B
	Northbound	29.3	C	38.7	D
	Southbound	29.7	C	46.6	D
Ward Circle:					
Massachusetts Ave & Ward Circle (West side)	Eastbound Right	46.5	E	29.5	D
Nebraska Ave & Ward Circle (South side)	**Overall**	**26.1**	**C**	**28.7**	**C**
	Eastbound	33.7	C	38.4	D
	Northbound	31.1	C	36.7	D
	Southbound	3.7	A	6.7	A
Massachusetts Ave & Ward Circle (East side)	Westbound Right	59.8	F	339.0	F
Nebraska Ave & Ward Circle (North side)	**Overall**	**13.5**	**B**	**24.4**	**C**
	Westbound	23.8	C	28.1	C
	Northbound	6.6	A	7.8	A
	Southbound	10.5	B	31.7	C
Massachusetts Ave & NAC/East Campus Driveway	Eastbound Left	2.3	A	1.0	A
	Northbound Right	17.5	C	21.2	C
	Southbound	35.5	E	247.8	F
Massachusetts Ave & Westover Place	Westbound Left	0.0	A	0.6	A
	Northbound	58.2	F	61.9	F
Nebraska Ave & New Mexico Ave	**Overall**	**20.9**	**C**	**24.1**	**C**
	Eastbound	36.2	D	35.9	D
	Westbound	30.5	C	30.2	C
	Northbound	15.2	B	15.3	B
	Southbound	22.8	C	27.2	C
New Mexico Ave & Commuter Lot	Eastbound Left	3.4	A	3.5	A
	Southbound	12.5	B	14.0	B
Nebraska Ave & 45th St	Southbound Left	1.0	A	0.8	A
	Westbound	9.3	A	12.4	B
Nebraska Ave & Rockwood Pkwy	**Overall**	**13.3**	**B**	**12.5**	**B**
	Eastbound	40.4	D	38.9	D
	Westbound	38.9	D	38.6	D
	Northbound	13.6	B	11.8	B

Intersection	Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
	Southbound	2.5	A	5.8	A
Rockwood Pkwy & Fletcher Gate	Eastbound Left	0.6	A	1.3	A
	Southbound	11.6	B	10.5	B
Rockwood Pkwy & Glenbrook Rd	**Overall**	**8.7**	**A**	**7.8**	**A**
	Eastbound	8.7	A	7.9	A
	Westbound	8.0	A	7.7	A
	Southbound	9.2	A	7.9	A

For the purpose of this analysis, it is desirable to achieve a level of service (LOS) of "E" or better on each approach. As stated previously, all study area intersections operate at acceptable levels of service during the morning and afternoon peak hours. However, several approaches continue to operate with unacceptable levels of service during one or more peak hours. The LOS results show that:

- All of the study intersections (overall LOS grade) operate at acceptable conditions during both the morning and afternoon peak hours.
- The following approaches continue to operate with unacceptable LOS during one or more peak hours:
  - The northbound approach of University Avenue at Massachusetts Avenue and 46th Street continues to operate under unacceptable conditions during the morning peak period, which is seen in both the existing and future without the 2011 Plan scenarios. The vehicular traffic generated by the 2011 Plan minimally impacts the poor LOS at this intersection.
  - The westbound approach of Massachusetts Avenue at Ward Circle operates above capacity during the morning and afternoon peak period, as shown in both the future without the 2011 Plan scenario as well. The vehicular traffic generated by the 2011 Plan minimally impacts the poor LOS at this intersection. However, long-term recommendations for Ward Circle are outlined below in the "Recommendations and Mitigation Measures" section of this report.
  - The southbound approach of the NAC Driveway at Massachusetts Avenue and the East Campus Driveway operates at an unacceptable level of service during the afternoon peak period, which is also seen in the existing and future without the 2011 Plan scenarios. Recommendations to mitigate the impact of the 2011 Plan are outlined below in the "Recommendations and Mitigation Measures" section of this report.
  - The northbound approach of Westover Place at Massachusetts Avenue operates at an unacceptable level of service during the morning and afternoon peak periods, which is seen in both the existing and future without the 2011 Plan scenarios. The vehicular traffic generated by the 2011 Plan minimally impacts the poor LOS at this intersection. However, improvements recommended for the adjacent intersection at the NAC and East Campus Driveways will improve the LOS at the intersection, as outlined below in the "Recommendations and Mitigation Measures" section of this report.
- No new unacceptable LOS are observed following the addition of the vehicular and pedestrian traffic generated by the 2011 Plan.

Future with 2011 Campus Plan Pedestrian Analysis Results

Pedestrian analyses were performed for the future with the 2011 Plan conditions at the intersections contained within the study area during the morning and afternoon peak hours. The analysis was based on "Chapter 13: Pedestrians" of the Highway Capacity Manual (HCM), as outlined previously.

Table 15 and Table 16 show the results of the capacity analyses, including LOS and average delay (in seconds). The capacity analysis results are also shown on Figure 33, Figure 34, Figure 35, and Figure 36.

Table 15: Main Campus – Total Future Pedestrian Levels of Service for Signalized Intersections

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/Tilden St	Eastbound	12.0	B	8.0	A
	Westbound	12.0	B	8.0	A
	Northbound	27.4	C	34.4	D
	Southbound	27.4	C	34.4	D
Massachusetts Ave & Glover Gate/Katzen Arts Center	Eastbound	7.6	A	5.8	A
	Westbound	8.0	A	6.1	A
	Northbound	35.3	D	39.6	D
	Southbound	35.3	D	39.6	D
Ward Circle:					
Nebraska Ave & Ward Circle	Eastbound	39.6	D	39.6	D
Nebraska Ave & Ward Circle	Westbound	39.6	D	39.6	D
Nebraska Ave & New Mexico Ave	Eastbound	39.6	D	39.6	D
	Westbound	39.6	D	39.6	D
	Northbound	19.8	B	21.1	C
Nebraska Ave & Rockwood Pkwy	Eastbound	19.8	B	21.1	C
	Westbound	37.8	D	37.8	D
	Northbound	37.8	D	37.8	D
	Southbound	8.8	A	8.8	A

Table 16: Main Campus – Total Future Pedestrian Levels of Service for Unsignalized Intersections

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & 46th St/University Ave	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
Massachusetts Ave & 45th St	Westbound	N/A - Stop controlled crossing, LOS A			
	Southbound	54,608.4	F	58,792.9	F
Ward Circle:					
Massachusetts Ave & Ward Circle	Southbound	120.9	F	44.1	E
Massachusetts Ave & Ward Circle	Northbound	180.5	F	37.1	E
Massachusetts Ave & Ward Circle	Northbound	28.7	D	80.9	F
Massachusetts Ave & Ward Circle	Southbound	19.4	C	92.8	F
Massachusetts Ave & NAC Driveway	Westbound	N/A - Stop controlled crossing, LOS A			
Massachusetts Ave & Westover Place	Eastbound	N/A - Stop controlled crossing, LOS A			

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Nebraska Ave & Commuter Lot (RIRO)	Northbound	N/A - Stop controlled crossing, LOS A			
New Mexico Ave & Commuter Lot	Westbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & 45th St	Northbound	N/A - Stop controlled crossing, LOS A			
Rockwood Pkwy & Tilden Gate	Westbound	N/A - Stop controlled crossing, LOS A			
Rockwood Pkwy & Fletcher Gate	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			

The analysis results indicate that all signalized crosswalks in the study area operate at acceptable levels of service during both the morning and afternoon peak hours. This indicates a low (LOS A and B) to moderate (LOS C and D) likelihood of non-compliance by pedestrians, which is reflected by pedestrians jaywalking across the intersection.

The analysis results also indicate that the majority of the unsignalized crosswalks in the study area operate at unacceptable levels of service during one or more peak hours. This indicates a moderate (LOS C and D) to very high (LOS F) likelihood of risk-taking behavior for pedestrians, which is reflected in pedestrians dashing between vehicles during short gaps in traffic. As stated previously, pedestrians have the right-of-way in all crosswalks in the District, so vehicles must yield to pedestrians in the crosswalk at the study intersections listed in Table 4. However, the LOS F calculated for the unsignalized approaches of Ward Circle and at the intersection of Massachusetts Avenue and 45th Street during the morning and afternoon peak hours indicates an unfriendly and intimidating environment for pedestrians. No new unacceptable LOS are observed for the future with the 2011 Plan scenario.

The southbound crosswalk at the intersection of Massachusetts Avenue and 45th Street continues to operate under unacceptable conditions during the morning peak period, which is seen in both the existing and future without the 2011 Plan scenarios. The vehicular traffic generated by the 2011 Plan minimally impacts the poor LOS at this intersection.

As explained in "Chapter 13: Pedestrians" of the Highway Capacity Manual (HCM), pedestrian LOS at an unsignalized location is based on the length of the crosswalk and the volume of conflicting vehicles. Thus, any short-term recommendations made for Ward Circle will not improve the pedestrian LOS because it is not affected by the volume of pedestrians. While AU recognizes that improving Ward Circle is a topic beyond the scope of its 2011 Plan, the University is willing to work with the community and District and Federal agencies towards a long-term solution to Ward Circle, to help the safety and convenience of its students and faculty/staff. Long-term options for Ward Circle should be based on a joint study of the Circle lead by AU. This study would need to include representatives from the various stakeholders with interest in Ward Circle such as AU and the surrounding community, including major parcel owners such as Department of Homeland Security, DDOT, and the National Park Service.

Recommendations and Mitigation Measures

As noted above, a few approaches operate under unacceptable conditions during one or more peak hours for the future with the 2011 Plan scenario. The impacts of the 2011 Plan are primarily seen at Ward Circle and the intersection of Massachusetts Avenue with the NAC and East Campus Driveways. Improvements are recommended in order to minimize the impacts of the 2011 Plan to vehicular commuter traffic and to minimize pedestrian and vehicular conflicts at crosswalks near the Main Campus.

For Ward Circle, the data collected and traffic modeling performed shows consistent problems with Ward Circle, including poor pedestrian and vehicular LOS. However, a signal constructed at the intersection of Massachusetts Avenue with the NAC and East Campus Driveways will improve vehicular LOS at Ward Circle. This signal will also provide an additional signalized location for pedestrians to cross Massachusetts Avenue. A future long-term study is recommended in order to address the existing and future safety and congestion issues at Ward Circle.

In order to mitigate the 2011 Plan impact to the intersection of Massachusetts Avenue with the NAC and East Campus Driveways and to provide an additional signalized pedestrian crossing, the construction of a traffic signal is recommended. A traffic signal would allow for vehicles to exit the NAC and East Campus Driveways and also allow pedestrians to cross Massachusetts Avenue at a signalized location, moving pedestrians away from the unsignalized crossing at Ward Circle. It was assumed that approximately two-thirds of the existing pedestrians crossing Massachusetts Avenue at Ward Circle would use the new signalized crosswalk at this location. In addition, the signal would provide more frequent gaps in traffic, which would allow for an improved LOS at the intersection of Massachusetts Avenue and Westover Place as well.

Table 17 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds) with and without the proposed recommendations. The results are also shown on Figure 37. The capacity analysis results show that the recommendations proposed improve all study area intersections to operate at acceptable conditions. The exception is the northbound approach of Westover Place at Massachusetts Avenue during the afternoon peak hour, which is still operating slightly above capacity with the additional gaps in traffic provided by the new signal. However, this delay is still an improvement versus the unacceptable LOS calculated for the future without the 2011 Plan scenario.

Table 18 shows the results of pedestrian capacity analysis performed for the proposed traffic signal at the intersection of Massachusetts Avenue with the NAC and East Campus. The results are also shown on Figure 37.

The analysis results indicate that the signalized crosswalks operate at acceptable levels of service during both the morning and afternoon peak hours. This indicates a low (LOS A) to moderate (LOS D) likelihood of non-compliance by pedestrians, which is reflected by pedestrians jaywalking across the intersection.

Table 17: Main Campus – Total Future Vehicular Levels of Service with Proposed Improvements

Intersection	Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Ward Circle:					
Massachusetts Ave & Ward Circle (East side)	Westbound Right	59.8	F	339.0	F
Improvement: Pedestrians moved to adjacent signalized intersection					
Massachusetts Ave & Ward Circle (East side)	Westbound Right	16.0	C	29.0	D
Massachusetts Ave & NAC/East Campus Driveway	Eastbound Left	2.3	A	1.0	A
	Northbound Right	17.5	C	21.2	C
	Southbound	35.5	E	247.8	F
Improvement: Install signal	**Overall**	**21.4**	**C**	**9.9**	**A**
	Eastbound	29.3	C	5.6	A
	Westbound	5.7	A	9.7	A
	Northbound Right	32.9	C	30.7	C
	Southbound	33.1	C	35.1	D
Massachusetts Ave & Westover Place	Westbound Left	0.0	A	0.6	A
	Northbound	58.2	F	61.9	F
Improvement: Adjacent signalized intersection	Westbound Left	0.0	A	0.5	A
	Northbound	44.0	E	53.3	F

Table 18: Main Campus – Total Future Pedestrian Levels of Service with Proposed Improvements

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Massachusetts Ave & Westover Place	Eastbound	N/A - Stop controlled crossing, LOS A			
Improvement: Install signal	Eastbound	6.8	A	6.8	A
	Westbound	6.8	A	6.8	A
	Southbound	39.6	D	39.6	D

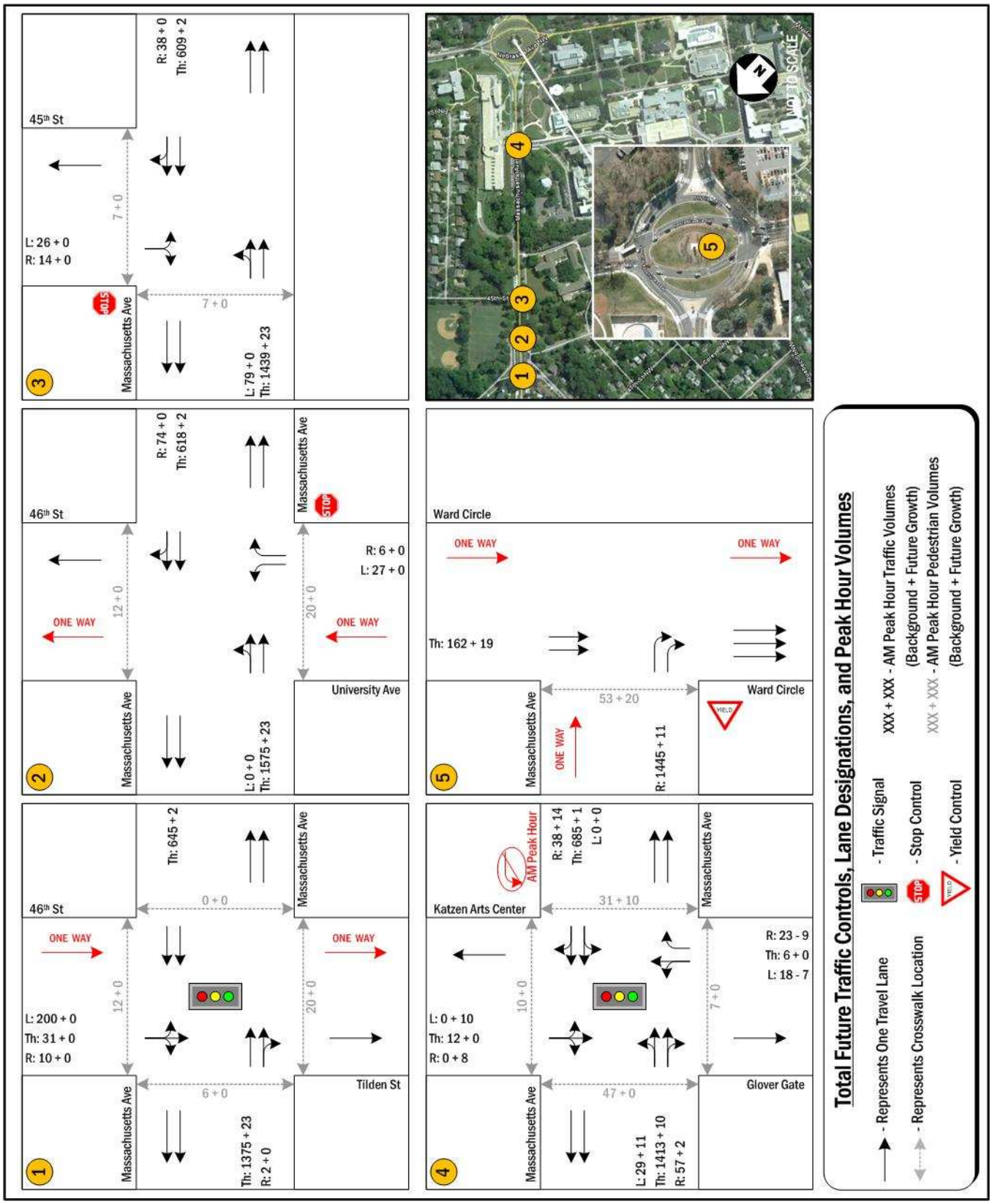

Figure 25: Main Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (1 of 4)

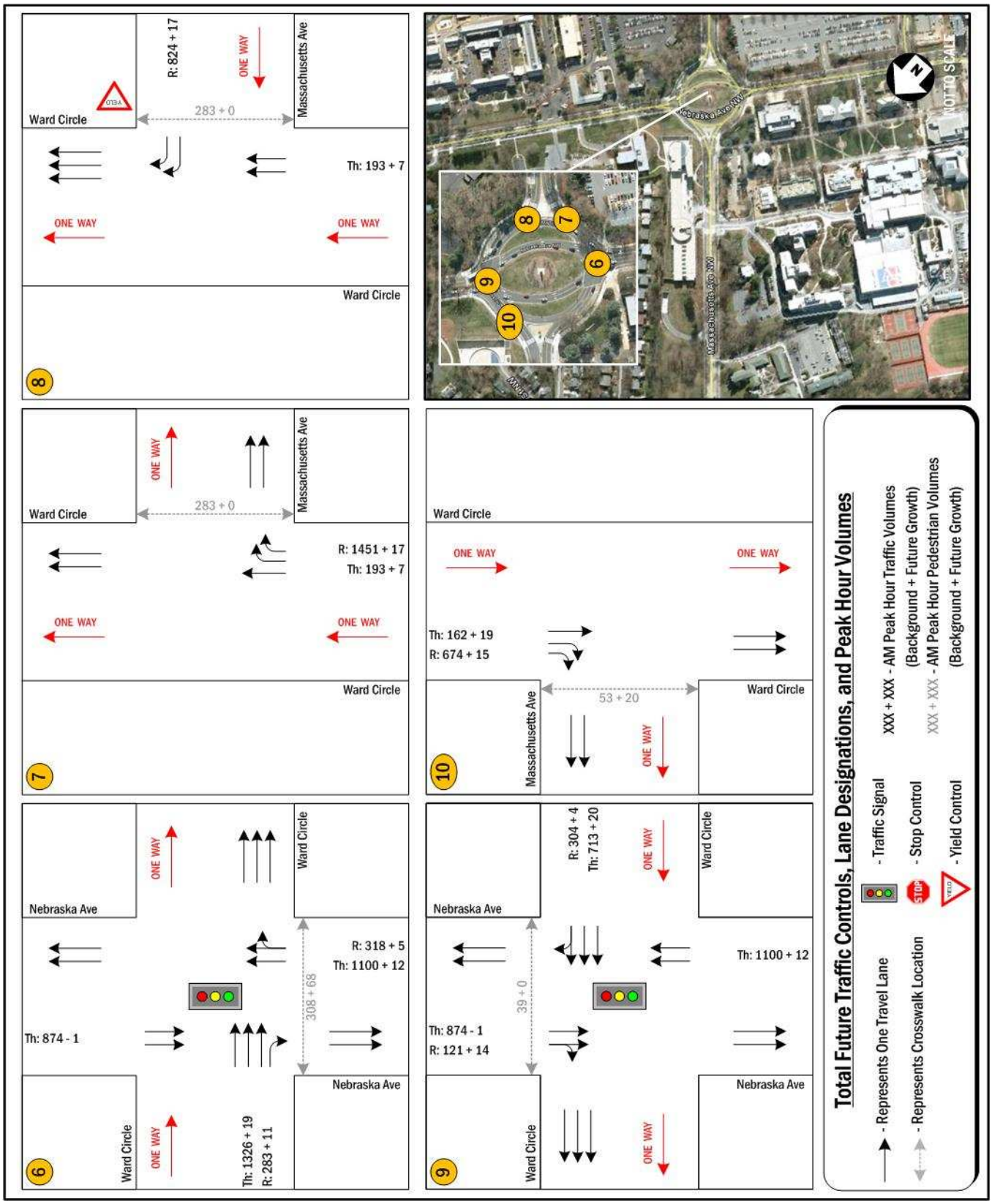

Figure 26: Main Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (2 of 4)

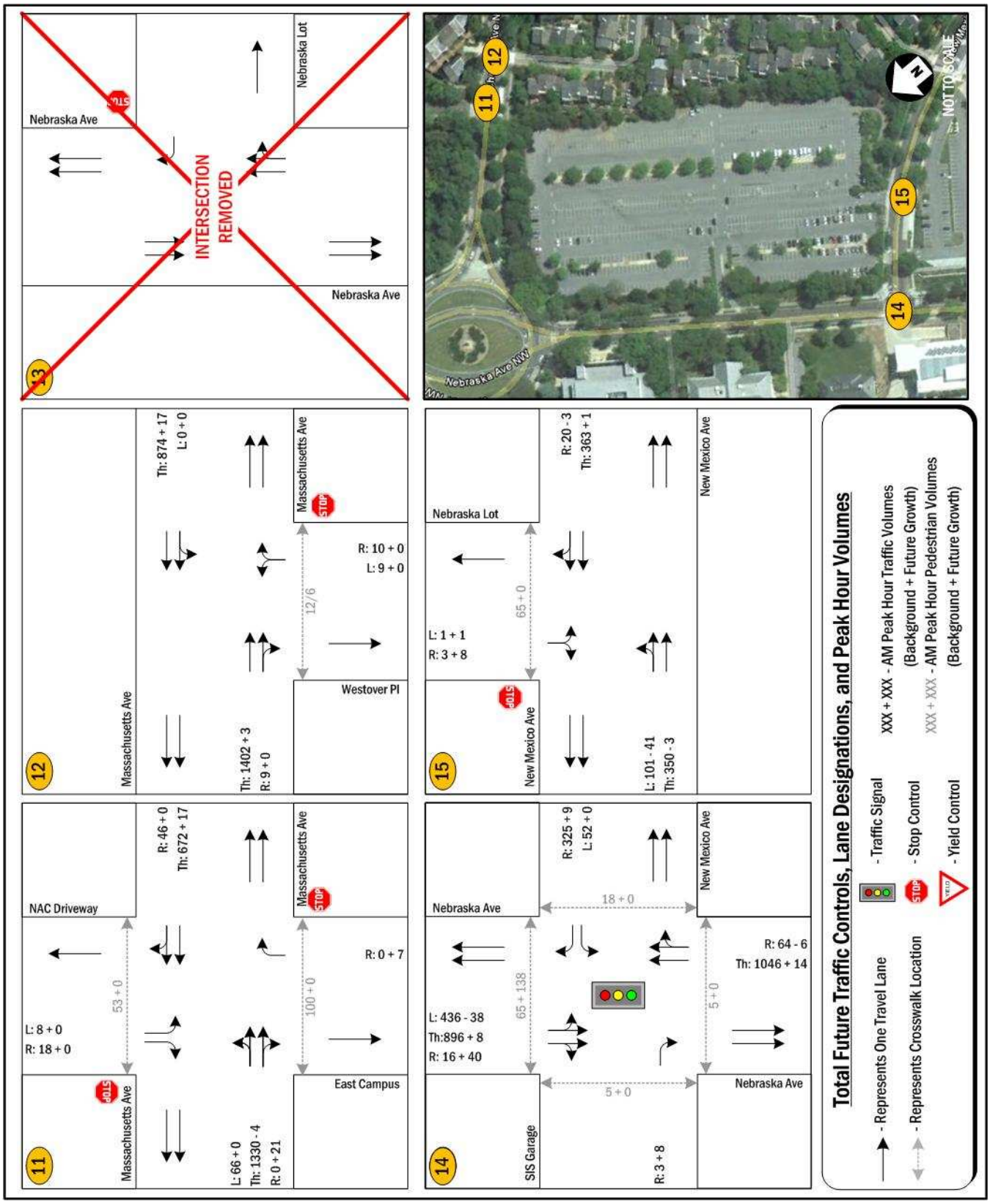

Figure 27: Main Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (3 of 4)

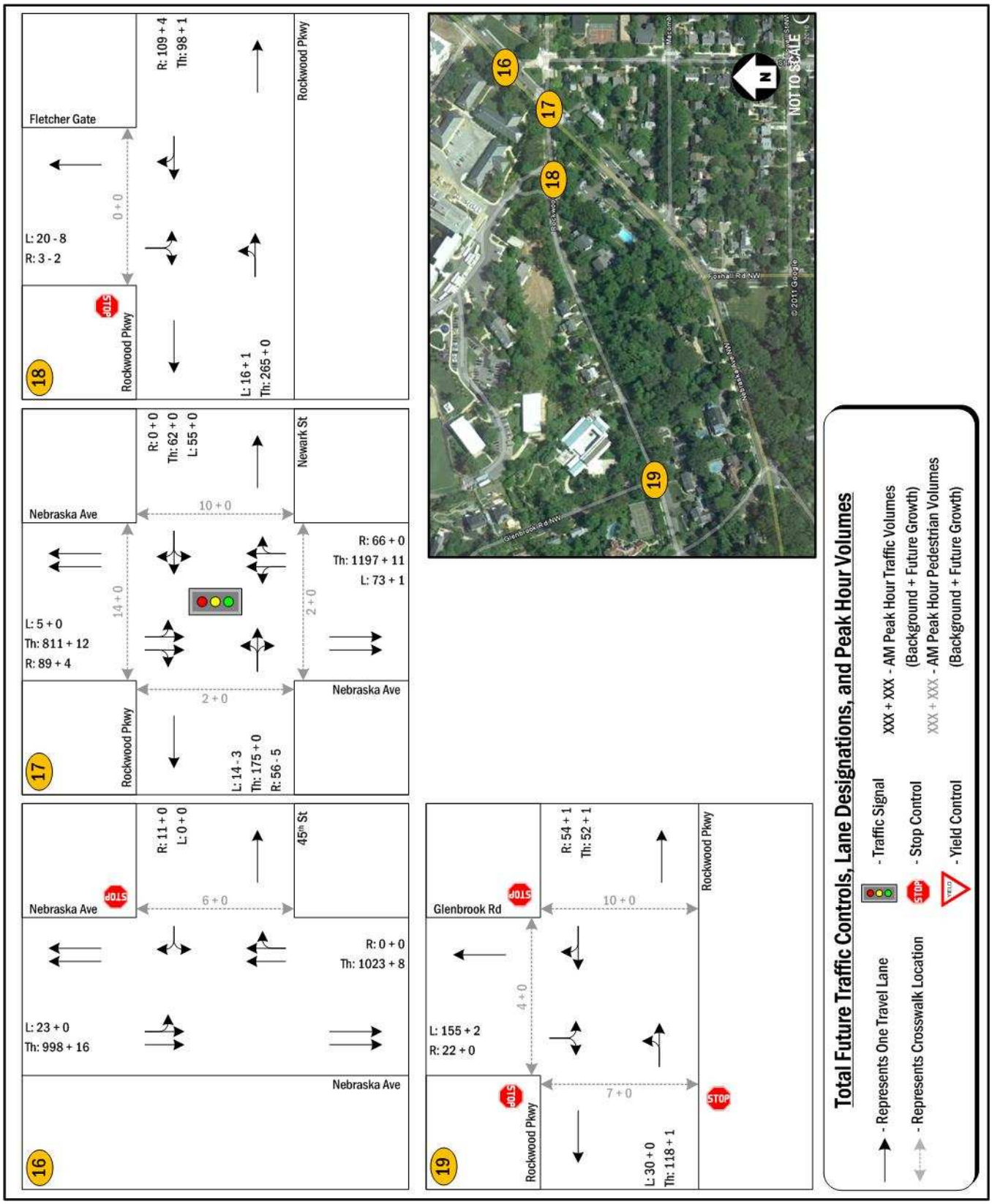

Figure 28: Main Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (4 of 4)

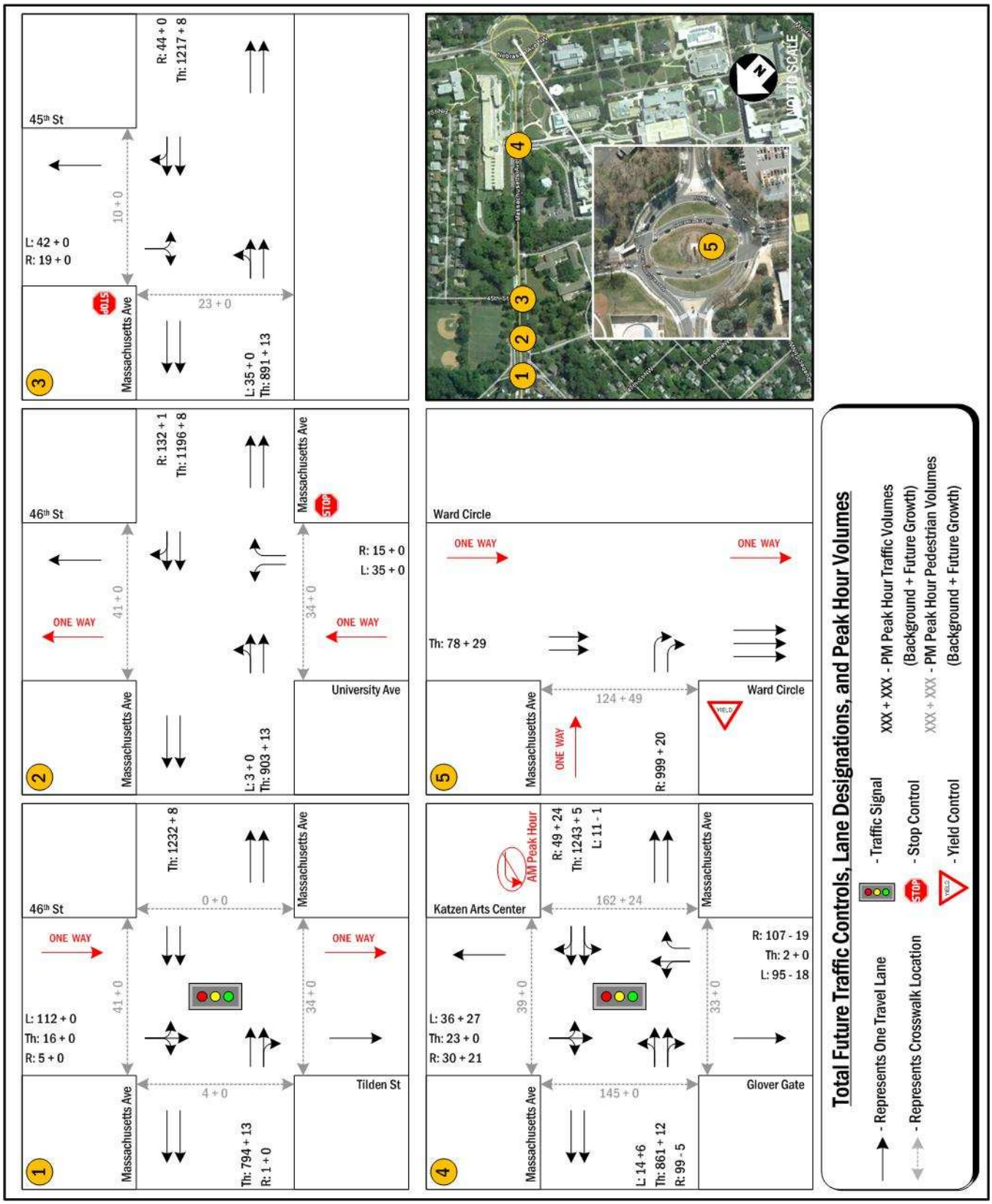

Figure 29: Main Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (1 of 4)

Figure 30: Main Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (2 of 4)

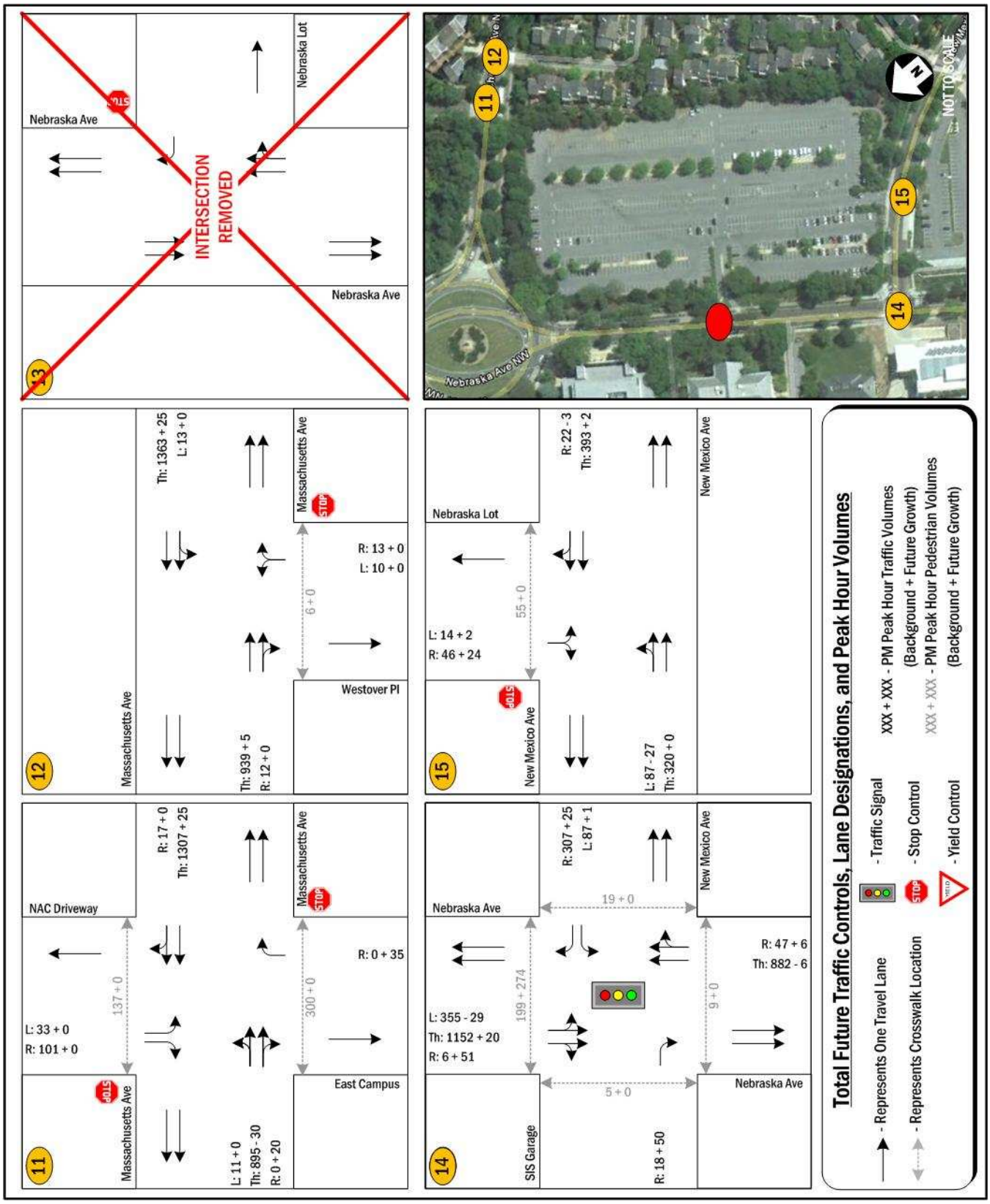

Figure 31: Main Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (3 of 4)

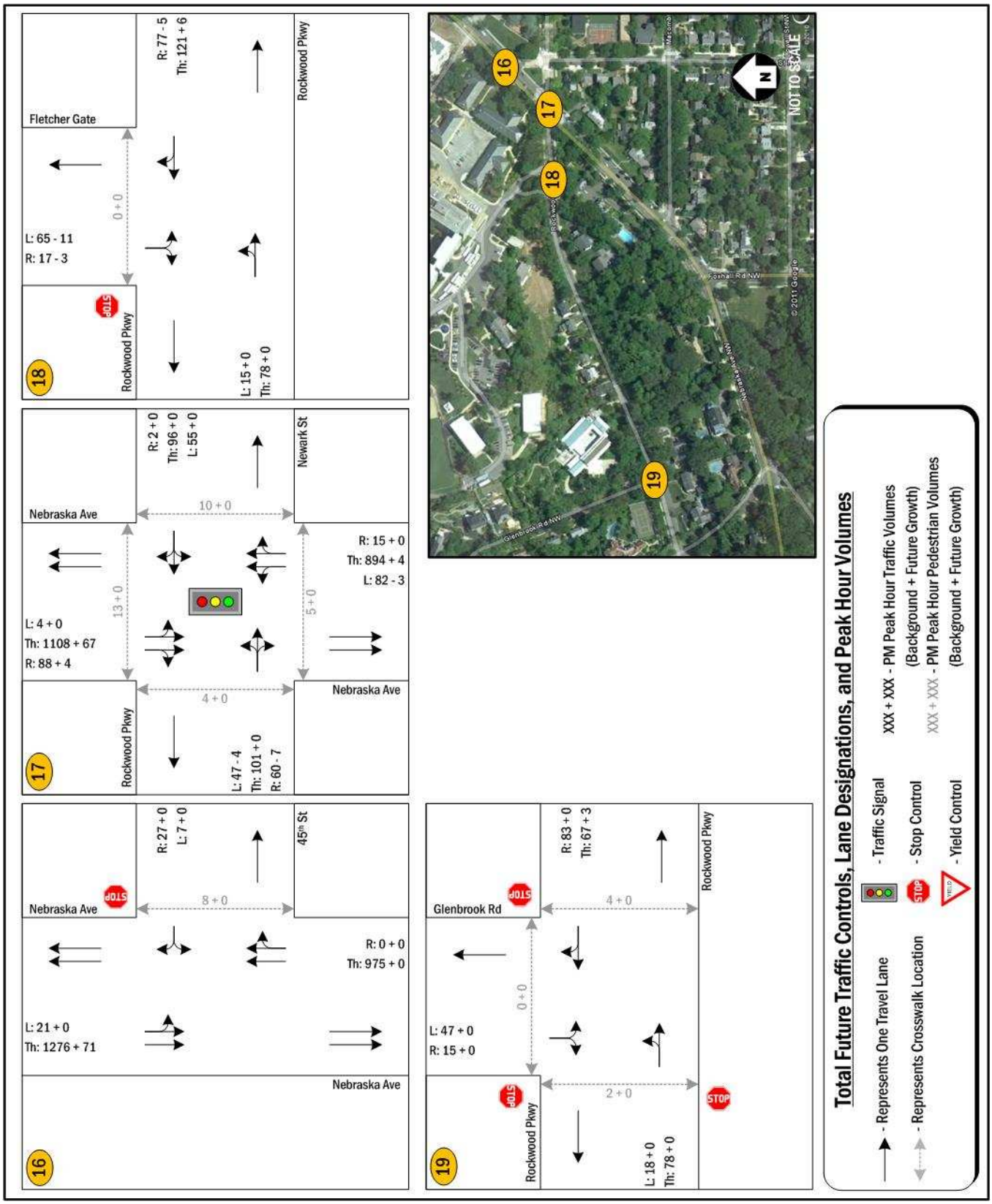

Figure 32: Main Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (4 of 4)

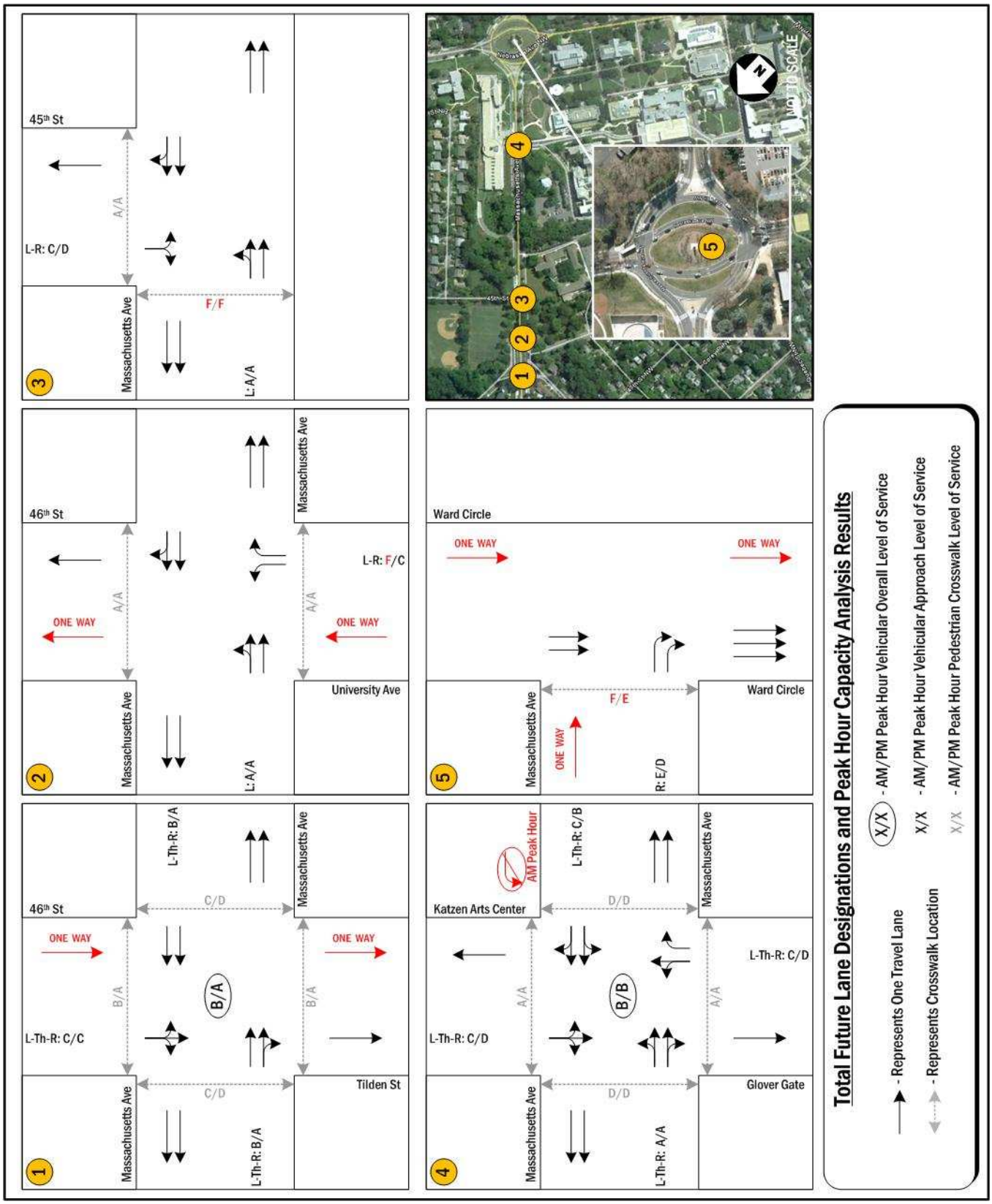

Figure 33: Main Campus – Total Future Lane Configurations and Capacity Analysis Results (1 of 4)

Figure 34: Main Campus – Total Future Lane Configurations and Capacity Analysis Results (2 of 4)

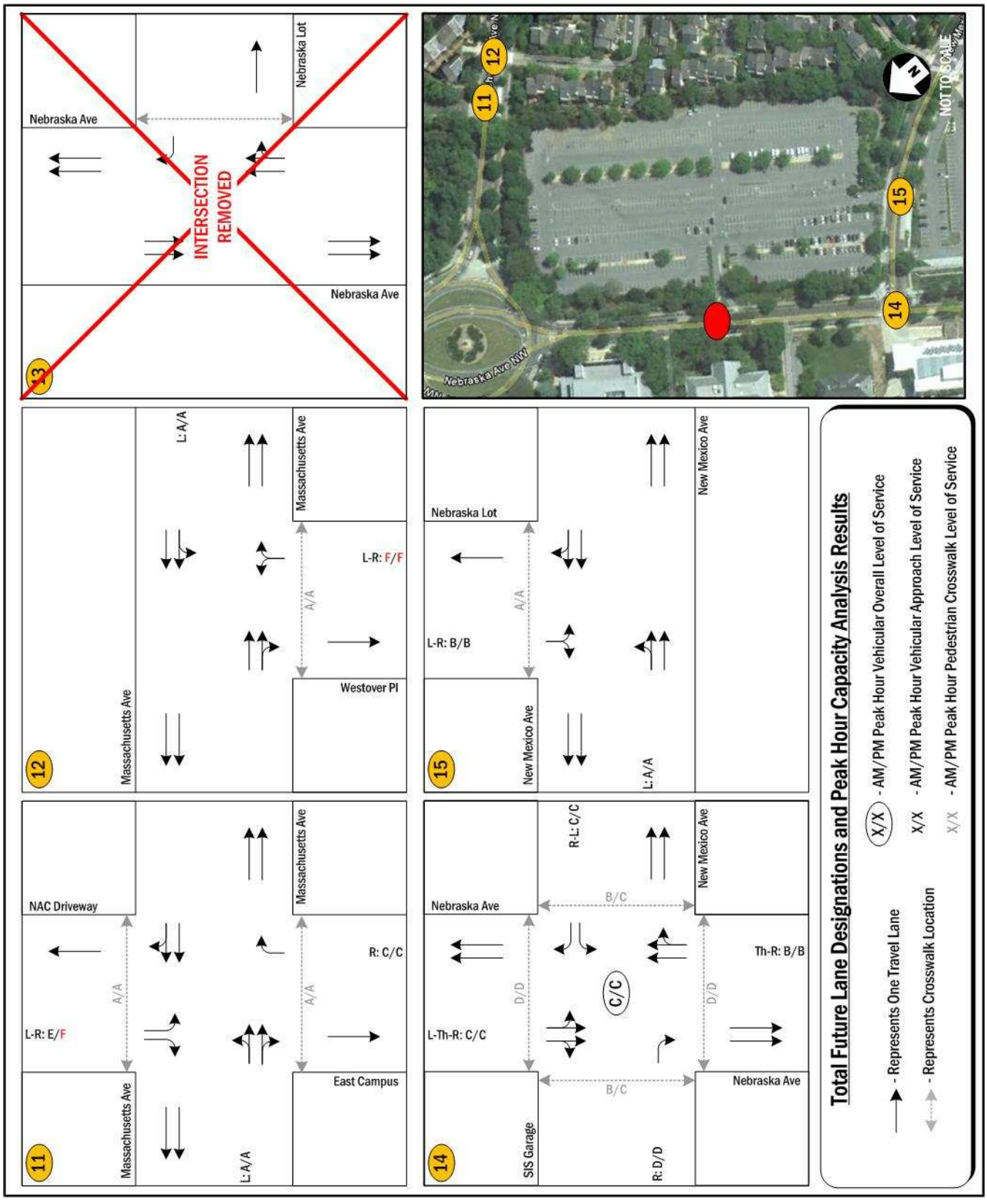

Figure 35: Main Campus – Total Future Lane Configurations and Capacity Analysis Results (3 of 4)

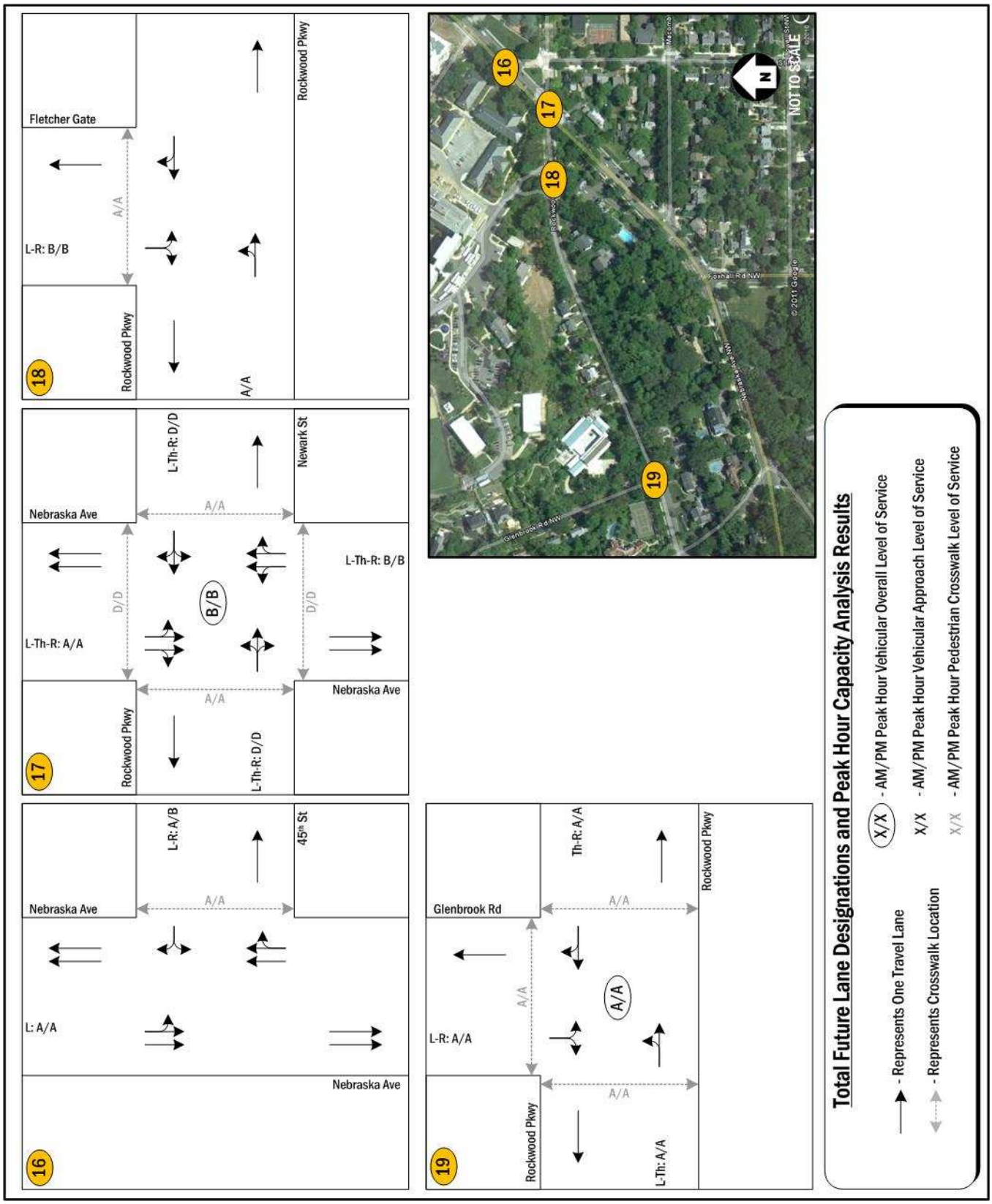

Figure 36: Main Campus – Total Future Lane Configurations and Capacity Analysis Results (4 of 4)

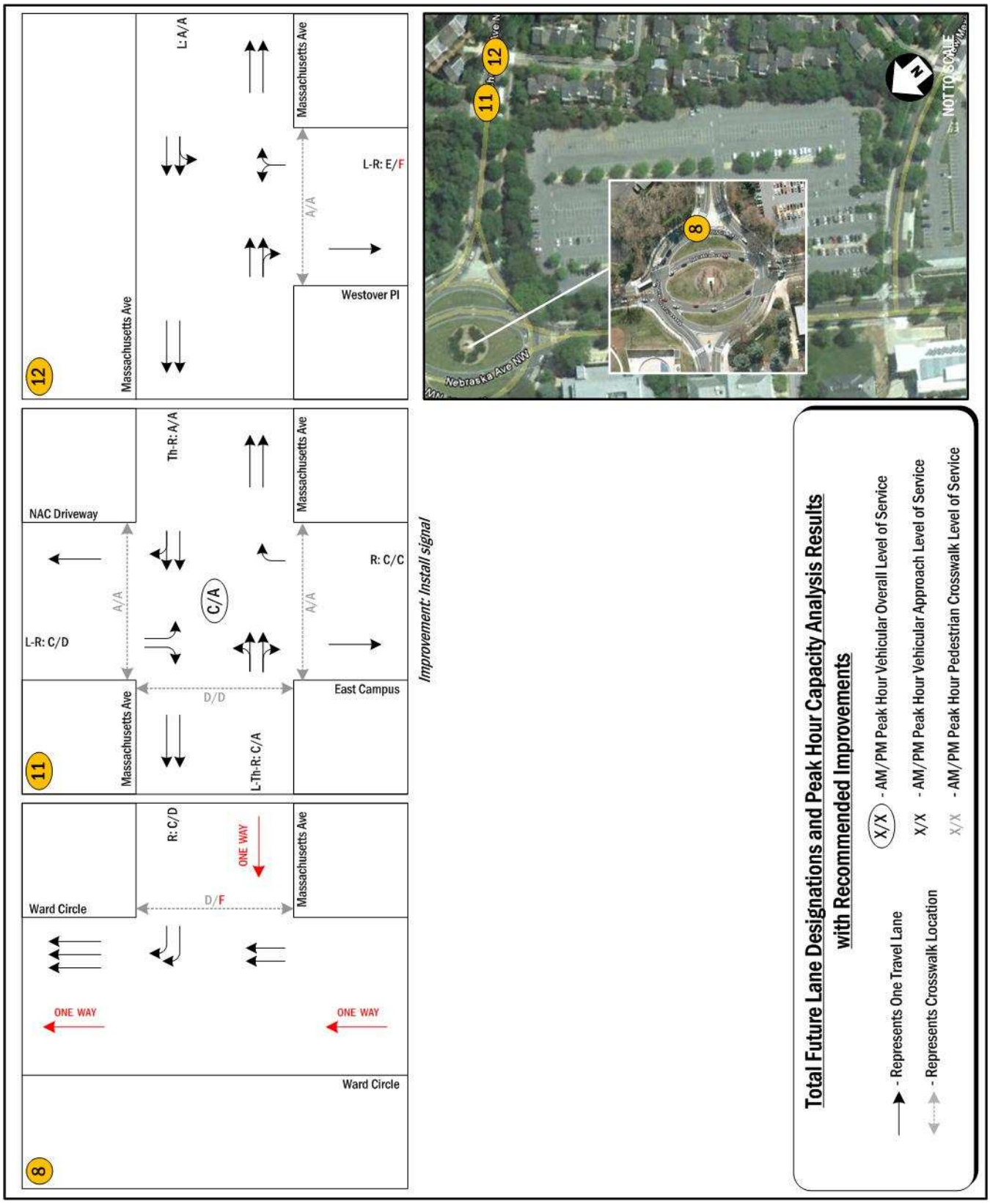

Figure 37: Main Campus – Total Future Capacity Analysis Results with Proposed Improvements

DETAILED CAPACITY ANALYSIS – TENLEY CAMPUS

Existing Conditions

Site Location and Major Transportation Features

The American University Tenley Campus is located in the northwest portion of Washington, DC, in Ward 3. The location of the University Tenley Campus, as shown previously in Figure 1, is primarily bounded by Yuma Street on the north, Warren Street on the south, 42nd Street on the west, and Nebraska Avenue on the east. (For the purpose of this analysis, Nebraska Avenue is assumed to have a north-south alignment.) The Tenley Campus is served by several arterials, including Wisconsin Avenue and Nebraska Avenue. Major collector roadways include Van Ness Street, 45th Street, and 42nd Street. The University is also served by several public transportation sources, including Metrorail and Metrobus. Additionally, the University also provides a free shuttle for students and faculty/staff that connects the Main Campus, Law School, Tenley Campus, and Metrorail station.

The Tenley Campus is also served by a pedestrian network consisting of sidewalks and crosswalks along the local streets surrounding the project site. In addition to pedestrian accommodations, the site is also served by the on- and off-street bicycle network, which consists of bike lanes and signed bicycle routes along local roadways.

Site Access and Existing Road Network

Regional access for the American University Tenley Campus is provided primarily by Wisconsin Avenue and Nebraska Avenue. Local access is also provided by Yuma Street, Warren Street, Van Ness Street, and 42nd Street. Figure 2, shown previously, shows the street network hierarchy for the study area, as well as the average annual weekday traffic volumes for the heavily traveled roadways.

Gorove/Slade conducted field reconnaissance to obtain the existing lane usage and traffic controls at the intersections within the Tenley Campus study area. Figure 38, Figure 39, Figure 40, Figure 41, and Figure 42 present the roadway lane configurations and traffic control devices provided at the study intersections. Figure 43 presents the number of travel lanes on the roadways surrounding the Tenley Campus. For the purpose of this report, Nebraska Avenue is assumed to have a north-south orientation. The physical and service characteristics of the key roadways providing local site access are as follows:

- *Wisconsin Avenue*
  Wisconsin Avenue is a 6-lane arterial, which runs north of the American University Tenley Campus. The roadway is classified by DDOT as a primary arterial with average annual weekday traffic of 34,000 vehicles. Within the limits of the study area, Wisconsin Avenue runs through Tenley Circle.

- *Nebraska Avenue*
  Nebraska Avenue is a 4-lane arterial, which runs along the east side of the American University Tenley Campus. The roadway is classified by DDOT as a primary arterial with average annual weekday traffic of 20,700 vehicles. Within the limits of the study area, Nebraska Avenue runs from Van Ness Street to Tenley Circle.

- *Yuma Street*
  Yuma Street is a 2-lane roadway, north of the American University Tenley Campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Yuma Street runs from 42nd Street to Nebraska Avenue.

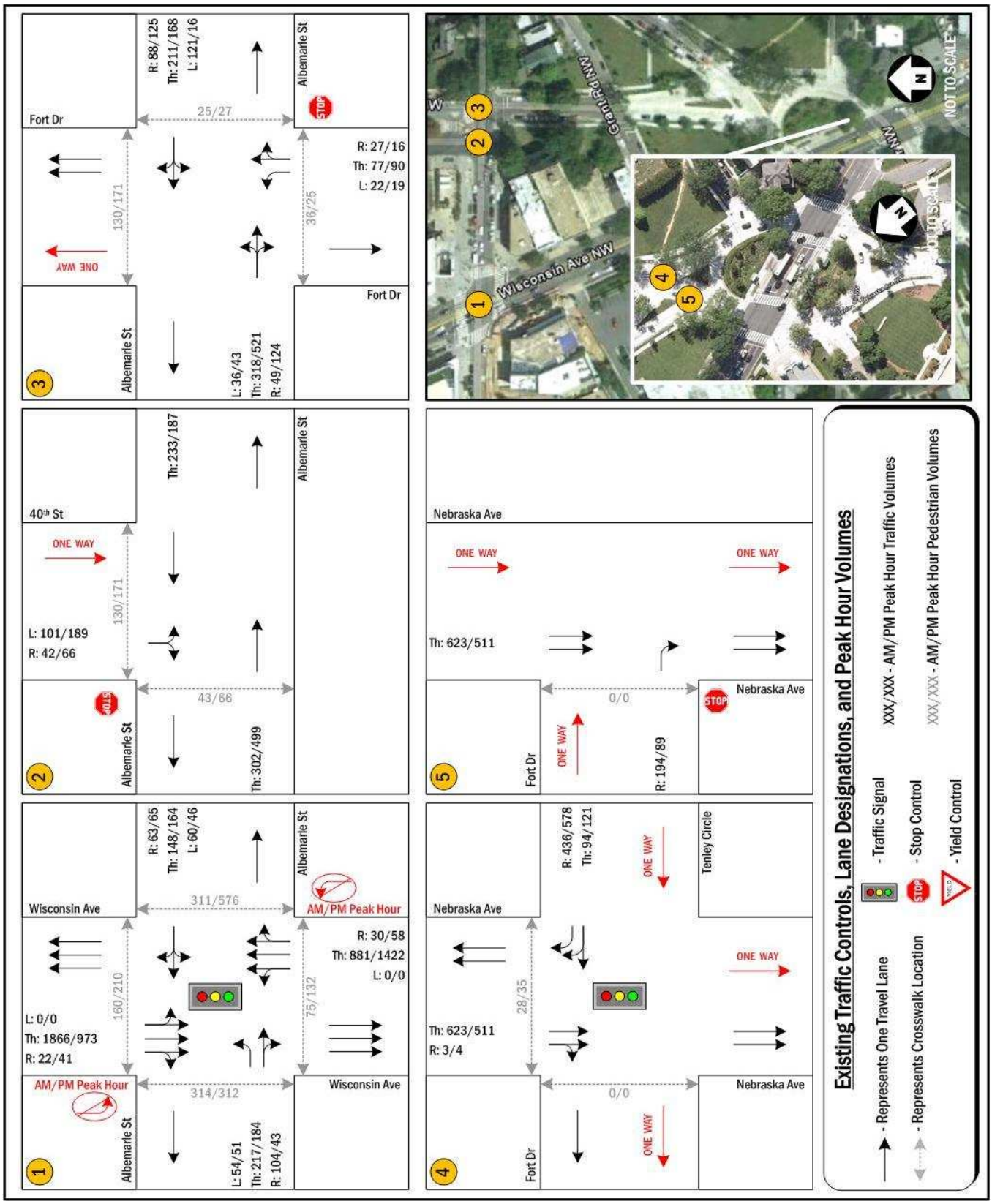

Figure 38: Tenley Campus – Existing Traffic Controls, Lane Designations, and Peak Hour Traffic Volumes (1 of 5)

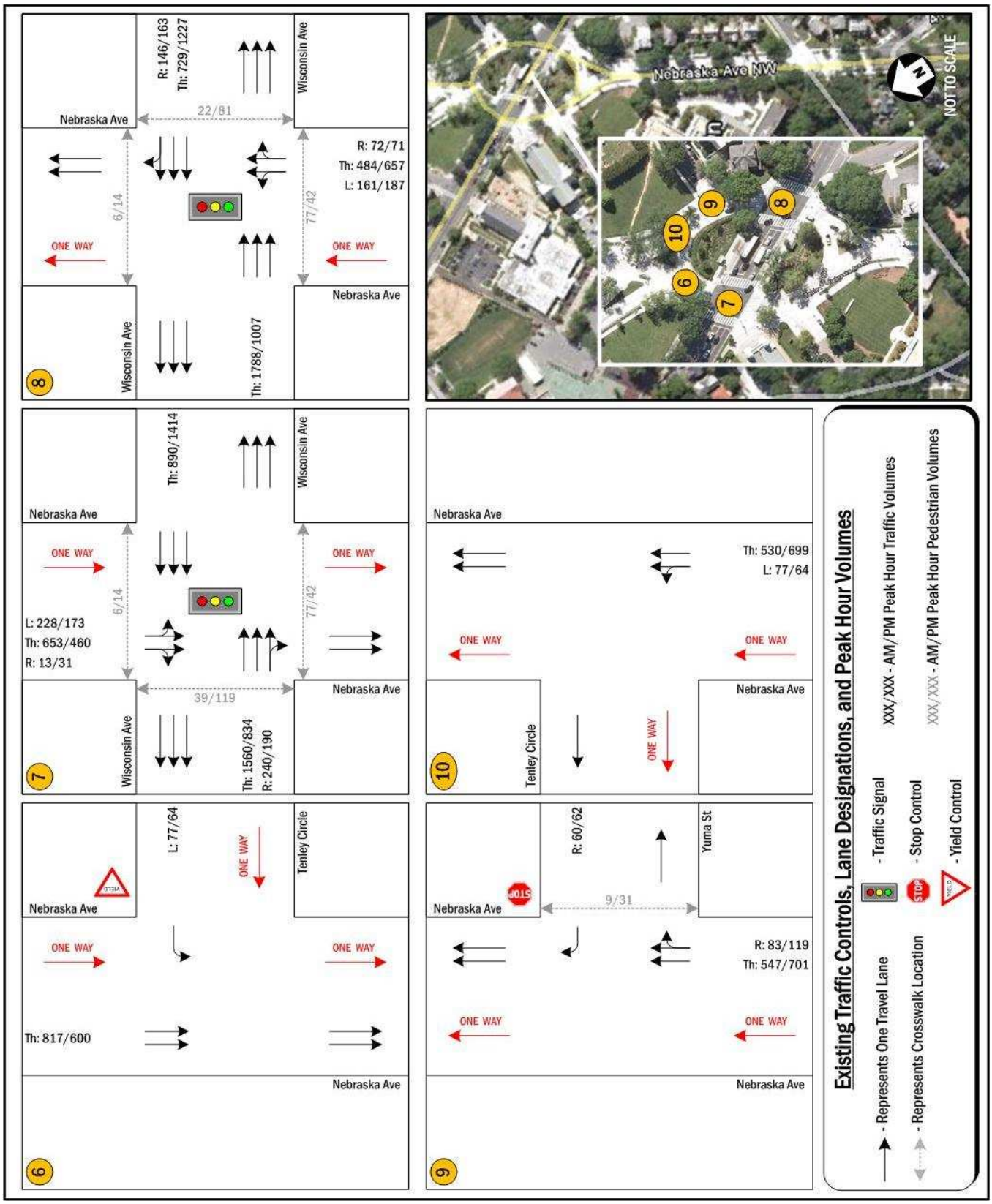

Figure 39: Tenley Campus – Existing Traffic Controls, Lane Designations, and Peak Hour Traffic Volumes (2 of 5)

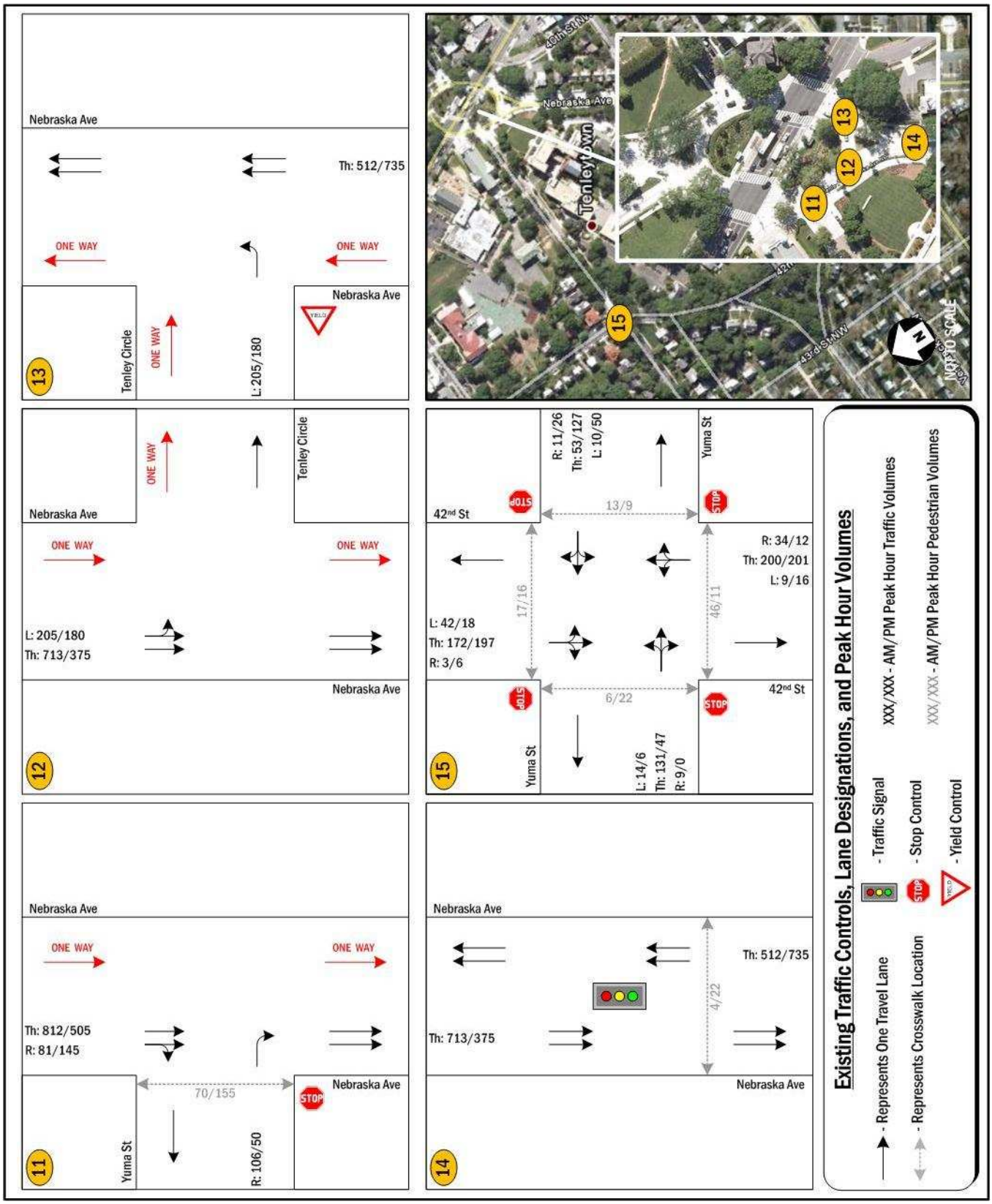

Figure 40: Tenley Campus – Existing Traffic Controls, Lane Designations, and Peak Hour Traffic Volumes (3 of 5)

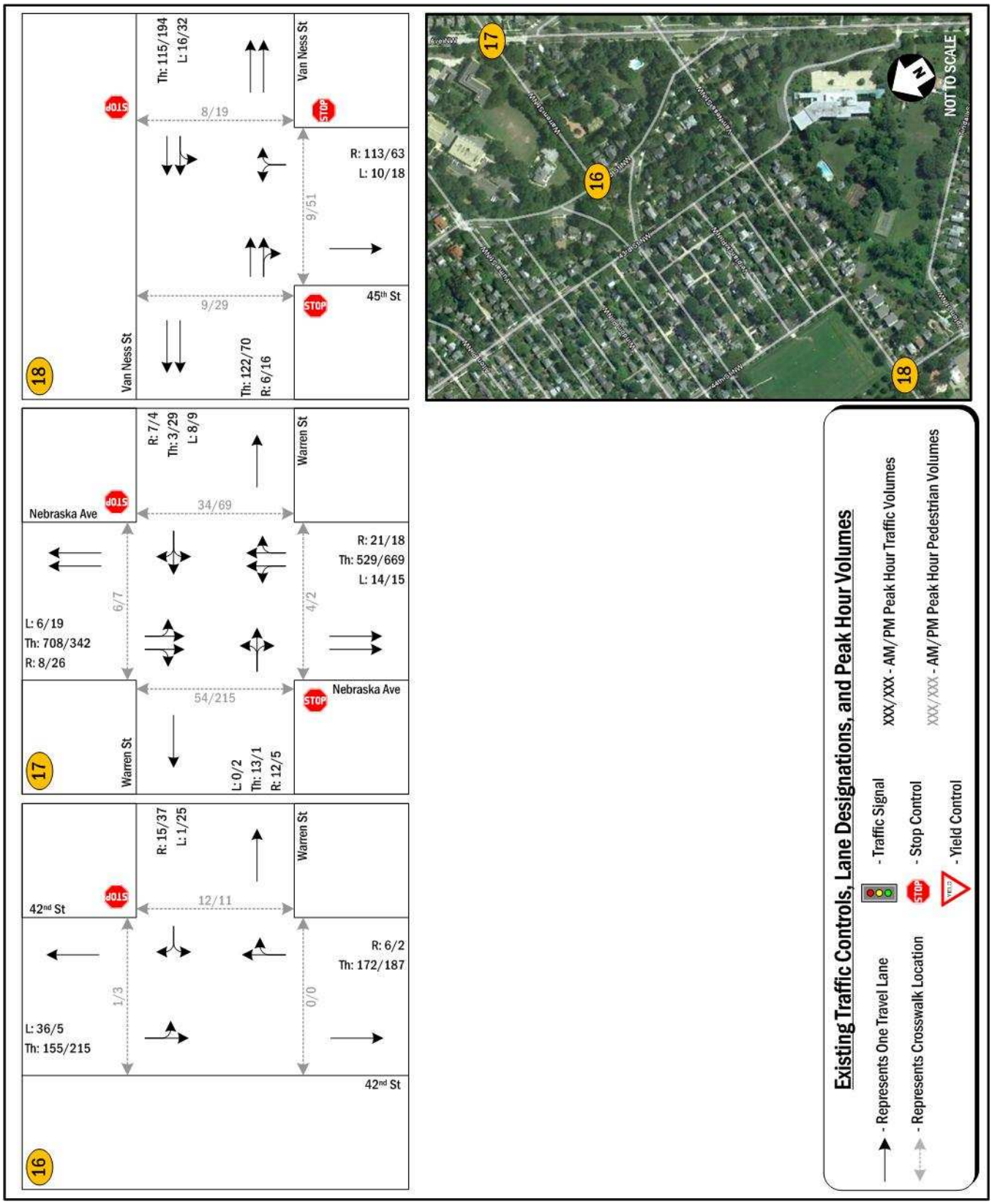

Figure 41: Tenley Campus – Existing Traffic Controls, Lane Designations, and Peak Hour Traffic Volumes (4 of 5)

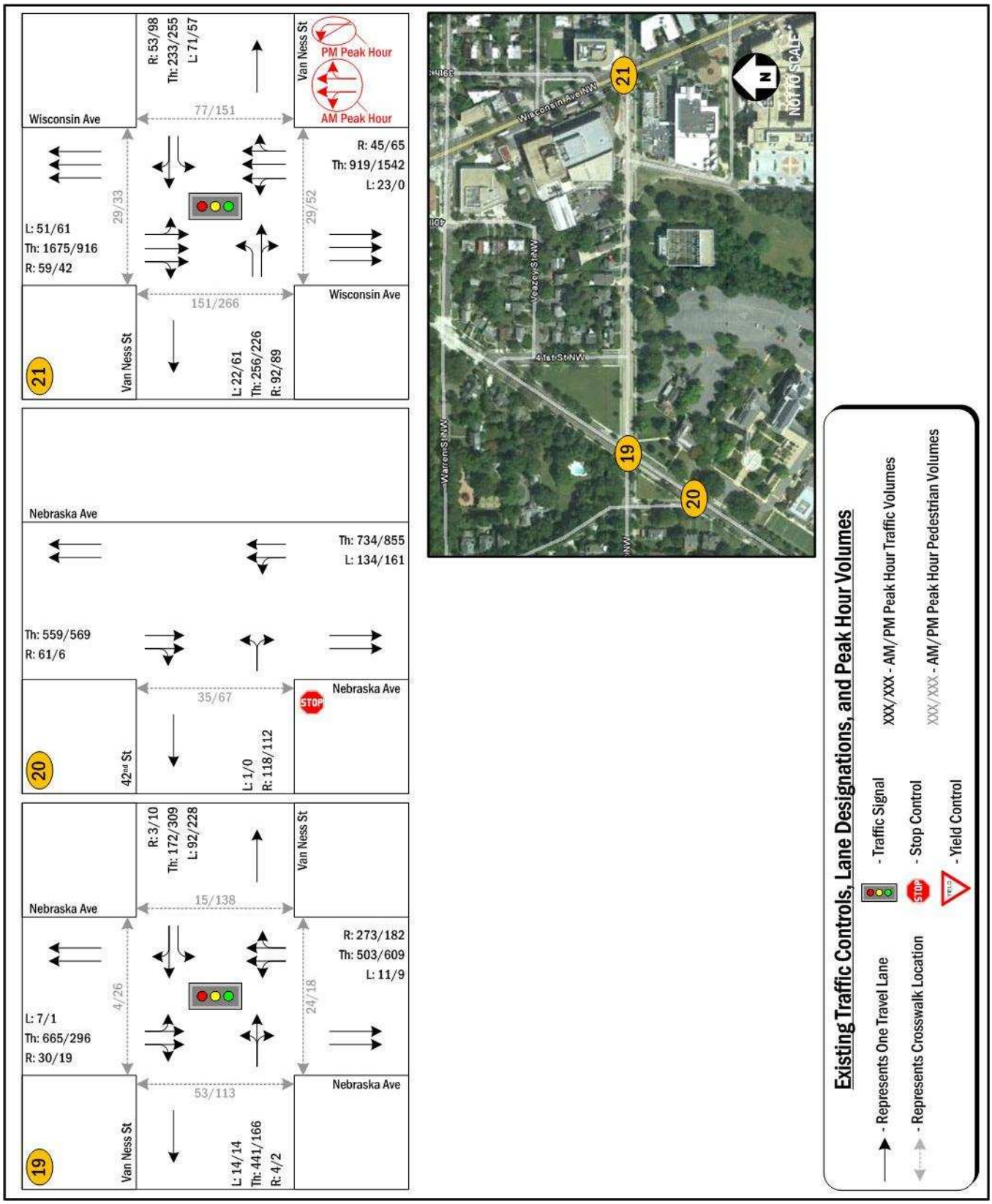

Figure 42: Tenley Campus – Existing Traffic Controls, Lane Designations, and Peak Hour Traffic Volumes (5 of 5)

Figure 43: Tenley Campus – Existing Number of Travel Lanes

- *Warren Street*
  Warren Street is a 2-lane roadway, south of the American University Tenley Campus. The roadway is classified by DDOT as a local road. Within the limits of the study area, Warren Street runs from 42nd Street to Nebraska Avenue.

- *Van Ness Street*
  Van Ness Street is a 2-lane roadway, south of the American University Tenley campus. The roadway is classified by DDOT as a collector, with an average daily traffic of 8,500 vehicles. Within the limits of the study area, Van Ness Street intersects Nebraska Avenue.

- *42nd Street*
  West of the American University Tenley Campus, 42nd Street is a 2-lane roadway. The roadway is classified by DDOT as a collector, with an average daily traffic of 6,600 vehicles. Within the limits of the study area, 42nd Street runs from Yuma Street to Warren Street. The posted speed limit in the vicinity of the site is 25 mph.

- *45th Street*
  West of the American University Tenley Campus, 45th Street is a 2-lane roadway. The roadway is classified by DDOT as a collector, with an average daily traffic of 2,400 vehicles. Within the limits of the study area, 42nd Street runs from Yuma Street to Warren Street. The posted speed limit in the vicinity of the site is 25 mph.

Site access for the Tenley Campus is provided by six driveways, which provide parking, loading, and pick-up/drop-off access. Figure 44 shows the primary access points on the Tenley Campus.

Existing Traffic Volumes

Traffic counts, including vehicular and pedestrian volumes, were conducted at the key study intersections between the hours of 6:00 to 9:00 AM and 3:00 to 7:00 PM on Tuesday, March 16, 2010. This count date represents a typical weekday when classes are in session for the University. The results of the traffic counts are included in the Technical Attachments. The morning and afternoon peak hours for the system of intersections being studied occur between 7:45 and 8:45 am and 5:30 and 6:30 pm, respectively. The majority of the intersections contained in the vehicular capacity analysis contain data collected by Gorove/Slade. However, data for a few of the study intersections was obtained from Kimley-Horn and Associates, Inc. from the *Transportation Study* performed for the U.S. Department of Homeland Security Nebraska Avenue Complex Master Plan "Draft Environmental Impact Statement" issued on January 14, 2011. Peak hour traffic volumes are shown on Figure 38, Figure 39, Figure 40, Figure 41, and Figure 42.

Field Observations

Observations of the study intersections were performed by Gorove/Slade in order to determine the lane configurations and signal timings. During these observation periods, remarks were noted in regards to signal operation. These observations were used to confirm the capacity analysis results for the existing conditions. The following observations were recorded for the intersections within the study area where data was collected by Gorove/Slade:

- *Tenley Circle – Wisconsin Avenue, Nebraska Avenue, Yuma Street, and Fort Drive*
  Tenley Circle experienced an acceptable amount of delay during the morning peak period. Vehicular traffic was concentrated on the southeast-bound approach of Wisconsin Avenue, which developed queues of approximately 8-10 vehicles at the intersection with Tenley Circle. Additionally, the southwest-bound approach of Nebraska

Avenue experiences queue development of approximately 6-8 vehicles at the intersection with Fort Drive. Vehicles traveling on the northwest-bound approach of Wisconsin Avenue and the northeast-bound approach of Nebraska Avenue experienced queue development of approximately 4-6 vehicles. The unsignalized approaches of east- and westbound Yuma Street and southbound Fort Drive experienced queue development of approximately 2-3 vehicles. The center of Tenley Circle was saturated with vehicles throughout the signal cycles. However, vehicles circulated well within the Circle, with the yield approaches operating under acceptable conditions as well.

Tenley Circle also experienced and acceptable amount of delay during the afternoon peak period. Vehicular traffic was heaviest on the northwest-bound approach of Wisconsin Avenue and the northeast-bound approach of Nebraska Avenue. Queues of approximately 8-10 vehicles and 6-8 vehicles developed on these approaches, respectively. Vehicles traveling on the southeast-bound approach of Wisconsin Avenue and the southwest-bound approach of Nebraska Avenue experienced queue development of approximately 4-6 vehicles. The unsignalized approaches of east- and westbound Yuma Street and southbound Fort Drive experienced queue development of approximately 2-3 vehicles. Similar to the morning peak period, the center of Tenley Circle was saturated with vehicles throughout the signal cycles.

Few pedestrians were observed in Tenley Circle during the morning and afternoon peak period. The majority crossed Wisconsin Avenue at the Circle moving towards Tenley Campus in the morning and away in the afternoon. Due to heavy traffic volumes, pedestrians utilized both crosswalks and pedestrian signals during both the peak hours at Tenley Circle. However, at the signalized pedestrian crossing on Nebraska Avenue, south of Tenley Circle, pedestrians frequently jaywalked across Nebraska Avenue due to large gaps in traffic from adjacent signals.

- *42nd Street & Yuma Street*

  The intersection of 42nd Street and Yuma Street experienced an acceptable amount of delay during the morning and afternoon peak periods. Very little queue development was observed.

  Few pedestrians were observed at the intersection of 42nd Street and Yuma Street. The pedestrians observed utilized the crosswalks provided at the all-way stop intersection.

- *42nd Street & Warren Street*

  The intersection of 42nd Street and Warren Street experienced an acceptable amount of delay during the morning and afternoon peak periods. Very little queue development was observed.

  Few pedestrians were observed at the intersection of 42nd Street and Warren Street. The pedestrians observed utilized the crosswalks provided at the all-way stop intersection.

Figure 44: Tenley Campus – Site Access Locations

- *Nebraska Avenue and Warren Street*

  The intersection of Nebraska Avenue and Warren Street experienced an acceptable amount of delay during the morning peak period. Vehicular traffic was concentrated on the southwest-bound approach of Nebraska Avenue, with queue development of approximately 6-8 vehicles during the east- and westbound green time. Vehicles traveling on the northeast-bound approach of Nebraska Avenue experienced queue development of approximately 4-6 vehicles. The east- and westbound approaches of Warren Street experienced an acceptable amount of delay as well. Queues of approximately 6-8 vehicles developed but were served during the green time provided.

  The intersection of Nebraska Avenue and Warren Street also experienced an acceptable amount of delay during the afternoon peak period. Vehicular traffic was heaviest on the northeast-bound approach of Nebraska Avenue. Queues of approximately 8-10 vehicles and 6-8 vehicles developed on the northeast- and southwest-bound approaches of Nebraska Avenue, respectively. Vehicles traveling along Warren Street also experienced queue development of approximately 6-8 vehicles, which were served during the green time provided.

  Few pedestrians were observed at the intersection of Nebraska Avenue and Warren Street. Due to heavy traffic volumes, pedestrians utilized both crosswalks and pedestrian signals during both the peak hours at the intersection.

- *Nebraska Avenue and Van Ness Street*

  The intersection of Nebraska Avenue and Van Ness Street experienced an acceptable amount of delay during the morning peak period. Vehicular traffic was concentrated on the southwest-bound approach of Nebraska Avenue, with queue development of approximately 6-8 vehicles during the east- and westbound green time. Vehicles traveling on the northeast-bound approach of Nebraska Avenue experienced queue development of approximately 4-6 vehicles. The eastbound approach of Van Ness Street experienced an acceptable amount of delay, though queues of approximately 8-10 vehicles developed. Queues of approximately 8-10 vehicles developed on the westbound approach of Van Ness Street as well, which operated near capacity during the morning peak period. Queues that developed along Van Ness Street were mostly served during the green time provided for the east- and westbound movements.

  The intersection of Nebraska Avenue and Van Ness Street also experienced an acceptable amount of delay during the afternoon peak period. Vehicular traffic was heaviest on the northeast-bound approach of Nebraska Avenue. Queues of approximately 8-10 vehicles and 6-8 vehicles developed on the northeast- and southwest-bound approaches of Nebraska Avenue, respectively. Vehicles traveling along Van Ness Street also experienced queue development of approximately 6-8 vehicles on the eastbound approach and 8-10 vehicles on the westbound approach, which were served during the green time provided.

  Few pedestrians were observed at the intersection of Nebraska Avenue and Van Ness Street. Due to heavy traffic volumes, pedestrians utilized both crosswalks and pedestrian signals during both the peak hours at the intersection.

- *Nebraska Avenue and 42nd Street*

  The intersection of Nebraska Avenue and 42nd Street operated with an acceptable amount of delay during the morning peak period. Very little queue development was observed along the southbound approach of 42nd Street. Vehicles were generally able to find acceptable gaps in traffic to turn on to Nebraska Avenue.

The intersection of Nebraska Avenue and 42nd Street operated with an acceptable amount of delay during the afternoon peak period as well. Vehicles were generally able to find acceptable gaps in traffic to turn on to Nebraska Avenue, though queues of approximately 4-6 vehicles occasionally developed.

Very few pedestrians were observed at the intersection of Nebraska Avenue and 42nd Street. No pedestrians were observed crossing Nebraska Avenue.

Existing Vehicular Capacity Analysis

Intersection capacity analyses were performed for the existing conditions at the intersections contained within the study area during the morning and afternoon peak hours. *Synchro, Version 7.0* was used to analyze the study intersections based on the Highway Capacity Manual (HCM) methodology. The majority of the intersections contained in the vehicular capacity analysis contain data collected by Gorove/Slade. However, data for a few of the study intersections was obtained from Kimley-Horn and Associates, Inc. from the *Transportation Study* performed for the U.S. Department of Homeland Security Nebraska Avenue Complex Master Plan "Draft Environmental Impact Statement" issued on January 14, 2011.

The results of the capacity analyses are expressed in level of service (LOS) and delay (seconds per vehicle) for each approach. A LOS grade is a letter grade based on the average delay (in seconds) experienced by motorists traveling through an intersection. LOS results range from "A" being the best to "F" being the worst. LOS E is typically used as the acceptable LOS threshold in the District; although LOS F is sometimes accepted in urbanized areas.

The existing LOS capacity analyses were based on: (1) the existing lane use and traffic controls; (2) the peak hour turning movement volumes; and (3) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). An average delay (of each approach) and LOS for the signalized intersections is also shown for an overall intersection LOS grade. The HCM does not give guidelines for calculating the average delay for a two-way stop-controlled intersection, as the approaches without stop signs would technically have no delay. Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments.

Table 19 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds). A key for the Tenley Circle intersections and movements is included as Figure 45. The capacity analysis results are also shown on Figure 46, Figure 47, Figure 48, Figure 49, and Figure 50. The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours.

Table 19: Tenley Campus – Existing Vehicular Levels of Service

Intersection	Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Wisconsin Ave & Albemarle St	**Overall**	**29.2**	**C**	**21.3**	**C**
	Eastbound	26.3	C	24.2	C
	Westbound	64.9	E	64.9	E
	Westbound	32.3	C	16.4	B
	Southbound	23.2	C	15.8	B
Albemarle St & 40th St	Southbound	17.5	C	47.6	E
Albemarle St & Fort Dr	Eastbound Left	1.1	A	1.1	A
	Westbound Left	3.4	A	0.7	A
	Northbound	44.3	E	54.6	F
Tenley Circle:					
A: Nebraska Ave & Fort Dr/Tenley Circle	**Overall**	**29.8**	**C**	**24.0**	**C**
	Westbound	15.0	B	13.9	B

Intersection	Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
	Southbound	42.4	D	37.8	D
B: Nebraska Ave & Fort Dr	Eastbound Right	10.2	B	9.3	A
C: Nebraska Ave & Tenley Circle	Westbound Left	9.7	A	9.4	A
D: Nebraska Ave & Wisconsin Ave	**Overall**	**18.6**	**B**	**5.8**	**A**
	Eastbound	19.9	B	6.2	A
	Westbound	4.0	A	2.9	A
	Southbound	30.4	C	11.5	B
E: Nebraska Ave & Wisconsin Ave	**Overall**	**10.8**	**B**	**33.1**	**C**
	Eastbound	3.1	A	3.8	A
	Westbound	12.2	B	24.1	C
	Northbound	28.5	C	79.0	E
F: Nebraska Ave & Yuma St	Westbound Right	9.4	A	10.0	B
G: Nebraska Ave & Tenley Circle	Northbound Left	2.5	A	1.9	A
H: Nebraska Ave & Yuma St	Eastbound Right	10.5	B	9.9	A
I: Nebraska Ave & Tenley Circle	Southbound Left	4.1	A	4.8	A
J: Nebraska Ave & Tenley Circle	Eastbound Left	12.5	B	14.0	B
K: Nebraska Ave Pedestrian Crossing	**Overall**	**13.5**	**B**	**21.4**	**C**
	Northbound	30.9	C	31.9	C
	Southbound	1.0	A	0.9	A
42nd St & Yuma St	**Overall**	**10.0**	**A**	**10.4**	**B**
	Eastbound	9.9	A	9.1	A
	Westbound	9.0	A	10.5	B
	Northbound	10.3	B	10.5	B
	Southbound	10.2	B	10.4	B
42nd St & Warren St	Westbound	9.5	A	10.7	B
	Southbound Left	1.6	A	0.2	A
Nebraska Ave & Warren St	Eastbound	25.3	D	21.4	C
	Westbound	22.7	C	43.2	E
	Northbound	0.7	A	0.6	A
	Southbound	0.2	A	0.8	A
Van Ness St & 45th St	**Overall**	**8.1**	**A**	**8.4**	**A**
	Eastbound	8.2	A	7.8	A
	Westbound	8.3	A	8.9	A
	Northbound	7.7	A	7.7	A
Nebraska Ave & Van Ness St	**Overall**	**26.2**	**C**	**21.0**	**C**
	Eastbound	55.8	E	28.4	C
	Westbound	41.9	D	26.3	C
	Northbound	5.8	A	20.5	C
	Southbound	23.8	C	8.6	A
Nebraska Ave & 42nd St	Eastbound	10.8	B	17.3	C
	Northbound Left	3.6	A	5.4	A
Wisconsin Ave & Van Ness St	**Overall**	**27.2**	**C**	**19.0**	**B**
	Eastbound	34.2	C	34.3	C
	Westbound	44.1	D	43.3	D
	Northbound	11.1	B	11.7	B
	Southbound	31.3	C	15.0	B

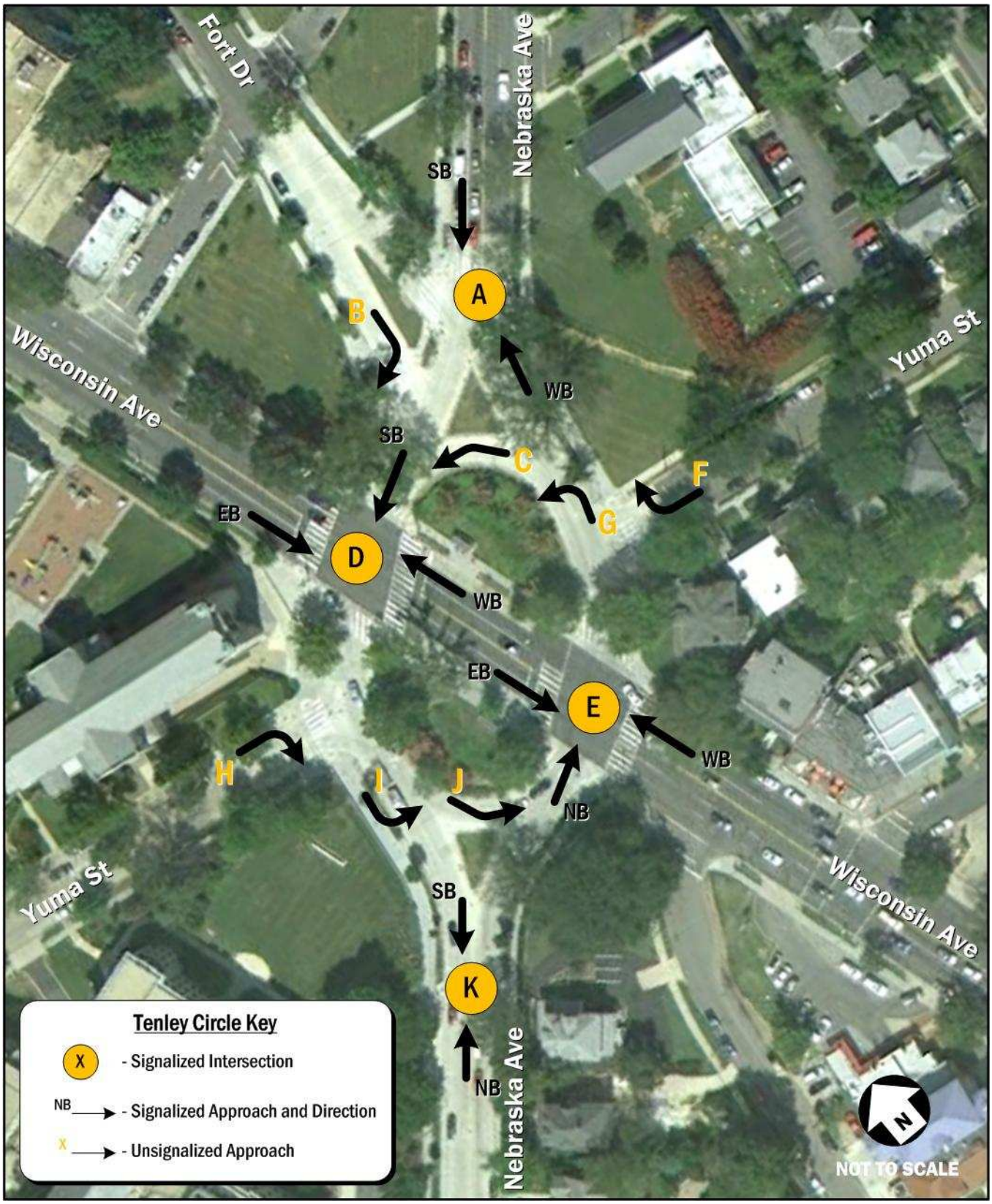

Figure 45: Tenley Circle Diagram of Intersections and Movements

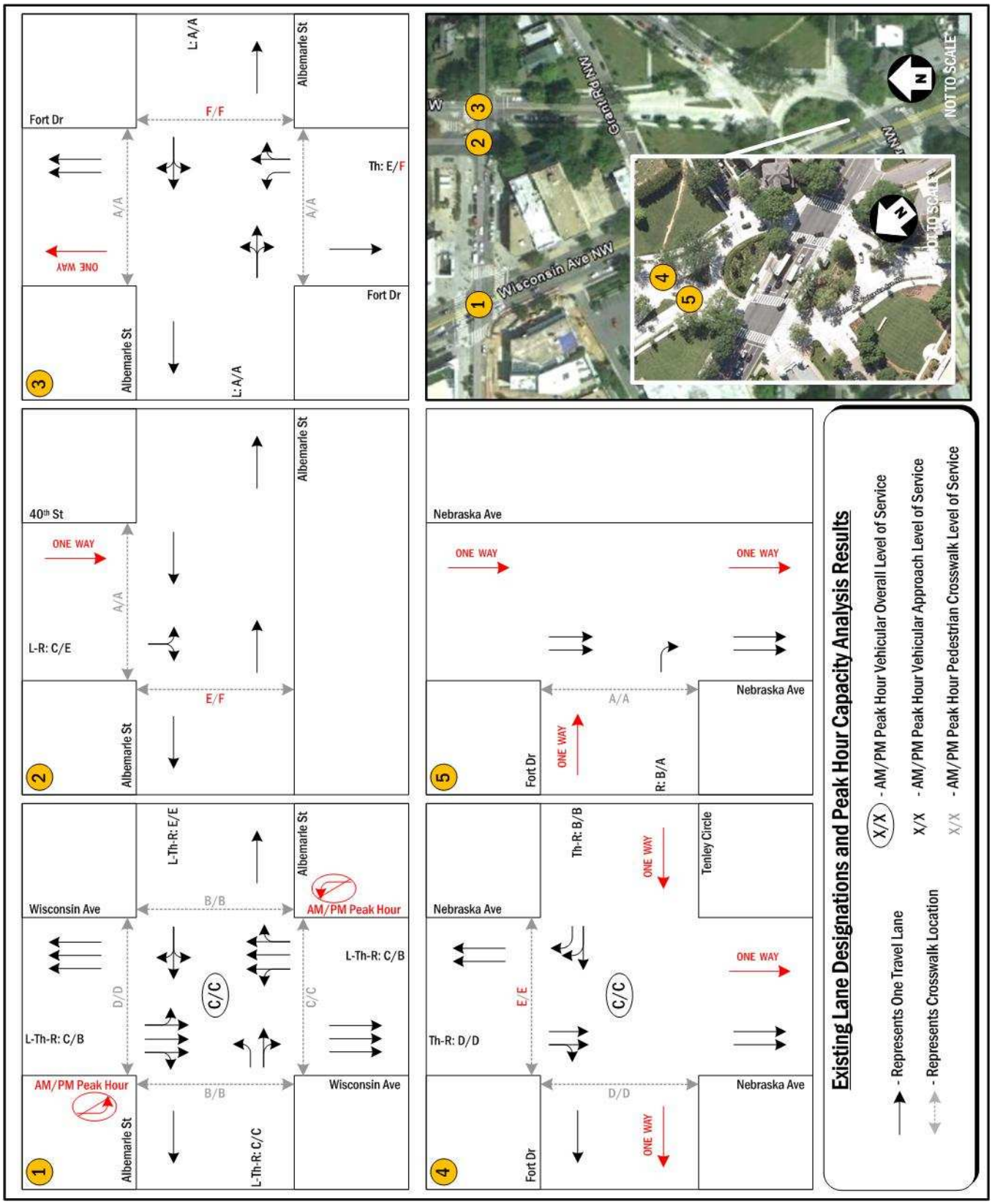

Figure 46: Tenley Campus – Existing Lane Configurations and Capacity Analysis Results (1 of 5)

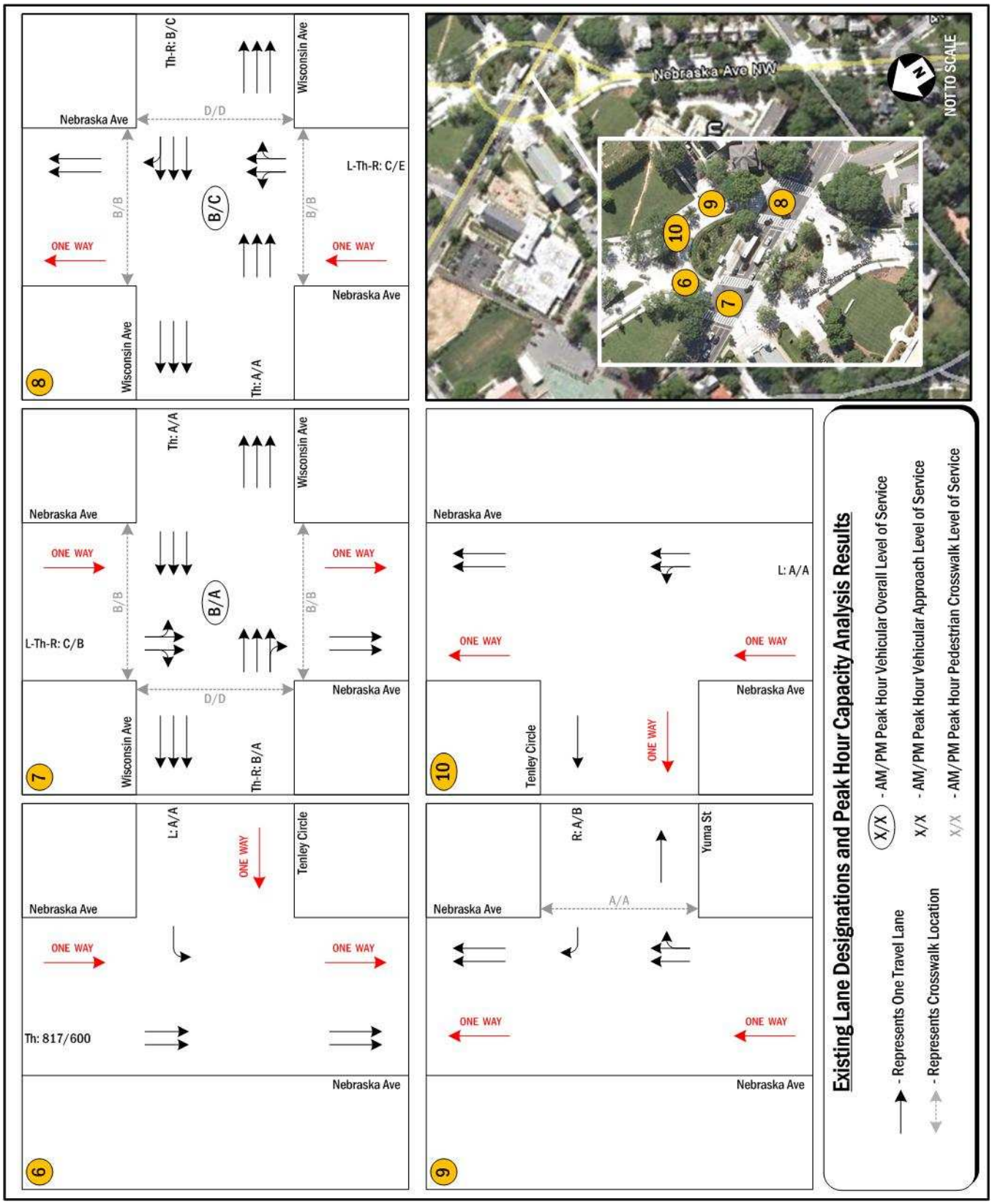

Figure 47: Tenley Campus – Existing Lane Configurations and Capacity Analysis Results (2 of 5)

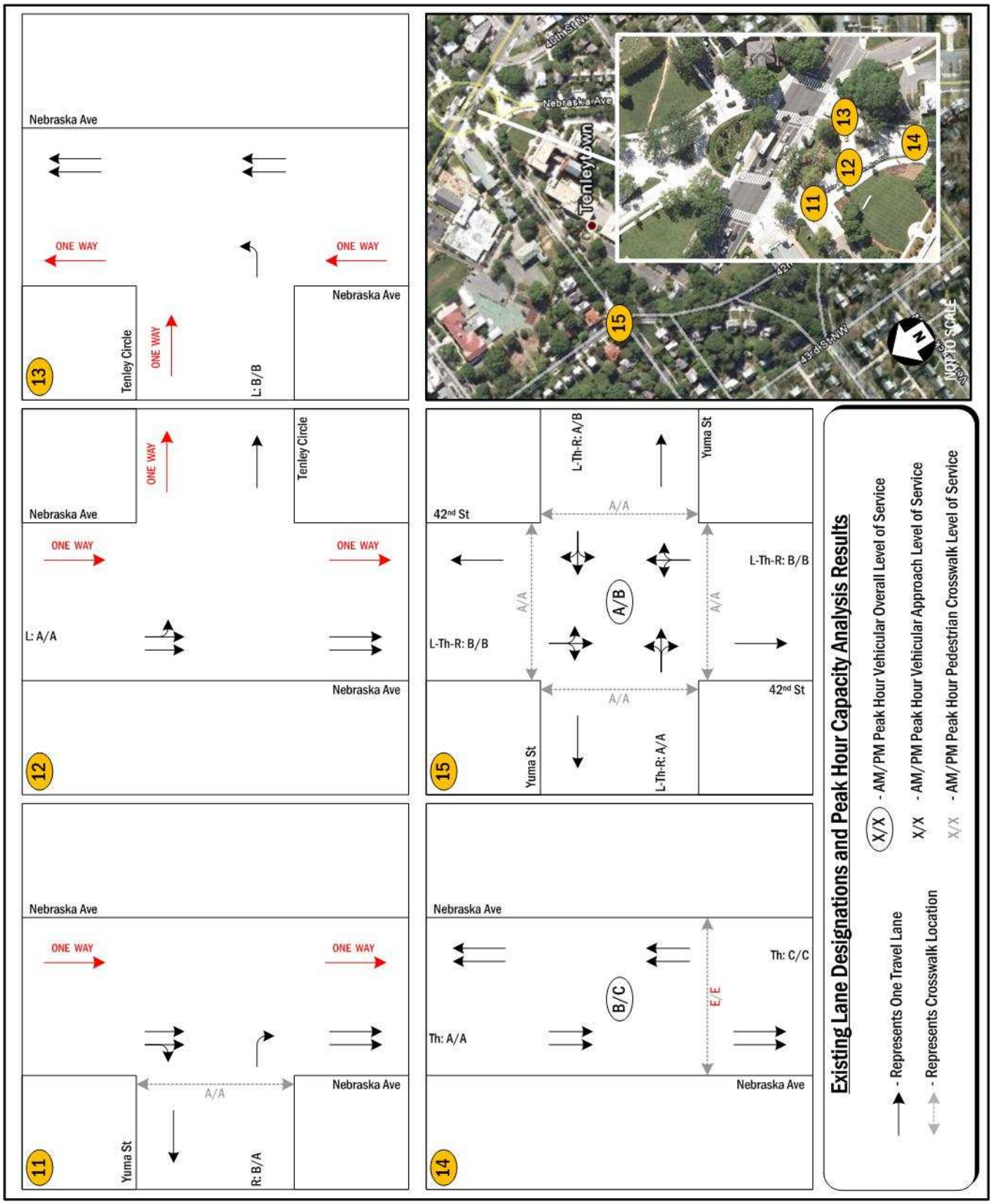

Figure 48: Tenley Campus – Existing Lane Configurations and Capacity Analysis Results (3 of 5)

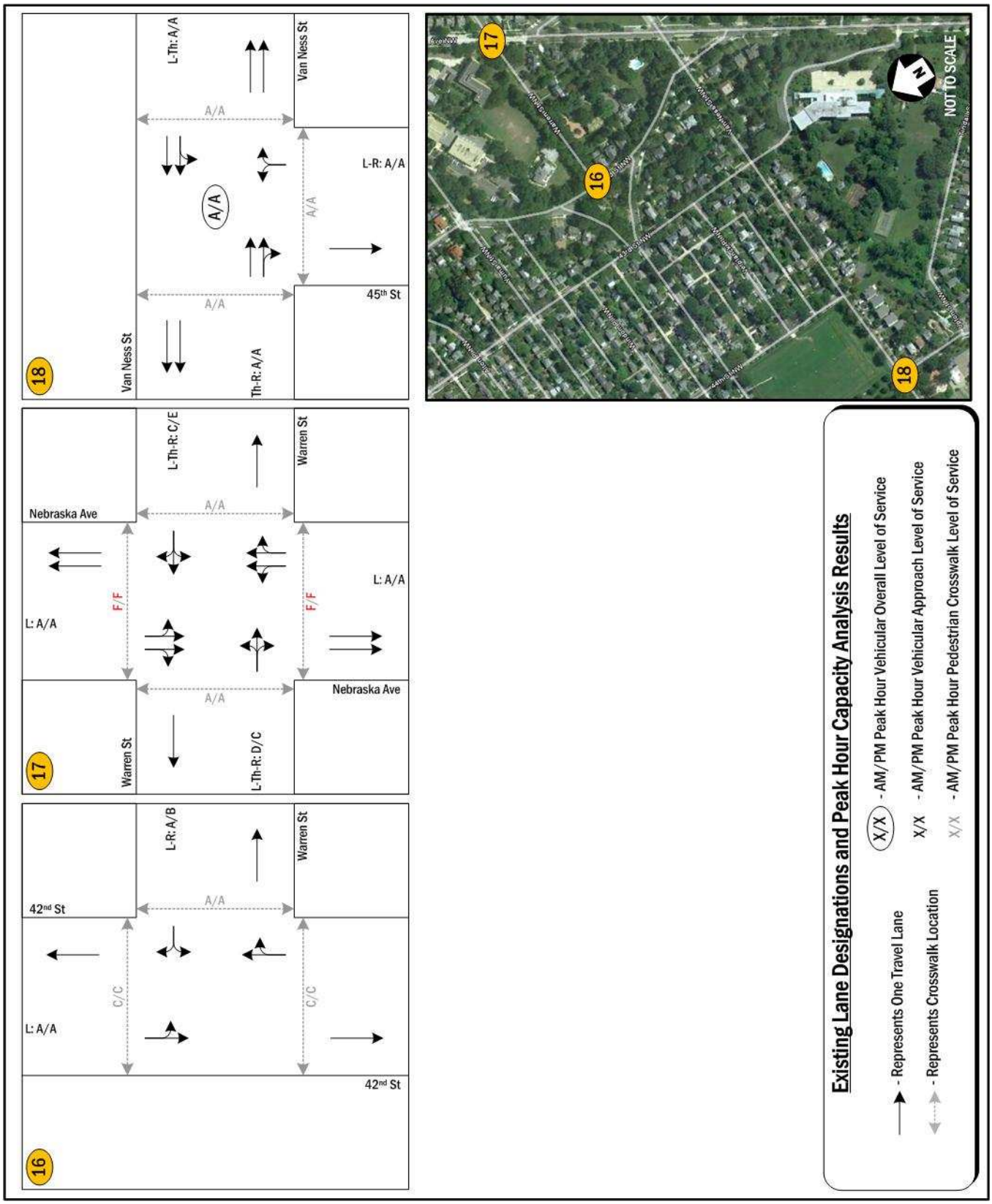

Figure 49: Tenley Campus – Existing Lane Configurations and Capacity Analysis Results (4 of 5)

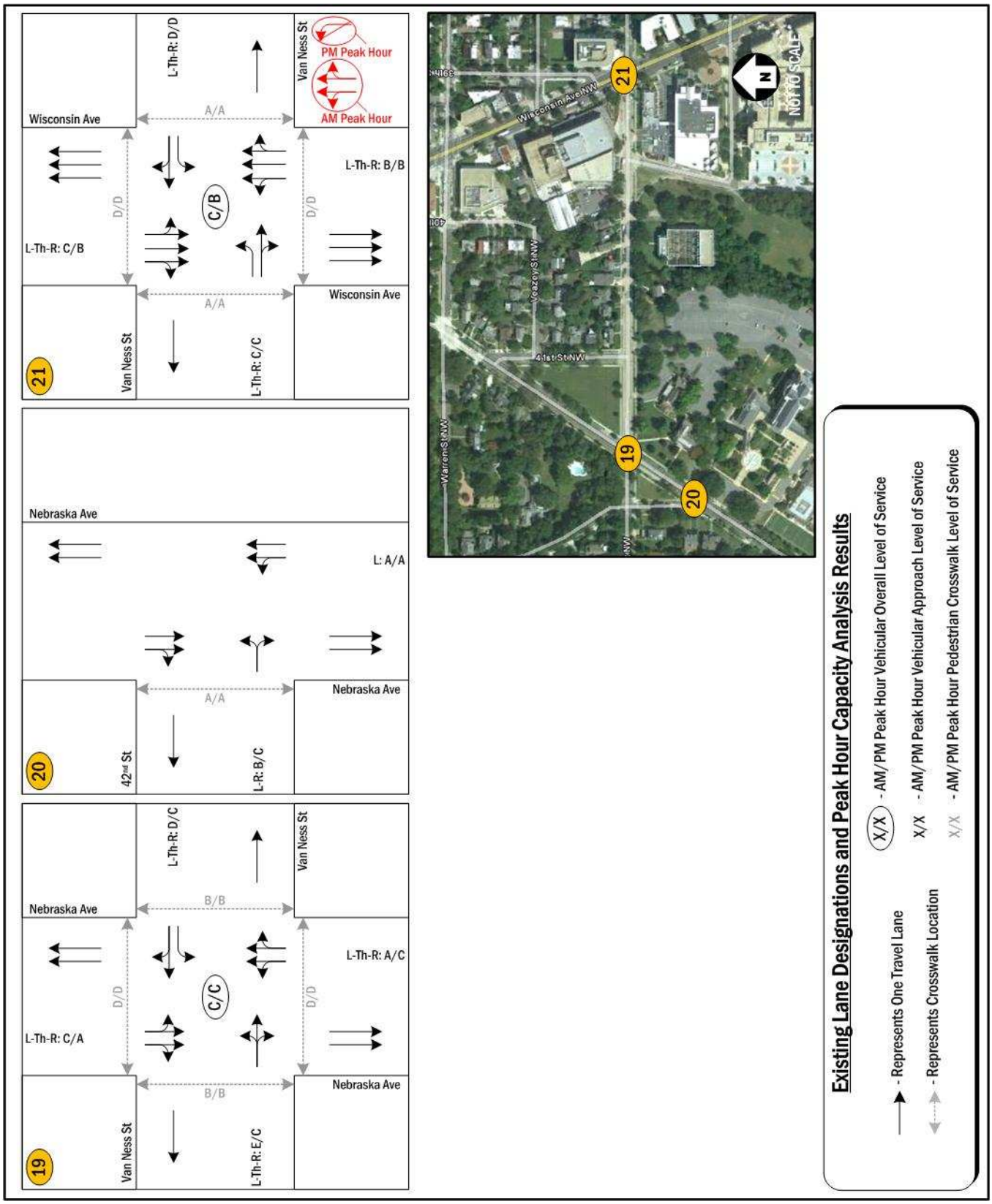

Figure 50: Tenley Campus – Existing Lane Configurations and Capacity Analysis Results (5 of 5)

For the purpose of this analysis, it is desirable to achieve a level of service (LOS) of "E" or better on each approach. As stated previously, all study area intersections operate at acceptable levels of service (overall LOS grade) during the morning and afternoon peak hours. However, the northbound approach of Fort Drive at Albemarle Street operates under unacceptable conditions during the afternoon peak period. The results from the capacity analyses generally confirm what was observed in the field.

Comparison of 2010 and 2000 Capacity Analysis Results

The results of the existing capacity analysis show some notable changes from the capacity analysis performed for the 2000 Campus Plan, as shown in Table 20. The following changes in level of service were observed between the 2000 and 2010 capacity analyses:

- *Nebraska Avenue & Tenley Circle*
  Afternoon peak hour overall LOS improved from LOS D in 2000 to LOS C in 2010.

- *Nebraska Avenue & Yuma Street*
  Eastbound right-turn afternoon LOS improved from LOS B in 2000 to LOS A in 2010.

- *42nd Street & Yuma Street*
  Morning peak hour overall LOS improved from LOS B in 2000 to LOS A in 2010. Afternoon peak hour overall LOS degraded from LOS A in 2000 to LOS B in 2010.

- *Nebraska Avenue & Warren Street*
  Eastbound approach LOS degraded from LOS C in 2000 to LOS D in 2010 and improved from LOS D in 2000 to LOS C in 2010 for the morning and afternoon peak hours, respectively.

Changes in LOS between the 2000 and 2010 capacity analyses are due to several factors, including changes in traffic volumes and traffic patterns, as well as changes to signal timings. Changes in LOS between the capacity analyses could also be due to improvements in the software used to estimate the delays and levels of service of the study area intersections. Overall, signal timing changes have had the largest impact. Additionally, the intersection of Nebraska Avenue and Tenley Circle was evaluated as a signalized intersection in the 2000 Campus Plan. In this analysis, the signalized intersection evaluated was the pedestrian crossing on Nebraska Avenue south of Tenley Circle.

Table 20: Tenley Campus – Level of Service Results from 2000 Campus Plan

Intersection	Approach	Campus Plan (2000)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
A: Nebraska Ave & Tenley Circle	**Overall**	**19.9**	**B**	**37.6**	**D**
	Eastbound	16.5	B	11.7	B
	Northbound	24.8	C	59.6	E
H: Nebraska Ave & Yuma St	Eastbound Right	14.9	B	12.3	B
42nd St & Yuma St	**Overall**	**10.31**	**B**	**9.22**	**A**
	Eastbound	10.91	B	8.90	A
	Westbound	10.07	B	9.02	A
	Northbound	11.47	B	10.11	B
	Southbound	11.53	B	9.67	A

Intersection	Approach	Campus Plan (2000)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
42nd St & Warren St	Westbound	9.6	A	9.9	A
	Southbound Left	7.6	A	7.6	A
Nebraska Ave & Warren St	Eastbound	15.8	C	26.4	D
	Westbound	24.9	C	39.8	E
	Northbound Left	9.3	A	9.0	A
	Southbound Left	8.9	A	9.6	A

Existing Pedestrian Analysis Results

Pedestrian analyses were performed for the existing conditions at the intersections contained within the study area during the morning and afternoon peak hours. The analysis was based on "Chapter 13: Pedestrians" of the Highway Capacity Manual (HCM).

The methodology for signalized intersections was used in order to estimate the average delay experienced by a pedestrian at a signalized crosswalk (the amount of time waiting for a "Walk" sign). This calculation is based on the effective green time programmed for pedestrians and the cycle length and rated by the amount of delay experienced. As stated in the HCM, pedestrian delay is not constrained by capacity, even when pedestrian flow rates reach 5,000 pedestrians per hour (pph). The results of the signalized intersection analyses are expressed in level of service (LOS) and delay (seconds) for each crosswalk. LOS results range from "A" being the best to "F" being the worst. The delay and LOS show the likelihood that a pedestrian will not comply with a traffic-control device (i.e. jaywalking).

The methodology for unsignalized intersections was used in order to estimate the average delay experienced by a pedestrian at an uncontrolled crosswalk. This methodology applies to unsignalized intersections with a pedestrian crossing against a free-flowing traffic stream or an approach not controlled by a stop-sign. The unsignalized intersection methodology does not apply to zebra-striped crossings at unsignalized intersections or at crossings against a traffic stream controlled by a stop-sign because pedestrians have the right-of-way and therefore experience no delay. It should be noted that in the District, pedestrians have the right-of-way at all crosswalks, including those against a free-flowing traffic stream, and therefore, theoretically experience no delay. However, the analysis was performed at pedestrian crossings against free-flowing traffic streams and yield-controlled approaches in order to evaluate the theoretical delay experienced by pedestrians. The calculation for average pedestrian delay at an unsignalized crossing is based on the average pedestrian walking speed, crosswalk length, assumed pedestrian lost time (start-up and end clearance time), and conflicting vehicular flow rate. The results of the unsignalized intersection analyses are expressed in level of service (LOS) and delay (seconds) for each crosswalk. LOS results range from "A" being the best to "F" being the worst. The delay and LOS show the likelihood that a pedestrian will engage in risk-taking behavior (i.e. accepting a short gap between vehicles).

Table 21 and Table 22 show the results of the capacity analyses, including LOS and average delay (in seconds). The capacity analysis results are also shown on Figure 46, Figure 47, Figure 48, Figure 49, and Figure 50.

The analysis results indicate that all signalized crosswalks in the study area operate at acceptable levels of service during both the morning and afternoon peak hours. This indicates a low (LOS A and B) to moderate (LOS C and D) likelihood of non-compliance by pedestrians, which is reflected by pedestrians jaywalking across the intersection. The study intersections with crosswalks operating at LOS D will experience a moderate to high likelihood of non-compliance.

The analysis results also indicate that the majority of the unsignalized crosswalks in the study area operate at acceptable levels of service during the morning and afternoon peak hours. This indicates a moderate (LOS C and D) likelihood of risk-taking behavior for pedestrians, which is reflected in occasional pedestrians dashing between vehicles during short gaps in traffic. As stated previously, pedestrians have the right-of-way in all crosswalks in the District, so vehicles must yield to pedestrians in the crosswalk at the study intersections listed in Table 22. However, the LOS E and F calculated indicate an unfriendly and intimidating environment for pedestrians.

Table 21: Tenley Campus – Existing Pedestrian Levels of Service for Signalized Intersections

Intersection	Parallel Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Wisconsin Ave & Albemarle St	Eastbound	27.4	C	28.1	C
	Westbound	38.7	D	39.6	D
	Northbound	15.7	B	15.1	B
	Southbound	15.7	B	15.1	B
Tenley Circle:					
A: Nebraska Ave & Fort Dr/Tenley Circle	Eastbound	41.4	E	41.4	E
	Southbound	31.2	D	31.2	D
D: Nebraska Ave & Wisconsin Ave	Eastbound	14.6	B	14.6	B
	Westbound	11.5	B	11.5	B
	Northbound	32.8	D	32.8	D
	Southbound	32.8	D	32.8	D
E: Nebraska Ave & Wisconsin Ave	Eastbound	11.5	B	11.5	B
	Westbound	14.6	B	14.6	B
	Northbound	32.8	D	32.8	D
	Southbound	32.8	D	32.8	D
K: Nebraska Ave Pedestrian Crossing	Eastbound	41.4	E	41.4	E
Nebraska Ave & Van Ness St	Eastbound	32.8	D	31.2	D
	Westbound	32.8	D	31.2	D
	Northbound	11.0	B	12.0	B
	Southbound	11.0	B	12.0	B
Wisconsin Ave & Van Ness St	Eastbound	37.0	D	35.3	D
	Westbound	37.0	D	35.3	D
	Northbound	8.8	A	9.7	A
	Southbound	8.8	A	9.7	A

Table 22: Tenley Campus – Existing Pedestrian Levels of Service for Unsignalized Intersections

Intersection	Parallel Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Albemarle St & 40th St	Westbound	N/A - Stop controlled crossing, LOS A			
	Southbound	32.9	E	58.7	F
Albemarle St & Fort Dr	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	48.9	F	62.3	F
Tenley Circle:					
B: Nebraska Ave & Fort Dr	Southbound	N/A - Stop controlled crossing, LOS A			
F: Nebraska Ave & Yuma St	Northbound	N/A - Stop controlled crossing, LOS A			
H: Nebraska Ave & Yuma St	Southbound	N/A - Stop controlled crossing, LOS A			

Intersection	Parallel Approach	Existing Conditions (2010)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
42nd St & Yuma St	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			
42nd St & Warren St	Eastbound	12.2	C	16.4	C
	Westbound	13.9	C	16.6	C
	Northbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & Warren St	Eastbound	2,166.4	F	898.9	F
	Westbound	3,107.4	F	1,048.1	F
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			
Van Ness & 45th St	Eastbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & 42nd St	Southbound	N/A - Stop controlled crossing, LOS A			

Future Conditions without 2011 Campus Plan

The American University 2011 Campus Plan for the Tenley Campus projects the future growth and development on the campus for 2011-2020. In order to determine the impact of the proposed development on campus, the future conditions without development are investigated as a benchmark.

Future without 2011 Campus Plan Traffic Volumes

The future conditions without the proposed 2011 Plan for the Tenley Campus include the traffic generated by background developments located near the University and inherent growth on the roadways. Growth from these two sources is added to the existing traffic volumes in order to determine the traffic projections for the in the future without the 2011 Plan for the Tenley Campus. The background developments included are the Wesley Theological Seminary Expansion, the Wisconsin Avenue Giant Planned Unit Development (PUD), and the DHS Nebraska Avenue Complex Master Plan, as agreed upon during a scoping meeting with the District Department of Transportation (DDOT) on April 29, 2010.

Future site-generated traffic volumes for the Wisconsin Avenue Giant were obtained from the *Transportation Impact Study* performed by Wells & Associates, Inc. in May 2008. Future site-generated traffic volumes for the DHS Nebraska Avenue Complex (NAC) Master Plan were obtained from the *Transportation Study* performed by Kimley-Horn and Associates, Inc. in November 2010. Future site-generated traffic volumes for the Wesley Theological Seminary Expansion are not included because it is not anticipated to generate any additional vehicular trips on the adjacent street network since no additional parking will be available on-site. This is consistent with the NAC study performed by Kimley-Horn.

Other traffic increases due to inherent growth was accounted for with a 1% growth rate over the 10-year period of analysis (2010 to 2020). This rate was obtained from the Kimley-Horn report for the NAC, which determined the growth factor by reviewing the Metropolitan Washington council of Governments (MWCOG) regional travel demand model forecasts contained in the *2009 Constrained Long Range Plan, Version 2.2* for the years 2010, 2020, and 2030. The traffic model review showed that the traffic volumes in the vicinity of NAC are expected to remain stable between 2010 and 2030, with an estimated increase of 1 percent. This is equal to a yearly traffic growth rate of less than 0.1 percent per year. As a result, a traffic growth factor of 1 percent from 2010 to 2020 was assumed for the NAC study, which was also applied for

the analysis contained in this report. This growth rate was applied to all turning movements, with the exception of the movements entering and exiting the NAC and the University.

The traffic volumes generated by the Wisconsin Avenue Giant, the NAC, and the inherent growth were added to the existing (2010) traffic volumes in order to establish the future (2020) traffic volumes without the proposed 2011 Plan. The traffic volumes for the future conditions without development are shown on Figure 51, Figure 52, Figure 53, Figure 54, and Figure 55 for the morning peak hour and on Figure 56, Figure 57, Figure 58, Figure 59, and Figure 60 for the afternoon peak hour.

Future without 2011 Campus Plan Vehicular Capacity Analysis

Intersection capacity analyses were performed for the future conditions without the 2011 Plan at the intersections contained within the study area during the morning and afternoon peak hours, following the methodology outlined previously. The capacity analyses for the future conditions without development were based on: (1) the existing lane use and traffic controls; (2) the conversion of 40th Street north of Albemarle Street to one-way northbound and of Fort Drive north of Albemarle Street to one-way southbound; (3) the peak hour turning movement volumes described previously; and (4) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments.

As stated in the *Transportation Report*, the draft final recommendations for the Rock Creek West II (RCW2) Livability Study were consulted for future recommendations. This includes the conversion of 40th Street and Fort Drive north of Albemarle Street from one-way southbound and northbound to one-way northbound and southbound, respectively. No other infrastructure improvements are assumed for the future conditions without the 2011 Plan for the Tenley Campus. However, the conversion of the intersection of Albemarle Street and Fort Drive to an all-way is also included as a potential future improvement, as recommended by Kimley-Horn and Associates, Inc. from the *Transportation Study* performed for the U.S. Department of Homeland Security Nebraska Avenue Complex Master Plan "Draft Environmental Impact Statement" issued on January 14, 2011. Signal timing changes are also suggested at Tenley Circle in order to improve the northbound approach of Nebraska Avenue and to correct the unacceptable pedestrian delays calculated previously.

Table 23 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds). The capacity analysis results are also shown on Figure 61, Figure 62, Figure 63, Figure 64, and Figure 65. The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours.

Table 23: Tenley Campus – Future Background Vehicular Levels of Service

Intersection	Approach	Future Background Conditions (2020)			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
Wisconsin Ave & Albemarle St	**Overall**	**30.2**	**C**	**22.8**	**C**
	Eastbound	26.5	C	24.3	C
	Westbound	66.9	E	66.3	E
	Westbound	32.5	C	19.6	B
	Southbound	24.7	C	16.5	B
Albemarle St & 40th St	Eastbound Left	1.4	A	1.4	A
Albemarle St & Fort Dr	Westbound Left	3.2	A	0.6	A
	Northbound	51.2	F	62.0	F
	Southbound	71.2	F	254.9	F

Intersection	Approach	Future Background Conditions (2020)			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
Improvement: Convert to all-way stop	**Overall**	**14.9**	**B**	**21.8**	**C**
	Eastbound	12.6	B	29.3	D
	Westbound	18.7	C	18.3	C
	Northbound	10.5	B	12.6	B
	Southbound	11.6	B	17.4	C
Tenley Circle:					
A: Nebraska Ave & Fort Dr/Tenley Circle	**Overall**	**31.3**	**C**	**25.2**	**C**
	Westbound	14.6	B	13.8	B
	Southbound	45.2	D	40.1	D
B: Nebraska Ave & Fort Dr	Eastbound Right	10.3	B	9.4	A
C: Nebraska Ave & Tenley Circle	Westbound Left	9.8	A	9.6	A
D: Nebraska Ave & Wisconsin Ave	**Overall**	**21.3**	**C**	**6.3**	**A**
	Eastbound	20.3	C	6.3	A
	Westbound	3.9	A	2.7	A
	Southbound	40.8	D	13.7	B
E: Nebraska Ave & Wisconsin Ave	**Overall**	**10.5**	**B**	**33.9**	**C**
	Eastbound	3.3	A	4.3	A
	Westbound	12.3	B	25.3	C
	Northbound	26.8	C	85.5	F
F: Nebraska Ave & Yuma St	Westbound Right	9.4	A	10.1	B
G: Nebraska Ave & Tenley Circle	Northbound Left	2.5	A	1.9	A
H: Nebraska Ave & Yuma St	Eastbound Right	10.6	B	10.0	B
I: Nebraska Ave & Tenley Circle	Southbound Left	4.1	A	4.8	A
J: Nebraska Ave & Tenley Circle	Eastbound Left	12.6	B	14.2	B
K: Nebraska Ave Pedestrian Crossing	**Overall**	**13.4**	**B**	**21.5**	**C**
	Northbound	30.9	C	32.0	C
	Southbound	1.1	A	0.9	A
Improvement: Retime signal					
A: Nebraska Ave & Fort Dr/Tenley Circle	**Overall**	**31.3**	**C**	**25.2**	**C**
	Westbound	14.6	B	13.8	B
	Southbound	45.2	D	40.1	D
B: Nebraska Ave & Fort Dr	Eastbound Right	10.3	B	9.4	A
C: Nebraska Ave & Tenley Circle	Westbound Left	9.8	A	9.6	A
D: Nebraska Ave & Wisconsin Ave	**Overall**	**21.3**	**C**	**5.9**	**A**
	Eastbound	20.3	C	7.2	A
	Westbound	3.9	A	4.1	A
	Southbound	40.8	D	7.7	A
E: Nebraska Ave & Wisconsin Ave	**Overall**	**10.5**	**B**	**25.5**	**C**
	Eastbound	3.3	A	6.3	A
	Westbound	12.3	B	27.7	C
	Northbound	26.8	C	46.1	D
F: Nebraska Ave & Yuma St	Westbound Right	9.4	A	10.1	B
G: Nebraska Ave & Tenley Circle	Northbound Left	2.5	A	1.9	A
H: Nebraska Ave & Yuma St	Eastbound Right	10.6	B	10.0	B
I: Nebraska Ave & Tenley Circle	Southbound Left	4.1	A	4.8	A
J: Nebraska Ave & Tenley Circle	Eastbound Left	12.6	B	14.2	B
K: Nebraska Ave Pedestrian Crossing	**Overall**	**14.0**	**B**	**17.5**	**B**
	Northbound	30.9	C	25.5	C
	Southbound	2.0	A	1.7	A

Intersection	Approach	Future Background Conditions (2020)			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
42nd St & Yuma St	**Overall**	**10.1**	**B**	**10.4**	**B**
	Eastbound	9.9	A	9.1	A
	Westbound	9.1	A	10.6	B
	Northbound	10.4	B	10.5	B
	Southbound	10.3	B	10.5	B
42nd St & Warren St	Westbound	9.6	A	10.8	B
	Southbound Left	1.6	A	0.2	A
Nebraska Ave & Warren St	Eastbound	26.3	D	21.6	C
	Westbound	23.4	C	44.5	E
	Northbound	0.7	A	0.6	A
	Southbound	0.2	A	0.8	A
Van Ness St & 45th St	**Overall**	**8.1**	**A**	**8.4**	**A**
	Eastbound	8.2	A	7.8	A
	Westbound	8.3	A	8.9	A
	Northbound	7.7	A	7.7	A
Nebraska Ave & Van Ness St	**Overall**	**26.6**	**C**	**20.5**	**C**
	Eastbound	56.9	E	28.5	C
	Westbound	42.8	D	26.1	C
	Northbound	5.7	A	19.6	B
	Southbound	24.2	C	8.5	A
Nebraska Ave & 42nd St	Eastbound	10.9	B	17.6	C
	Northbound Left	3.7	A	5.5	A
Wisconsin Ave & Van Ness St	**Overall**	**27.9**	**C**	**19.9**	**B**
	Eastbound	35.3	D	35.5	D
	Westbound	45.1	D	44.4	D
	Northbound	11.7	B	12.4	B
	Southbound	32.2	C	17.4	B

For the purpose of this analysis, it is desirable to achieve a level of service (LOS) of "E" or better on each approach. As stated previously, all study area intersections operate at acceptable levels of service during the morning and afternoon peak hours. However, a few approaches continue to operate with unacceptable levels of service during one or more peak hours. The LOS results show that:

- All of the study intersections (overall LOS grade) operate at acceptable conditions during both the morning and afternoon peak hours.
- The following approaches continue to operate with unacceptable LOS during one or more peak hours:
  - The north- and southbound approaches of Fort Drive at Albemarle Street operate under unacceptable conditions during the morning and afternoon peak period. The conversion to an all-way stop intersection, as recommended in the "Draft Environmental Impact Statement" for the NAC, will allow the intersection to operate at acceptable LOS.
  - The northbound approach of Nebraska Avenue at Tenley Circle operates under unacceptable conditions during the afternoon peak period. Adjusting the signal timings to provide more green time for the movement, as well as correcting the deficient pedestrian timing, will result in acceptable conditions for both vehicles and pedestrians.

- No new unacceptable LOS are observed for the future without the 2011 Plan scenario.

Future without 2011 Campus Plan Pedestrian Analysis Results

Pedestrian analyses were performed for the future without the 2011 Plan conditions at the intersections contained within the study area during the morning and afternoon peak hours. The analysis was based on "Chapter 13: Pedestrians" of the Highway Capacity Manual (HCM), as outlined previously.

Table 24 and Table 25 show the results of the capacity analyses, including LOS and average delay (in seconds). The capacity analysis results are also shown on Figure 61, Figure 62, Figure 63, Figure 64, and Figure 65.

Table 24: Tenley Campus – Future Background Pedestrian Levels of Service for Signalized Intersections

Intersection	Parallel Approach	Future Background Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Wisconsin Ave & Albemarle St	Eastbound	27.4	C	28.1	C
	Westbound	38.7	D	39.6	D
	Northbound	15.7	B	15.1	B
	Southbound	15.7	B	15.1	B
Tenley Circle:					
A: Nebraska Ave & Fort Dr/Tenley Circle	Eastbound	41.4	E	41.4	E
	Southbound	31.2	D	31.2	D
D: Nebraska Ave & Wisconsin Ave	Eastbound	14.6	B	14.6	B
	Westbound	11.5	B	11.5	B
	Northbound	32.8	D	32.8	D
	Southbound	32.8	D	32.8	D
E: Nebraska Ave & Wisconsin Ave	Eastbound	11.5	B	11.5	B
	Westbound	14.6	B	14.6	B
	Northbound	32.8	D	32.8	D
	Southbound	32.8	D	32.8	D
K: Nebraska Ave Pedestrian Crossing	Eastbound	41.4	E	41.4	E
Improvement: Retime signal					
A: Nebraska Ave & Fort Dr/Tenley Circle	Eastbound	39.6	D	39.6	E
	Southbound	31.2	D	24.5	C
D: Nebraska Ave & Wisconsin Ave	Eastbound	14.6	B	19.8	B
	Westbound	11.5	B	16.2	B
	Northbound	32.8	D	25.9	C
	Southbound	32.8	D	25.9	C
E: Nebraska Ave & Wisconsin Ave	Eastbound	11.5	B	16.2	B
	Westbound	14.6	B	19.8	B
	Northbound	32.8	D	25.9	C
	Southbound	32.8	D	25.9	C
K: Nebraska Ave Pedestrian Crossing	Eastbound	39.6	D	39.6	D
Nebraska Ave & Van Ness St	Eastbound	32.8	D	31.2	D
	Westbound	32.8	D	31.2	D
	Northbound	11.0	B	12.0	B
	Southbound	11.0	B	12.0	B
Wisconsin Ave & Van Ness St	Eastbound	37.0	D	35.3	D
	Westbound	37.0	D	35.3	D
	Northbound	8.8	A	9.7	A
	Southbound	8.8	A	9.7	A

Table 25: Tenley Campus – Future Background Pedestrian Levels of Service for Unsignalized Intersections

Intersection	Parallel Approach	Future Background Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Albemarle St & 40th St	Westbound	N/A - Stop controlled crossing, LOS A			
	Southbound	33.5	E	60.2	F
Albemarle St & Fort Dr	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	50.1	F	64.0	F
Improvement: Convert to all-way stop	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
Tenley Circle:					
B: Nebraska Ave & Fort Dr	Southbound	N/A - Stop controlled crossing, LOS A			
F: Nebraska Ave & Yuma St	Northbound	N/A - Stop controlled crossing, LOS A			
H: Nebraska Ave & Yuma St	Southbound	N/A - Stop controlled crossing, LOS A			
42nd St & Yuma St	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			
42nd St & Warren St	Eastbound	12.4	C	18.4	D
	Westbound	15.0	C	19.5	C
	Northbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & Warren St	Eastbound	2,950.6	F	1,000.3	F
	Westbound	3,107.4	F	1,214.3	F
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			
Van Ness & 45th St	Eastbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & 42nd St	Southbound	N/A - Stop controlled crossing, LOS A			

The analysis results indicate that all signalized crosswalks in the study area operate at acceptable levels of service during both the morning and afternoon peak hours, except two located at Tenley Circle. However, the signal timing improvements at Tenley Circle bring all signalized crosswalks to acceptable LOS. This indicates a low (LOS A and B) to moderate (LOS C and D) likelihood of non-compliance by pedestrians, which is reflected by pedestrians jaywalking across the intersection.

The analysis results also indicate that the majority of the unsignalized crosswalks in the study area operate at acceptable levels of service during the morning and afternoon peak hours. This indicates a moderate (LOS C and D) likelihood of risk-taking behavior for pedestrians, which is reflected in occasional pedestrians dashing between vehicles during short gaps in traffic. As stated previously, pedestrians have the right-of-way in all crosswalks in the District, so vehicles must yield to pedestrians in the crosswalk at the study intersections listed in Table 22. However, the LOS E and F calculated indicate an unfriendly and intimidating environment for pedestrians. No new unacceptable LOS are observed for the future without the 2011 Plan scenario. Additionally, the conversion of the intersection of Albemarle Street & Fort Drive to all-way stop control brings the crosswalks to acceptable LOS since stop-controlled crossing have no pedestrian delay.

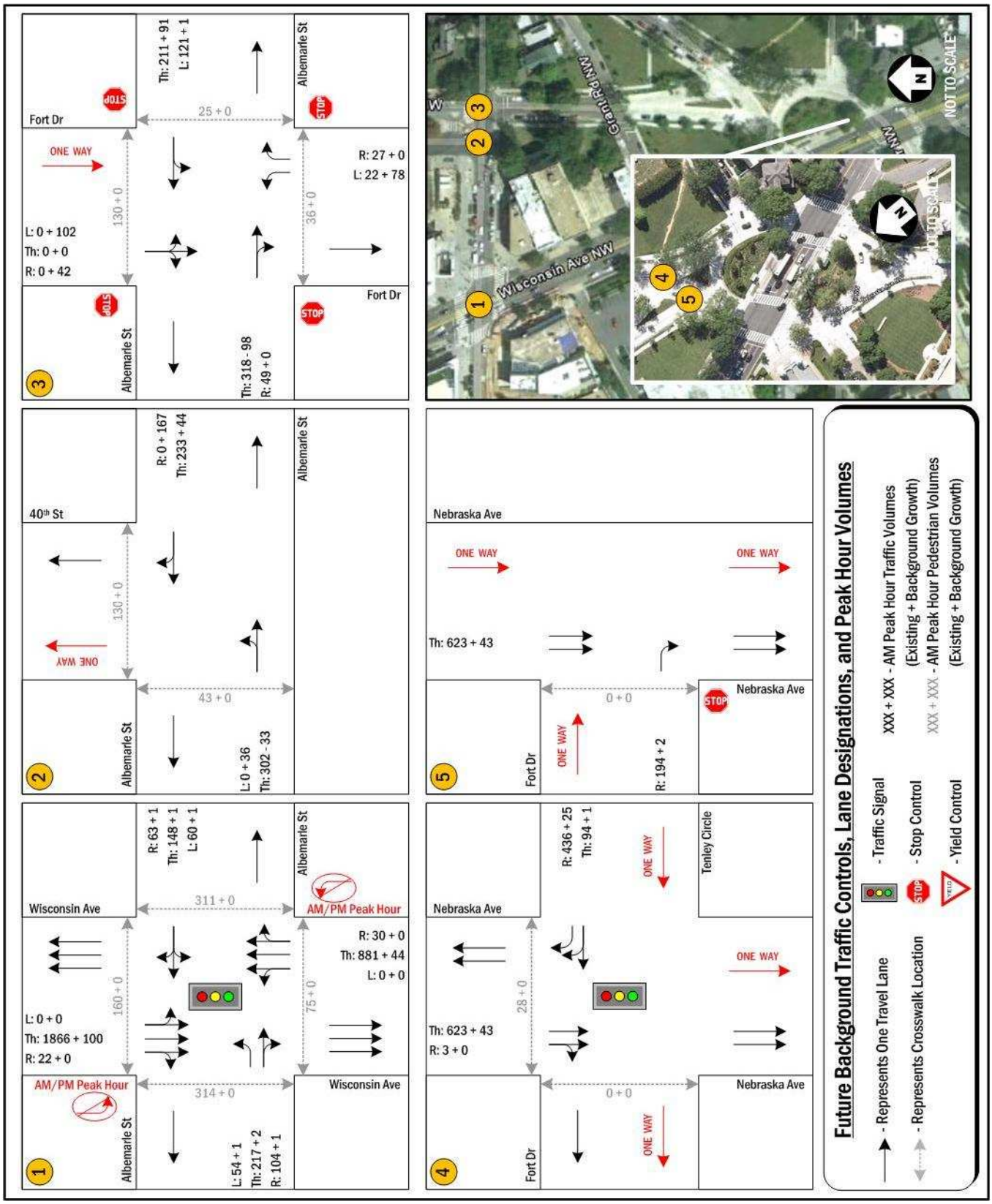

Figure 51: Tenley Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (1 of 5)

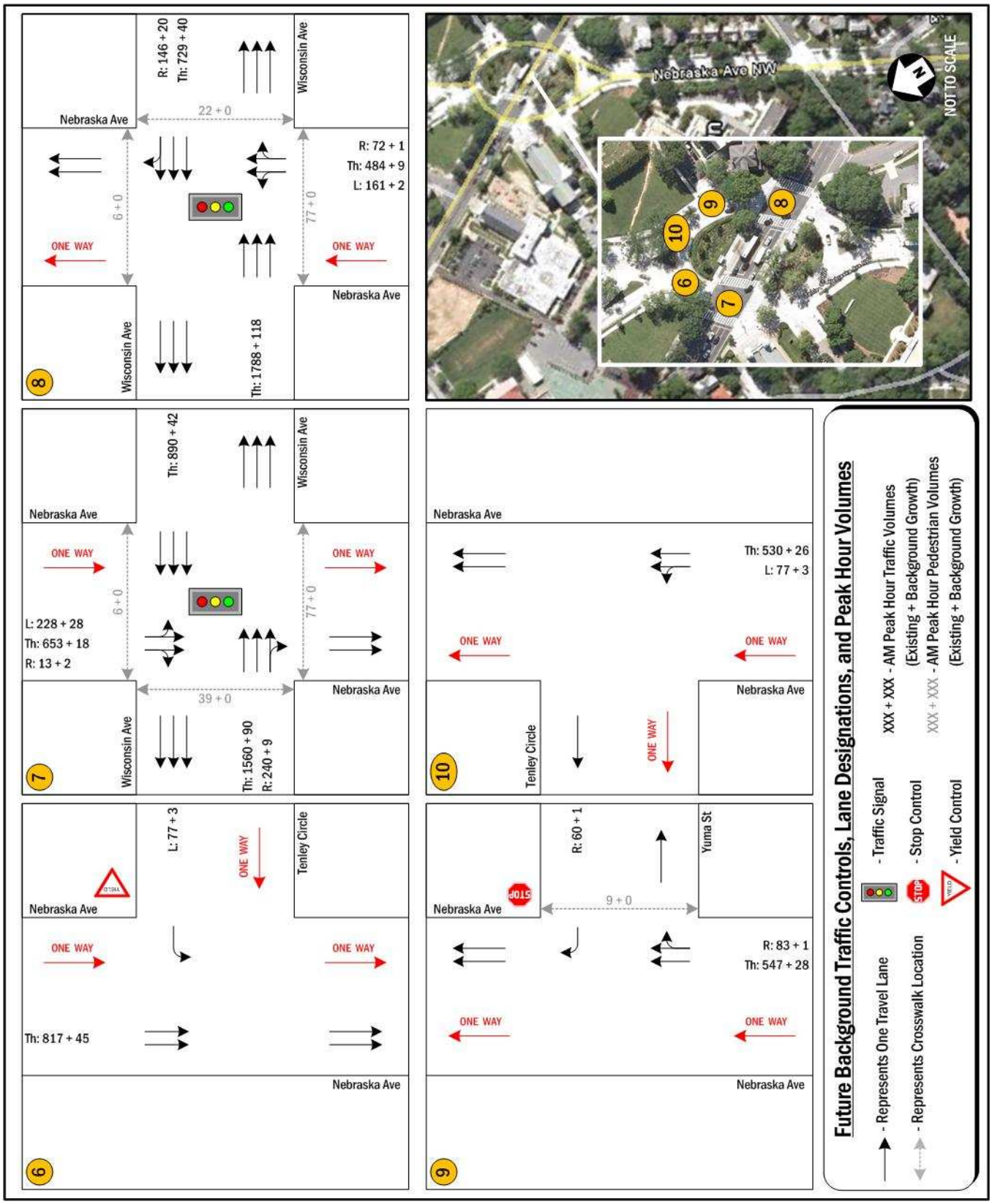

Figure 52: Tenley Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (2 of 5)

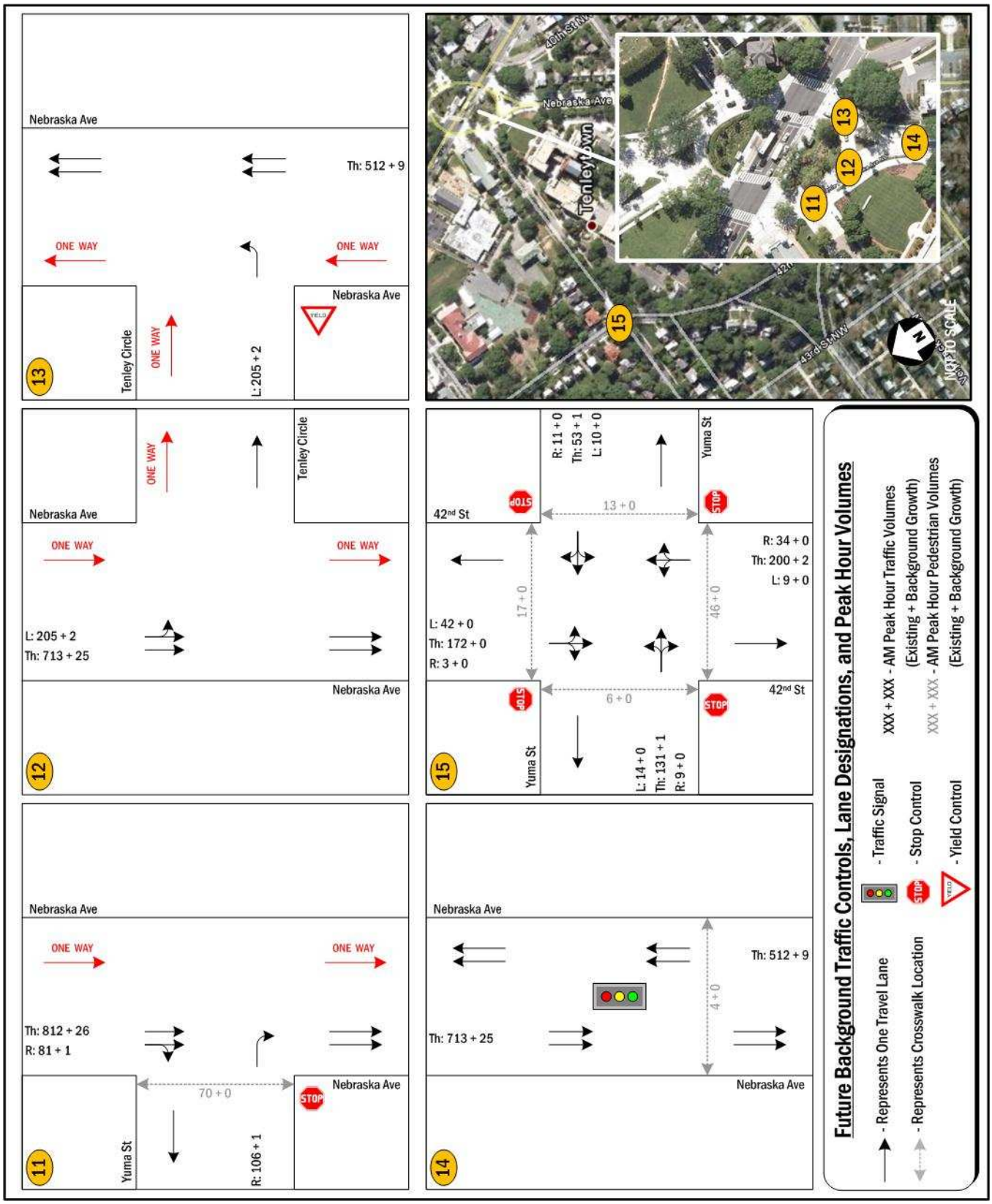

Figure 53: Tenley Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (3 of 5)

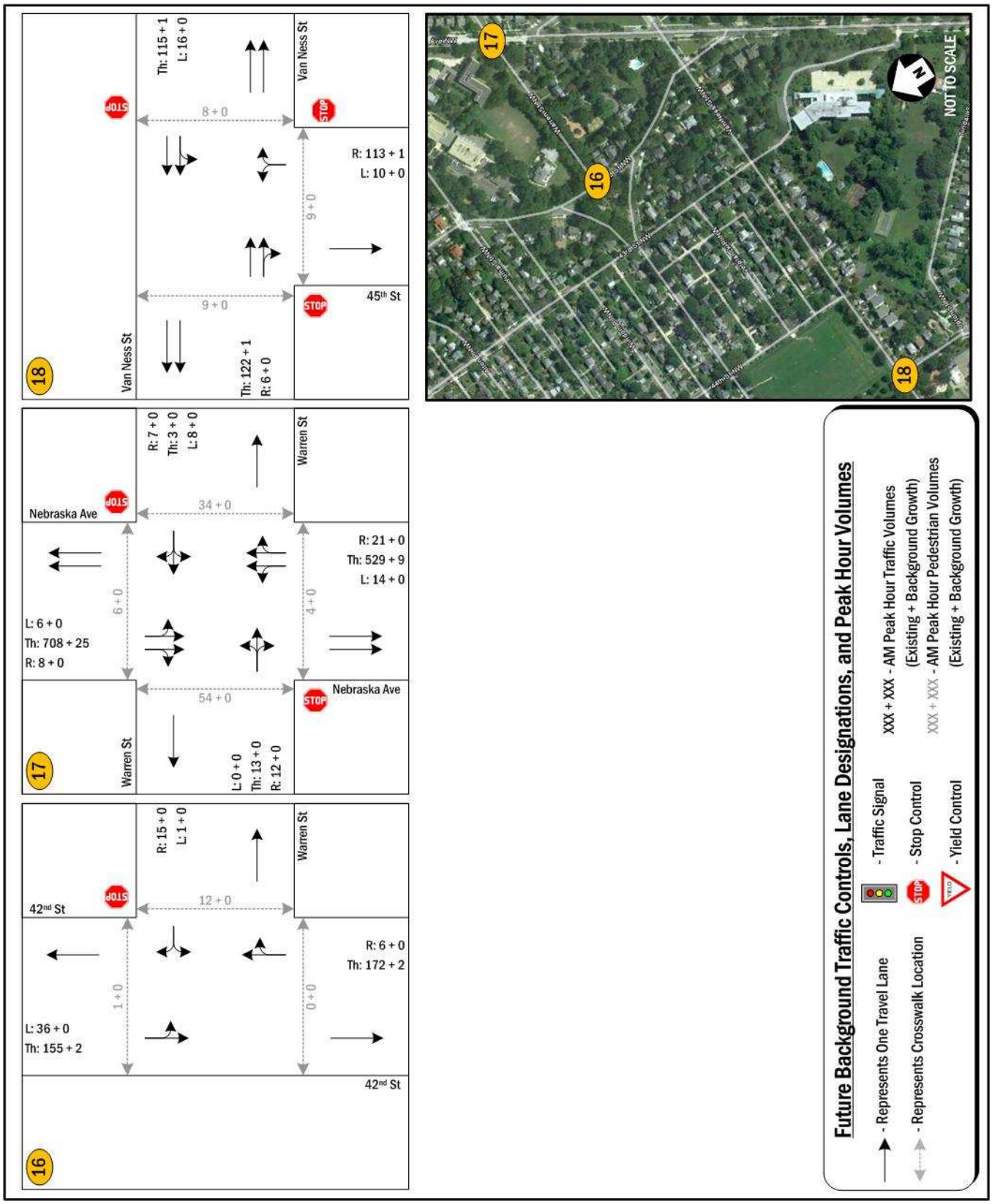

Figure 54: Tenley Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (4 of 5)

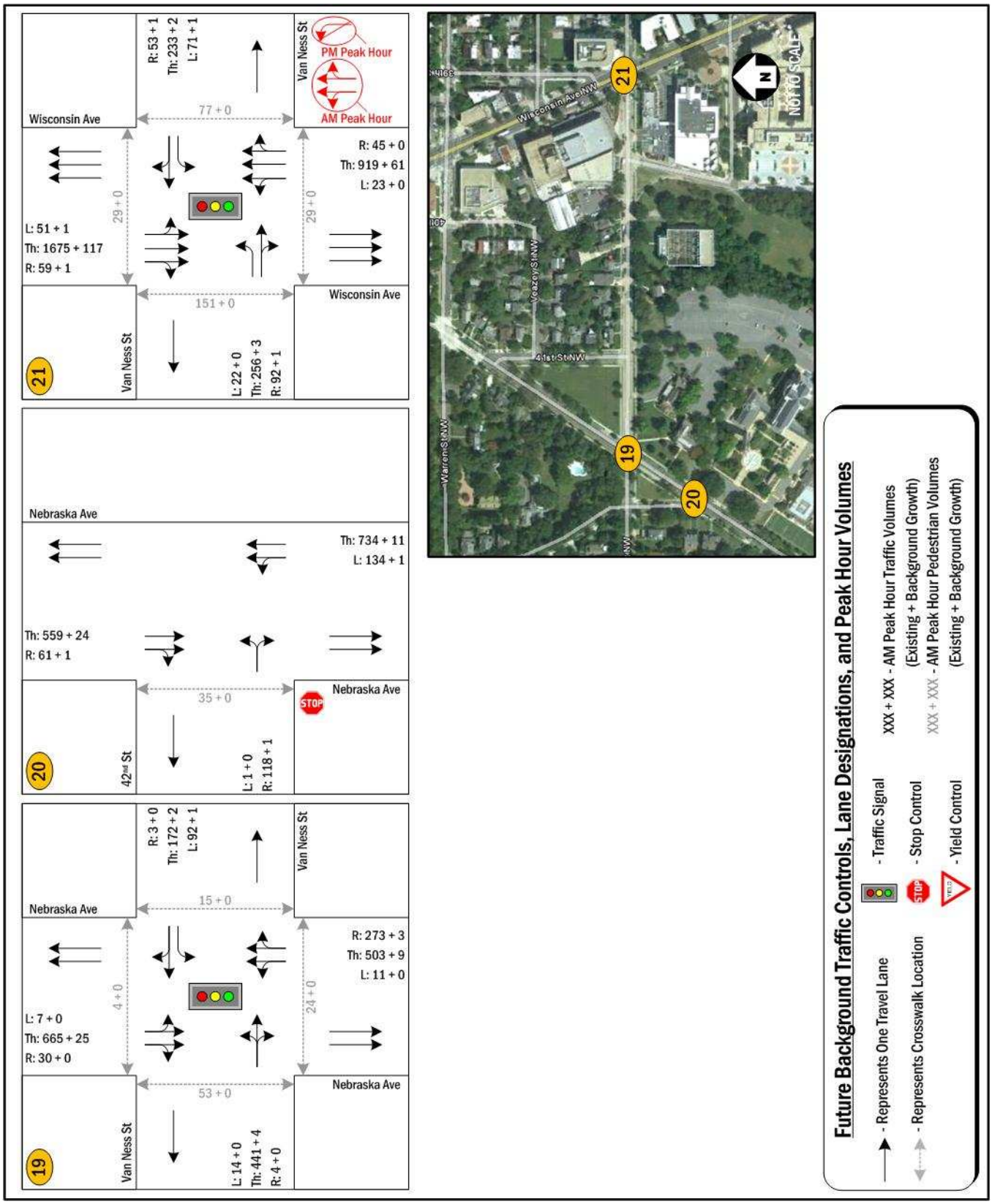

Figure 55: Tenley Campus – Future Background Traffic Controls, Lane Designations, and AM Traffic Volumes (5 of 5)

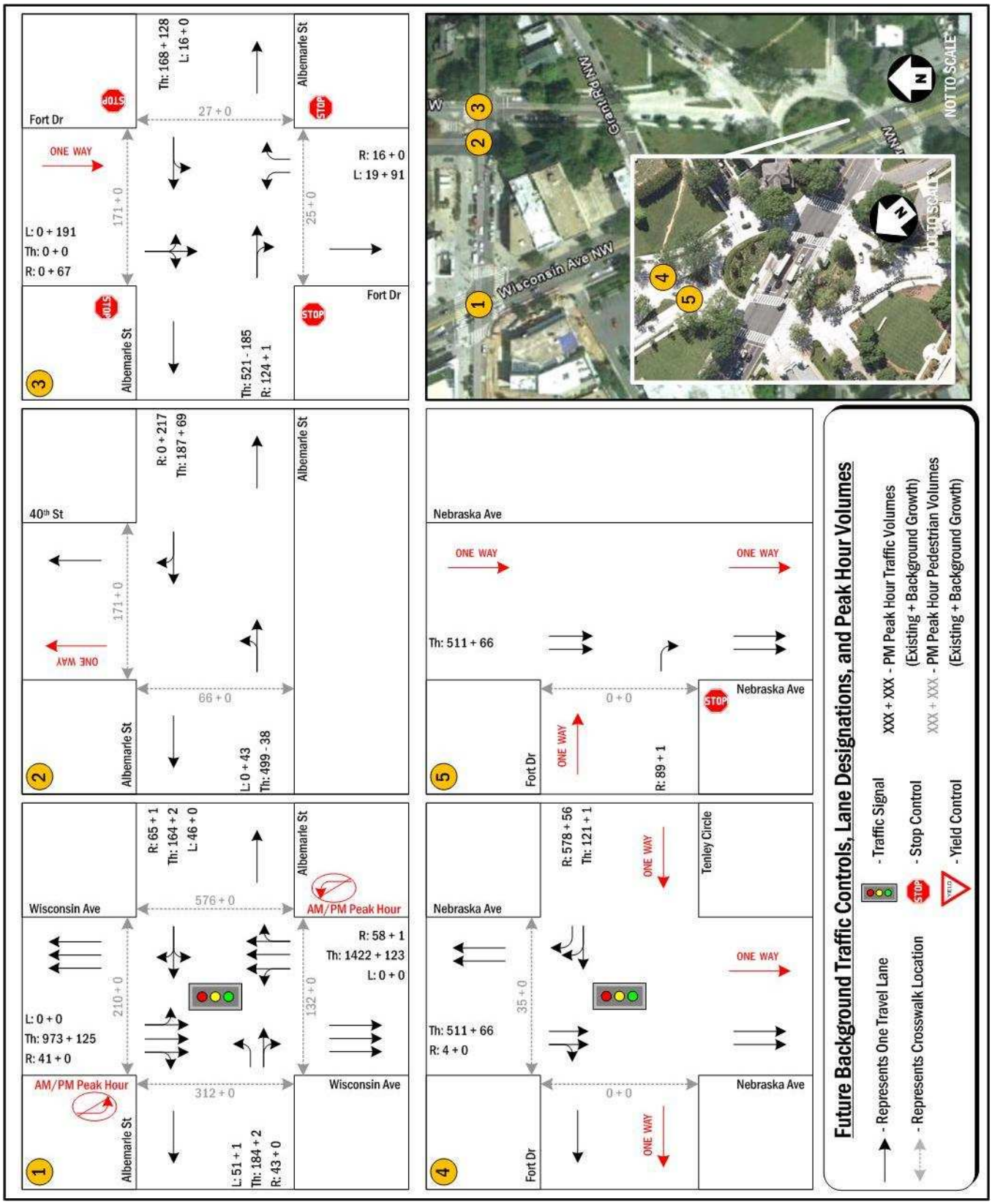

Figure 56: Tenley Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (1 of 5)

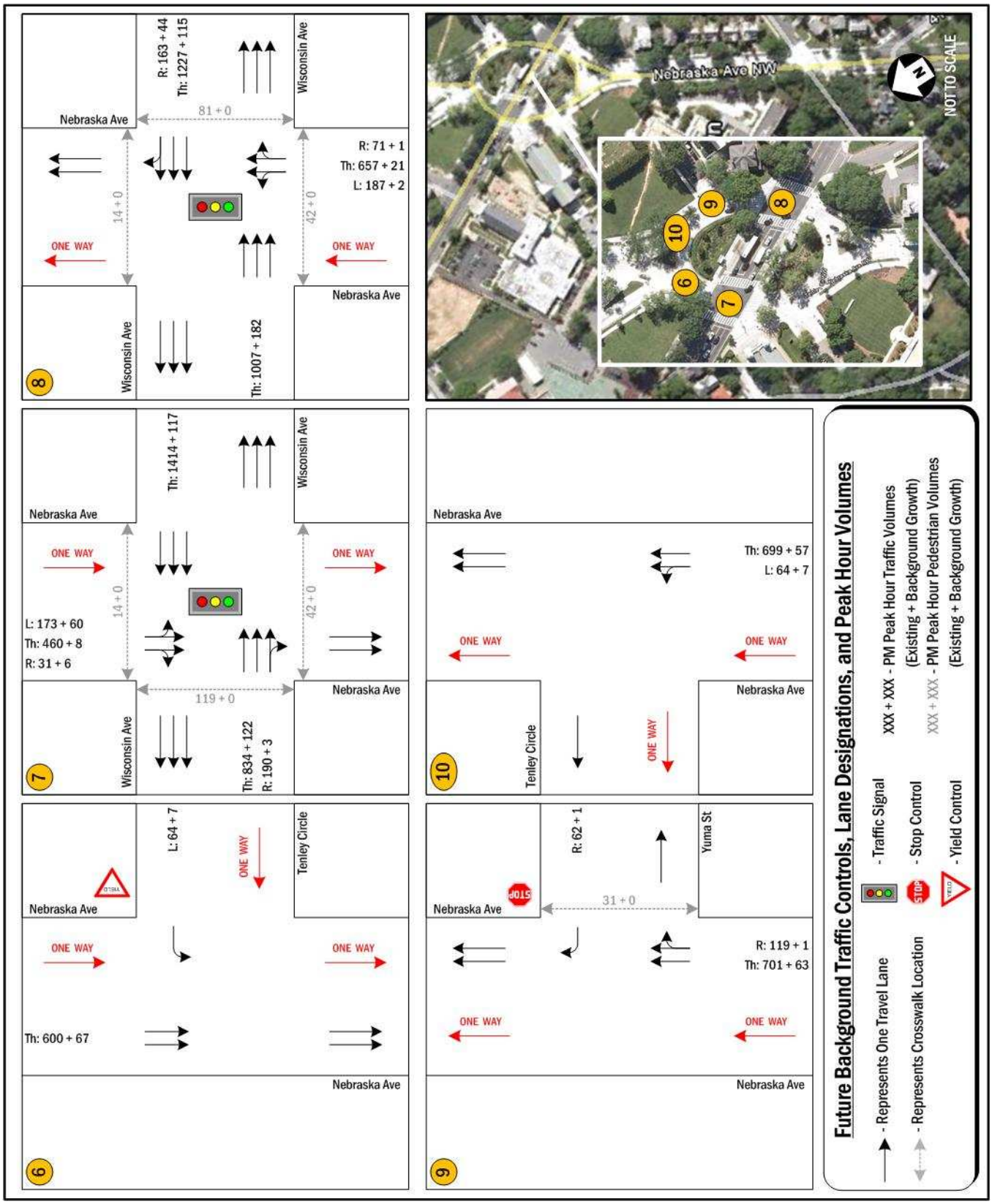

Figure 57: Tenley Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (2 of 5)

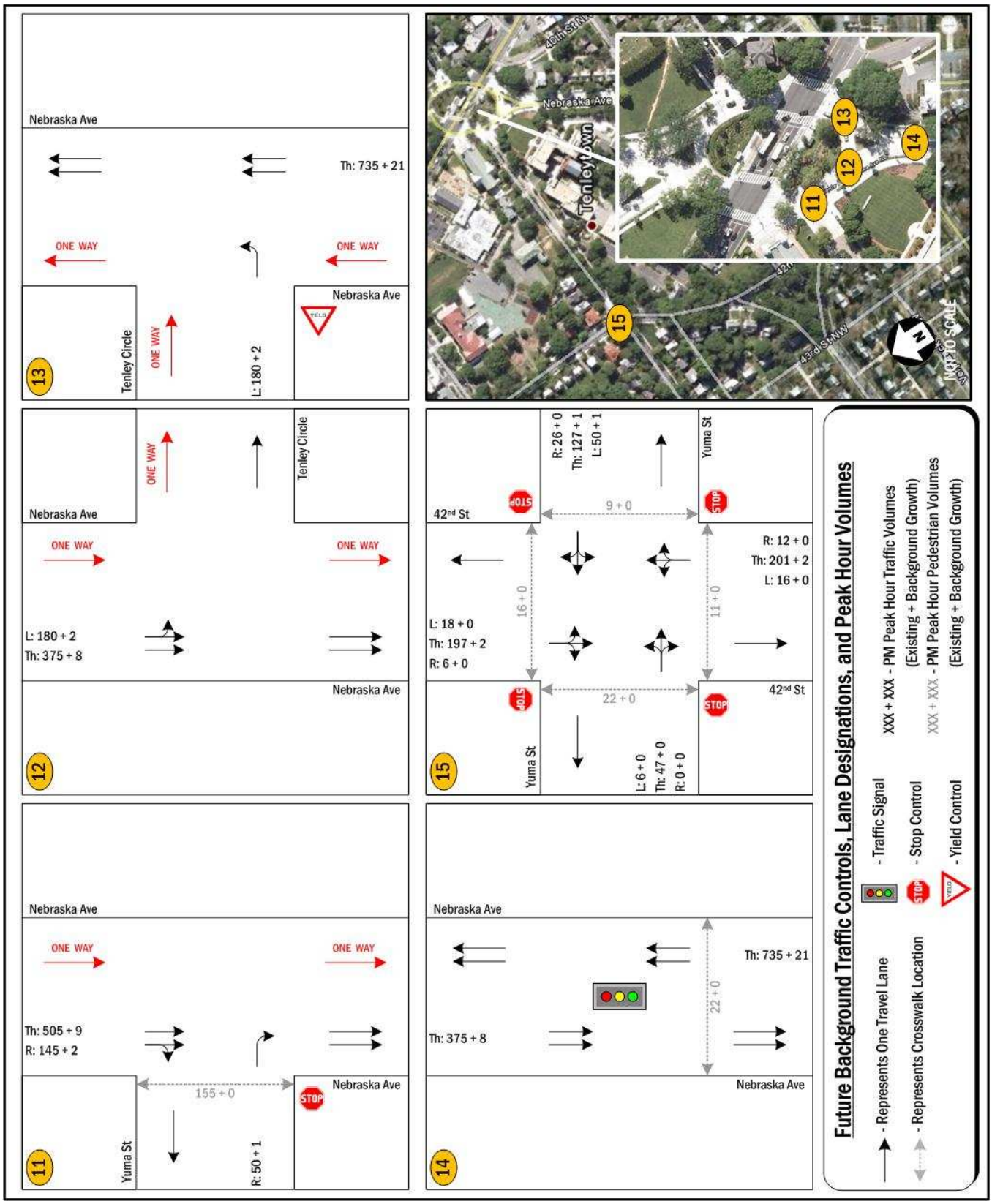

Figure 58: Tenley Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (3 of 5)

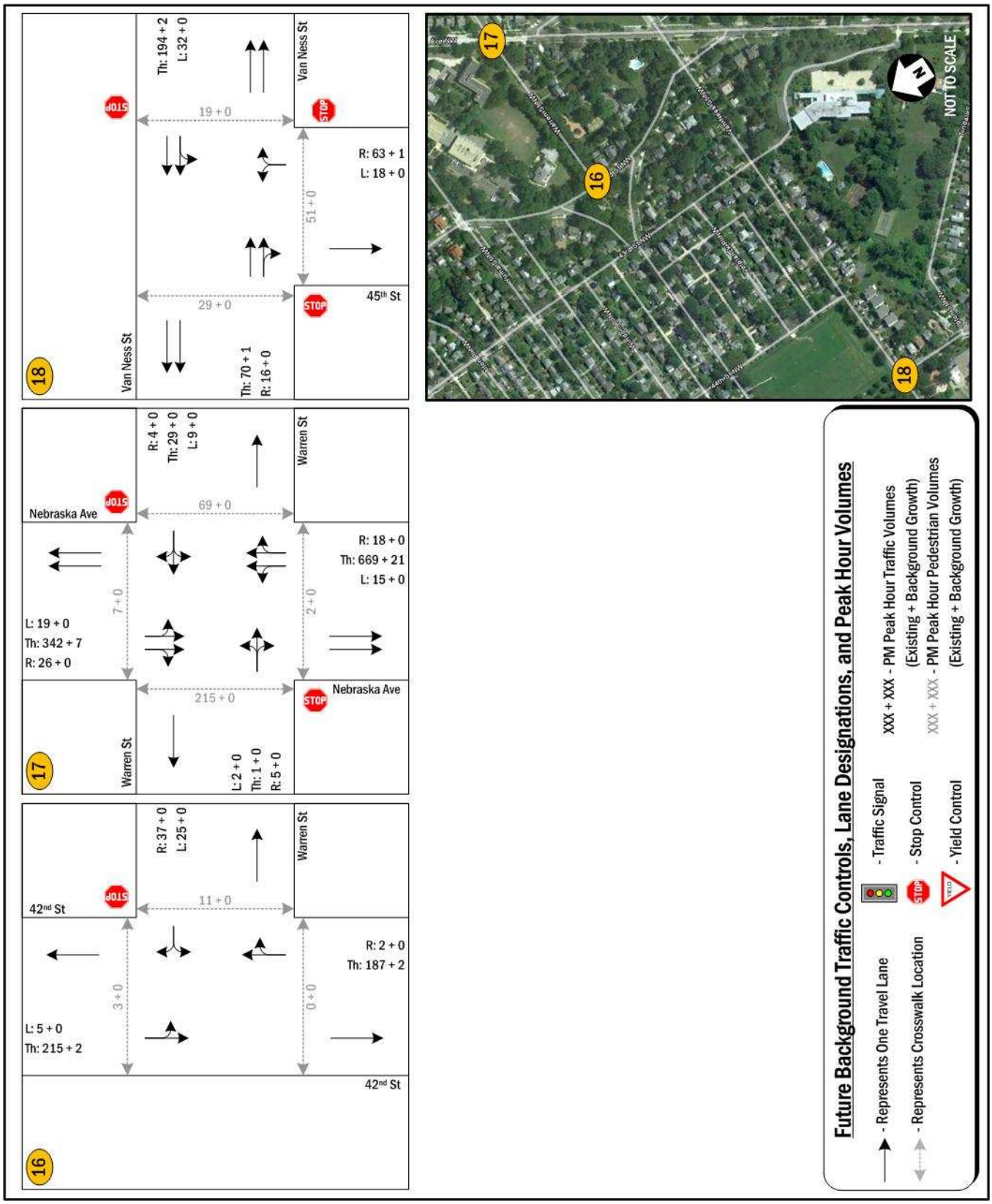

Figure 59: Tenley Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (4 of 5)

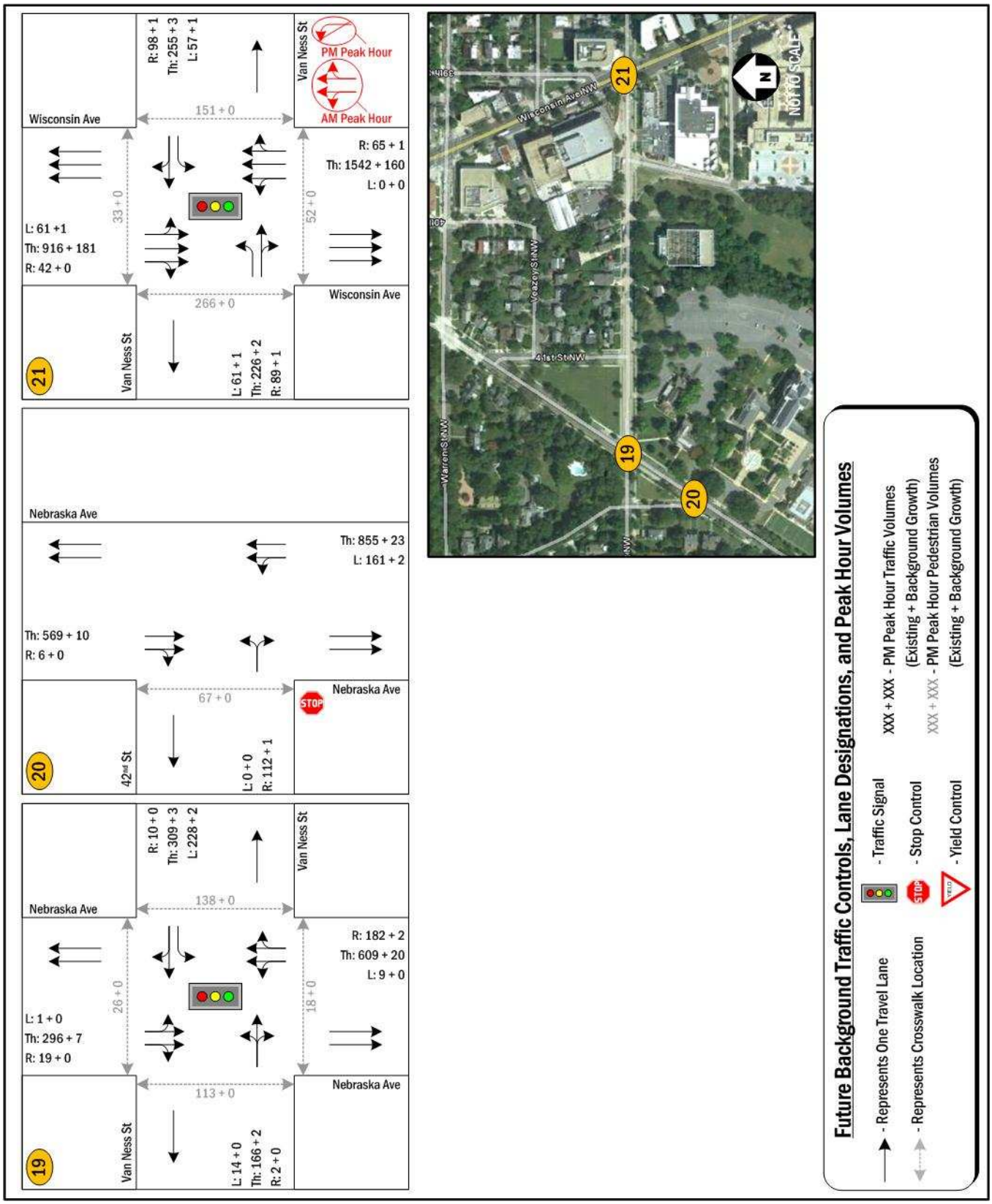

Figure 60: Tenley Campus – Future Background Traffic Controls, Lane Designations, and PM Traffic Volumes (5 of 5)

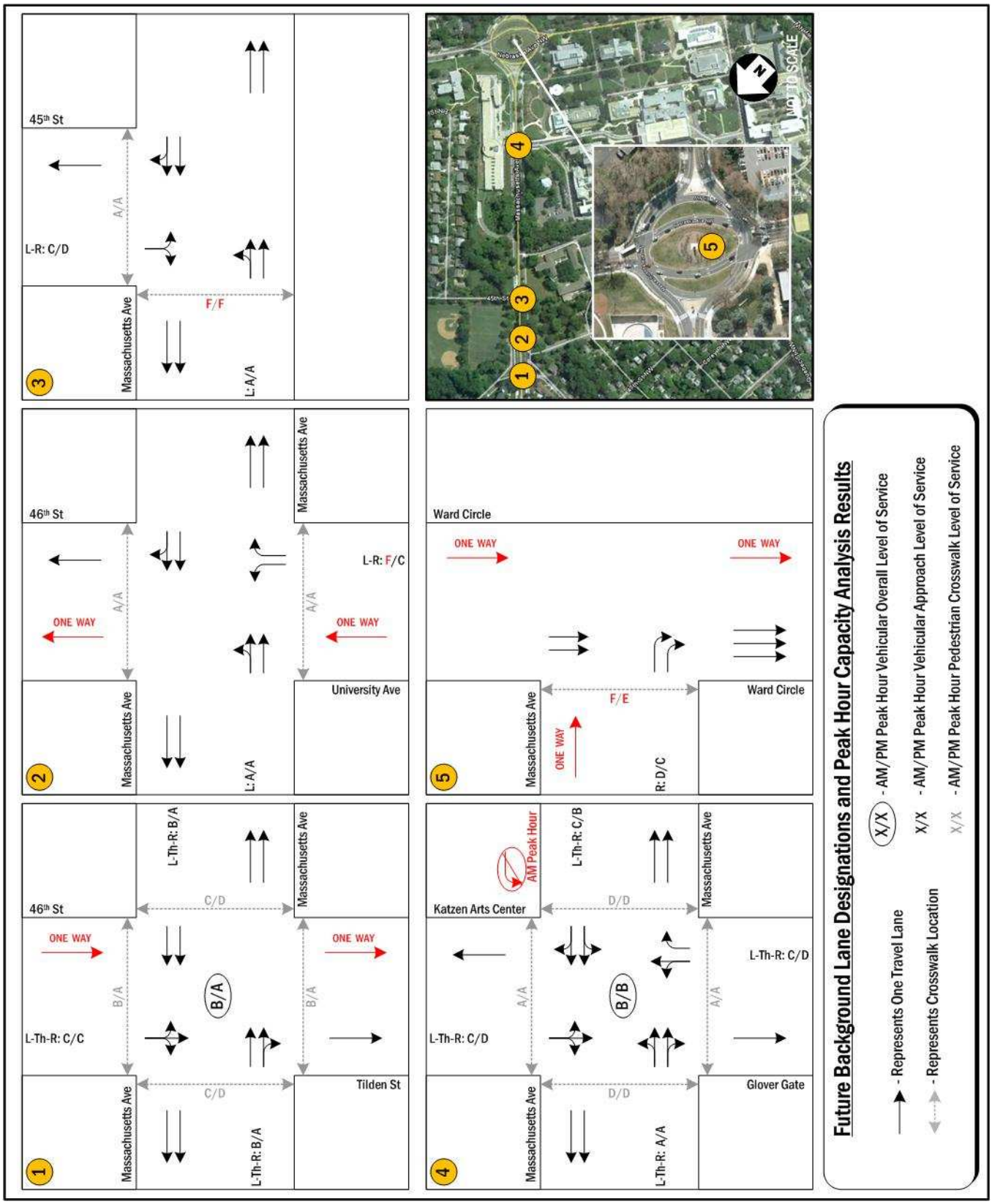

Figure 61: Tenley Campus – Future Background Lane Configurations and Capacity Analysis Results (1 of 5)

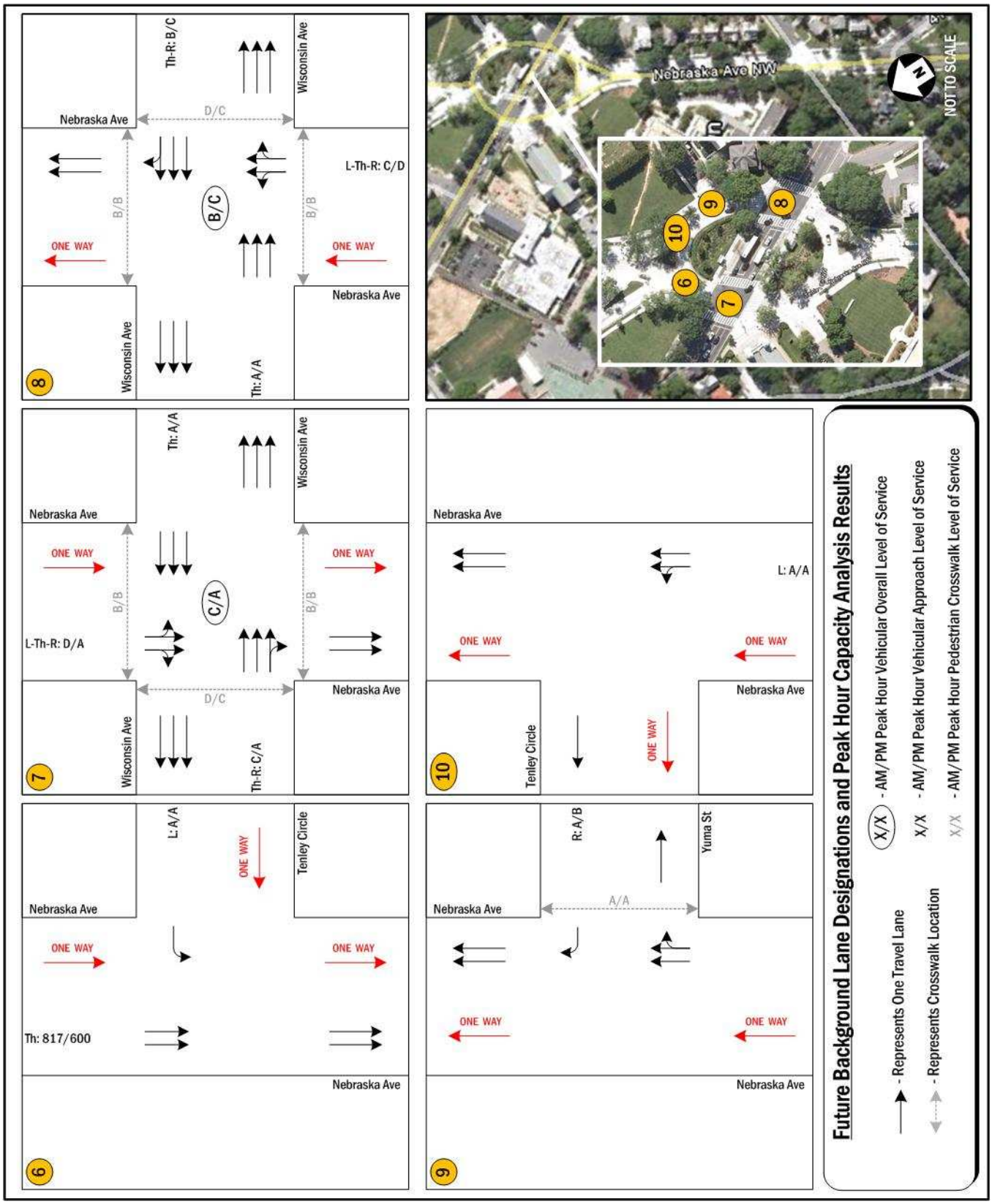

Figure 62: Tenley Campus – Future Background Lane Configurations and Capacity Analysis Results (2 of 5)

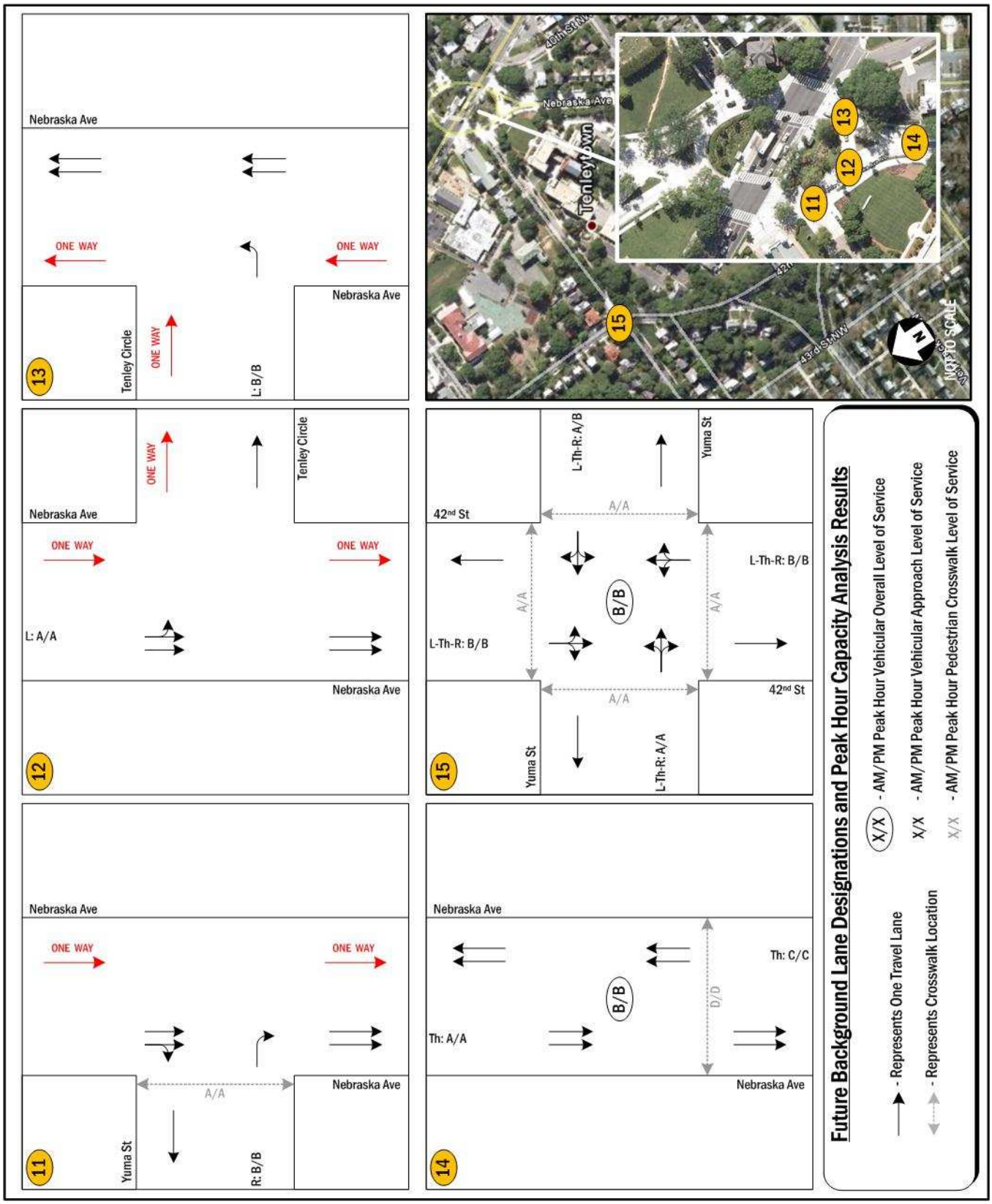

Figure 63: Tenley Campus – Future Background Lane Configurations and Capacity Analysis Results (3 of 5)

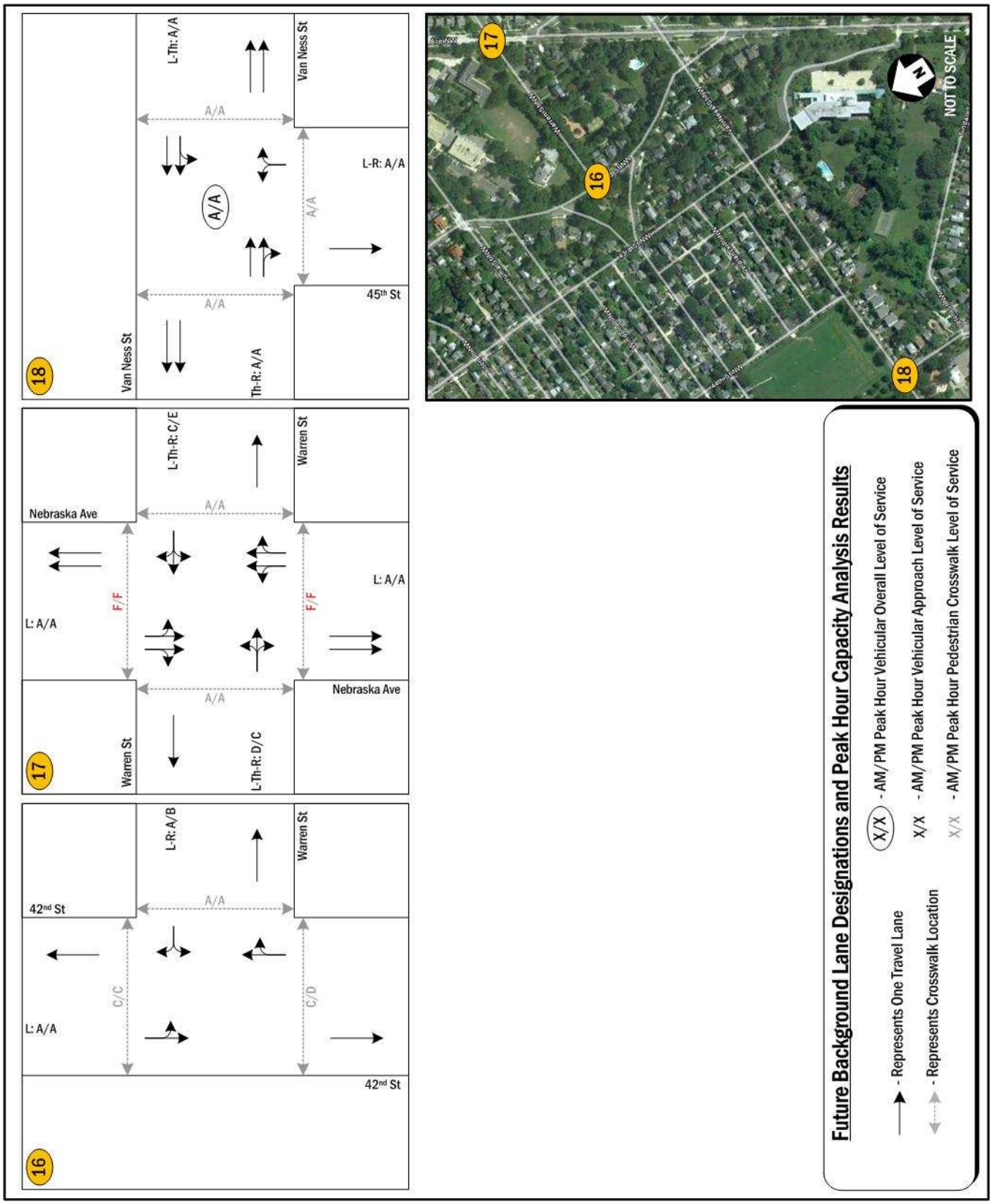

Figure 64: Tenley Campus – Future Background Lane Configurations and our Capacity Analysis Results (4 of 5)

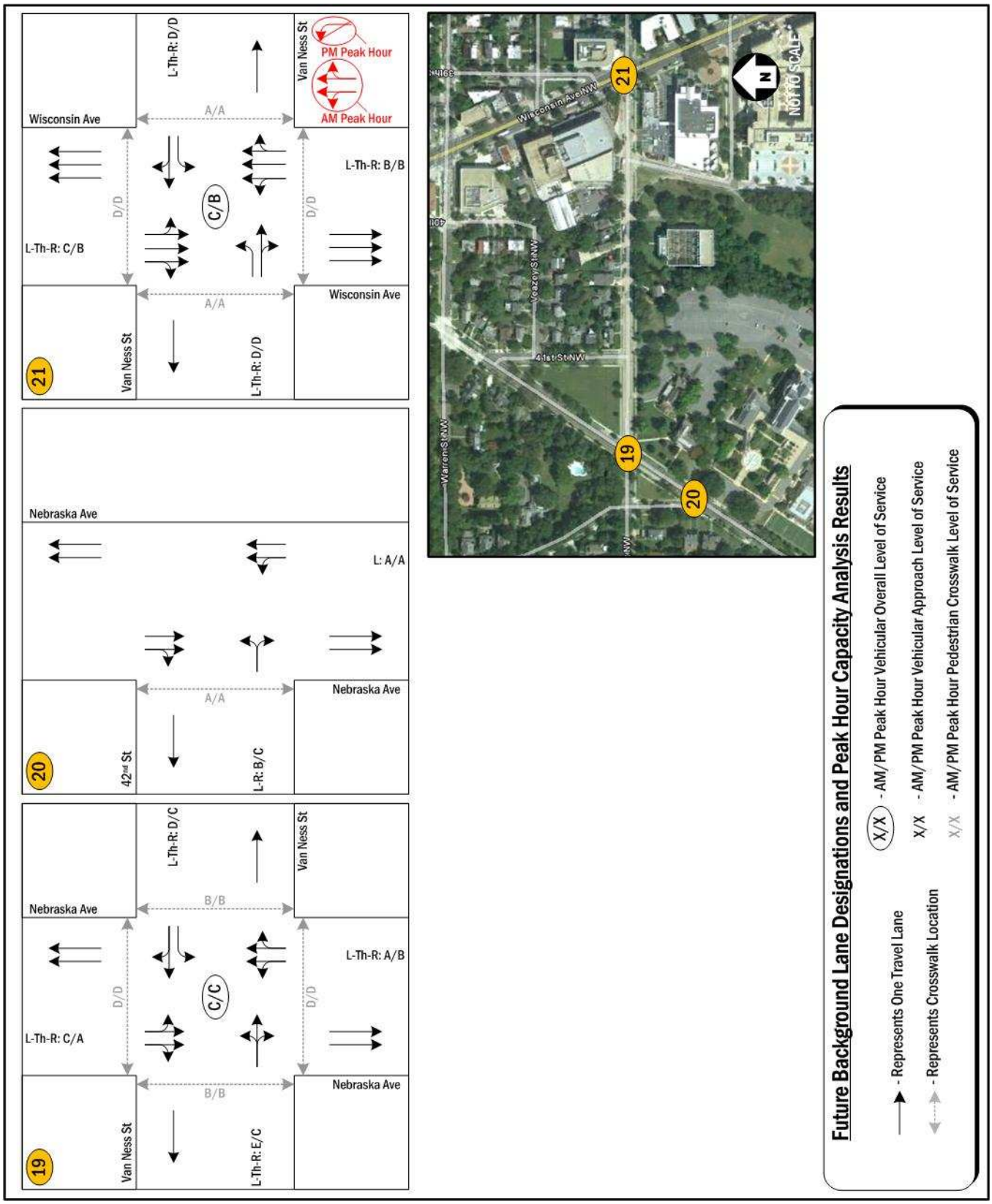

Figure 65: Tenley Campus – Future Background Lane Configurations and our Capacity Analysis Results (5 of 5)

Future Conditions with 2011 Campus Plan

Analysis of the 2011 Campus Plan for the Tenley Campus development conditions includes an assessment of the future transportation conditions for the year 2020. The American University 2011 Campus Plan Update for the Tenley Campus focuses on creating a campus for the Washington College of Law (WCL) through removal of some of the existing buildings on the campus and the addition of approximately 244,000 square feet of campus space in the approximate footprints of the existing buildings. The Tenley Campus will contain approximately 300,000 square feet of new and renovated facilities. The Washington College of Law is projected to increase the student enrollment to approximately 2,000, and the faculty/staff population could increase to approximately 500 with the full potential growth allowed in the 2011 Plan for the Tenley campus.

The *Transportation Report* identifies the locations of development areas in the 2011 Plan for the Tenley Campus. The *American University 2011 Campus Plan* provides a more detailed description of the proposed development.

Future with 2011 Campus Plan Traffic Volumes

The impact of the proposed changes to the Tenley Campus was based on changes to vehicular and pedestrian generated on the campus. Vehicular trips were generated based on changes due to changes in parking. In order to provide a conservative analysis, it was assumed that the upper limit of potential parking (500 spaces) would be built on the Tenley Campus.

First, the existing trips on the Tenley Campus were removed from the surrounding roadway network, and then the new proposed WCL garage trips were added. In order to determine the trips removed from the Tenley Campus, a trip generation rate was estimated based on existing (2010) driveway counts at the University Gates (Glover Gate on Massachusetts Avenue, Tilden Gate on Rockwood Parkway, and Nebraska Avenue Lot on Nebraska and New Mexico Avenues) and on trip generation rates used in the *Transportation Analysis of the SIS Parking Facility* performed by HNTB in March 2005. This trip generation rate was assumed to be 0.30 trips per space during the morning peak hour (0.25 inbound and 0.05 outbound) and 0.50 trips per space during the afternoon peak hour (0.20 inbound and 0.30 outbound).

In order to determine the future trips generated by the 500 underground parking spaces, the trip generation rate for the WCL was estimated based on existing survey data collected by Gorove/Slade on April 13, 2010. The online-survey was distributed to the WCL population to determine the existing mode split of the WCL and the locations utilized for parking by each of the user types. As shown in the *Transportation Report*, the results showed that over half of the WCL students who responded to the survey utilize modes such as Metrorail and walking, instead of driving alone. Faculty and staff at the WCL who responded to the survey had high percentages of driving. Table 26 shows the mode split data obtained for the WCL.

The survey also recorded arrival and departure times for the WCL, which were used to determine the trip generation rates for the future Tenley Campus. This trip generation rate was assumed to be 0.30 trips per space during the morning peak hour (0.25 inbound and 0.05 outbound) and 0.30 trips per space during the afternoon peak hour (0.10 inbound and 0.20 outbound). Table 27 shows the existing trips removed, the future WCL trips added, and the net gain of trips in the study area.

Table 26: Tenley Campus – Washington College of Law Mode Split Data

Mode	Students	Adjunct Faculty	Faculty	Staff
Walk	10%	0%	3%	1%
Bike	3%	0%	0%	0%
Drive Alone	35%	70%	75%	55%
Scooter/Motorcycle	2%	5%	2%	0%
Drive Carpool	4%	5%	0%	7%
Carpool Rider/Dropped Off	5%	0%	0%	7%
Metrorail & AU Shuttle	28%	15%	15%	20%
Metrobus	13%	5%	5%	10%
Total	100.0%	100.0%	100.0%	100.0%

Table 27: Tenley Campus – Net New Vehicular Trips

Source	Size	Net Trips			
		AM Peak Hour		*PM Peak Hour*	
		In	Out	In	Out
Existing Trips Removed (2010)	79 Spaces	20	4	16	24
Future WCL Trips Added (2020)	500 Spaces	125	25	50	100
Total	**421 Spaces**	**105**	**21**	**34**	**76**

In addition to vehicular trips, the proposed 2011 Plan for the Tenley Campus will generate additional pedestrian trips. Pedestrian trips will be generated by the increase in student and faculty/staff populations. These pedestrian trips would be generated by pedestrians walking from the Tenleytown-AU Metrorail station, from adjacent Metrobus stops, and from adjacent neighborhoods. These pedestrian trips were estimated using the mode split data obtained from the survey, shown previously in Table 26. Table 28 shows the pedestrian trips added to the Tenley Campus.

The pedestrian trips shown in Table 28 were distributed through the study area based on their assumed arrival location and the location of the WCL front doorway along Yuma Street west of Tenley Circle. It was assumed that all Metrorail trips would originate from the north and cross Yuma Street at Tenley Circle, with some pedestrians crossing Wisconsin Avenue as well. Metrobus trips would primarily arrive from the north, approximately 75 percent, and cross Yuma Street at Tenley Circle. The remainder, approximately 25 percent, would arrive from the south and cross Nebraska Avenue at the pedestrian signal at Tenley Circle. Walking trips would primarily arrive from the north, approximately 75 percent, and cross Yuma Street at Tenley Circle, with some pedestrians crossing Wisconsin Avenue as well. The remainder, approximately 25 percent, would arrive from the south and cross Nebraska Avenue at Warren Street, with some pedestrians crossing Nebraska Avenue as well. These splits are shown in Table 28, as well as the resulting pedestrian trips added to each crosswalk.

The traffic volumes for the future conditions with the 2011 Plan for the Tenley Campus were calculated by subtracting the existing trips generated by the University and adding the site-generated vehicular and pedestrian volumes generated by the WCL to the future without the 2011 Plan traffic volumes. The future traffic volumes with the proposed development on the Tenley Campus are shown on Figure 66, Figure 67, Figure 68, Figure 69, and Figure 70 for the morning peak hour and Figure 71, Figure 72, Figure 73, Figure 74, and Figure 75 for the afternoon peak hour.

Table 28: Tenley Campus – Pedestrian Trips Added

Source	Percentage	Number	Mode	AM Peak Hour	PM Peak Hour
Students	30%	600	Metrorail	180	180
	15%	300	Metrobus	90	90
	10%	200	Walking	60	60
Faculty/Staff	15%	75	Metrorail	23	23
	5%	25	Metrobus	8	8
	5%	25	Walking	8	8
Total				**369**	**369**
Crossing Yuma St at Tenley Circle (Western Crosswalk)				323	323
Crossing Wisconsin Ave at Tenley Circle (Northern Crosswalk)				75	75
Crossing Nebraska Ave at Tenley Circle (Pedestrian Crosswalk)				23	23
Crossing Warren St at Nebraska Ave (Western Crosswalk)				13	13
Crossing Warren St at Nebraska Ave (Eastern Crosswalk)				10	10
Crossing Nebraska Ave at Warren St (Northern Crosswalk)				10	10

Note: Pedestrian trips added to study area greater than the total pedestrian trips generated as several pedestrian trips will travel through multiple crosswalks.

Future with 2011 Campus Plan Vehicular Capacity Analysis

Intersection capacity analyses were performed for the future conditions with the 2011 Plan for the Tenley Campus at the intersections contained within the study area during the morning and afternoon peak hours, following the methodology outlined previously. The capacity analyses for the future conditions with the 2011 Plan were based on: (1) the existing lane use and traffic controls; (2) the conversion of 40th Street north of Albemarle Street to one-way northbound and of Fort Drive north of Albemarle Street to one-way southbound; (3) the peak hour turning movement volumes described previously; and (4) the Highway Capacity Manual (HCM) methodologies (using *Synchro 7* software). Detailed LOS descriptions and the analysis worksheets are contained in the Technical Attachments.

As stated previously, the draft final recommendations for the Rock Creek West II (RCW2) Livability Study were consulted for future recommendations. This includes the conversion of 40th Street and Fort Drive north of Albemarle Street from one-way southbound and northbound to one-way northbound and southbound, respectively. Signal timing changes are also suggested at Tenley Circle in order to improve the northbound approach of Nebraska Avenue and to correct the unacceptable pedestrian delays calculated previously.

Table 29 shows the results of the capacity analyses, including LOS and average delay per vehicle (in seconds). The capacity analysis results are also shown on Figure 76, Figure 77, Figure 78, Figure 79, and Figure 80. The capacity analyses results indicate that all study area intersections operate at acceptable levels of service during both the morning and afternoon peak hours.

Table 29: Tenley Campus – Total Future Vehicular Levels of Service

Intersection	Approach	Total Future Conditions (2020)			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
Wisconsin Ave & Albemarle St	**Overall**	**28.1**	**C**	**22.7**	**C**
	Eastbound	26.9	C	24.3	C
	Westbound	67.4	E	66.3	E
	Westbound	22.8	C	19.3	B
	Southbound	25.5	C	16.6	B
Albemarle St & 40th St	Eastbound Left	1.4	A	1.4	A
Albemarle St & Fort Dr	Westbound Left	3.2	A	0.6	A
	Northbound	51.2	F	62.0	F
	Southbound	71.2	F	254.9	F
Improvement: Convert to all-way stop	Overall	**14.9**	**B**	**21.8**	**C**
	Eastbound	12.6	B	29.3	D
	Westbound	18.7	C	18.3	C
	Northbound	10.5	B	12.6	B
	Southbound	11.6	B	17.4	C
Tenley Circle:					
A: Nebraska Ave & Fort Dr/Tenley Circle	**Overall**	**32.0**	**C**	**25.4**	**C**
	Westbound	14.6	B	13.8	B
	Southbound	46.3	D	40.5	D
B: Nebraska Ave & Fort Dr	Eastbound Right	10.4	B	9.4	A
C: Nebraska Ave & Tenley Circle	Westbound Left	9.9	A	9.6	A
D: Nebraska Ave & Wisconsin Ave	**Overall**	**22.5**	**22.5**	**6.6**	**A**
	Eastbound	20.7	20.7	6.6	A
	Westbound	4.0	4.0	3.1	A
	Southbound	44.5	44.5	14.1	B
E: Nebraska Ave & Wisconsin Ave	**Overall**	**10.4**	**B**	**36.5**	**D**
	Eastbound	3.1	A	4.1	A
	Westbound	11.1	B	25.3	C
	Northbound	28.3	C	94.1	F
F: Nebraska Ave & Yuma St	Westbound Right	9.4	A	10.1	B
G: Nebraska Ave & Tenley Circle	Northbound Left	2.5	A	1.9	A
H: Nebraska Ave & Yuma St	Eastbound Right	16.8	C	17.8	C
I: Nebraska Ave & Tenley Circle	Southbound Left	3.9	A	4.5	A
J: Nebraska Ave & Tenley Circle	Eastbound Left	12.6	B	14.3	B
K: Nebraska Ave Pedestrian Crossing	**Overall**	**13.0**	**B**	**21.4**	**C**
	Northbound	31.0	C	32.2	C
	Southbound	1.3	A	0.8	A
Improvement: Retime signal					
A: Nebraska Ave & Fort Dr/Tenley Circle	**Overall**	31.6	C	**21.4**	**C**
	Westbound	13.6	B	15.6	B
	Southbound	46.3	D	28.9	C
B: Nebraska Ave & Fort Dr	Eastbound Right	10.4	B	9.4	A
C: Nebraska Ave & Tenley Circle	Westbound Left	9.9	A	9.6	A
D: Nebraska Ave & Wisconsin Ave	**Overall**	**22.5**	**C**	**6.2**	**A**
	Eastbound	20.7	C	7.5	A
	Westbound	3.8	A	4.5	A
	Southbound	44.5	D	7.7	A
E: Nebraska Ave & Wisconsin Ave	**Overall**	**11.7**	**B**	**23.8**	**C**
	Eastbound	3.1	A	6.1	A

Intersection	Approach	Total Future Conditions (2020)			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
	Westbound	11.1	B	27.7	C
	Northbound	34.5	C	39.2	D
F: Nebraska Ave & Yuma St	Westbound Right	9.4	A	10.1	B
G: Nebraska Ave & Tenley Circle	Northbound Left	2.5	A	1.9	A
H: Nebraska Ave & Yuma St	Eastbound Right	16.8	C	17.8	C
I: Nebraska Ave & Tenley Circle	Southbound Left	3.9	A	4.5	A
J: Nebraska Ave & Tenley Circle	Eastbound Left	12.6	B	14.3	B
K: Nebraska Ave Pedestrian Crossing	**Overall**	**13.6**	**B**	**17.5**	**B**
	Northbound	31.0	C	25.7	C
	Southbound	2.4	A	1.7	A
42nd St & Yuma St	**Overall**	**10.1**	**B**	**10.3**	**B**
	Eastbound	10.0	A	9.0	A
	Westbound	9.0	A	10.4	B
	Northbound	10.3	B	10.4	B
	Southbound	10.3	B	10.4	B
42nd St & Warren St	Westbound	9.7	A	11.8	B
	Southbound Left	0.5	A	0.2	A
Nebraska Ave & Warren St	Eastbound	32.7	D	47.7	E
	Westbound	24.9	C	67.6	F
	Northbound	2.4	A	1.4	A
	Southbound	0.2	A	0.7	A
Van Ness St & 45th St	**Overall**	**8.1**	**A**	**8.4**	**A**
	Eastbound	8.2	A	7.8	A
	Westbound	8.3	A	9.0	A
	Northbound	7.7	A	7.7	A
Nebraska Ave & Van Ness St	**Overall**	**30.3**	**C**	**20.2**	**C**
	Eastbound	72.8	E	28.6	C
	Westbound	43.2	D	26.1	C
	Northbound	6.0	A	19.8	B
	Southbound	24.0	C	9.4	A
Nebraska Ave & 42nd St	Eastbound	10.9	B	18.6	C
	Northbound Left	3.8	A	5.7	A
Wisconsin Ave & Van Ness St	**Overall**	**28.4**	**C**	**20.1**	**C**
	Eastbound	36.1	D	37.1	D
	Westbound	46.2	D	44.9	D
	Northbound	13.7	B	12.4	B
	Southbound	31.7	C	17.3	B

For the purpose of this analysis, it is desirable to achieve a level of service (LOS) of "E" or better on each approach. As stated previously, all study area intersections operate at acceptable levels of service during the morning and afternoon peak hours. However, a few approaches continue to operate with unacceptable levels of service during one or more peak hours. The LOS results show that:

- All of the study intersections (overall LOS) operate at acceptable conditions during both the morning and afternoon peak hours.

- The following approaches continue to operate with unacceptable LOS during one or more peak hours:
  - The north- and southbound approaches of Fort Drive at Albemarle Street continue to operate under unacceptable conditions during the morning and afternoon peak period. The conversion to an all-way stop intersection, as recommended in the "Draft Environmental Impact Statement" for the NAC, will allow the intersection to operate at acceptable LOS.
  - The northbound approach of Nebraska Avenue at Tenley Circle continues to operate under unacceptable conditions during the afternoon peak period. Adjusting the signal timings to provide more green time for the movement, as well as correcting the deficient pedestrian timing, will result in acceptable conditions for both vehicles and pedestrians.
- The westbound approach of Warren Street at Nebraska Avenue operates above capacity during the afternoon peak period. At the time of this analysis, details on the proposed WCL parking garage such as access locations and total amount of spaces were not finalized. Thus, this report does not recommend specific mitigation measures to alleviate congestion generated by the proposed garage. Instead, this report recommends that when the final design of the campus is assembled, and the location of the garage driveway finalized, these results will be revised to reflect the final design. An updated traffic analysis will be presented during the further processing submittal process, which will present the revised results and make recommendations on mitigation measures, if needed.

Future with 2011 Campus Plan Pedestrian Analysis Results

Pedestrian analyses were performed for the future with the 2011 Plan conditions at the intersections contained within the study area during the morning and afternoon peak hours. The analysis was based on "Chapter 13: Pedestrians" of the Highway Capacity Manual (HCM), as outlined previously.

Table 30 and Table 31 show the results of the capacity analyses, including LOS and average delay (in seconds). The capacity analysis results are also shown on Figure 76, Figure 77, Figure 78, Figure 79, and Figure 80.

Table 30: Tenley Campus – Total Future Pedestrian Levels of Service for Signalized Intersections

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
Wisconsin Ave & Albemarle St	Eastbound	27.4	C	28.1	C
	Westbound	38.7	D	39.6	D
	Northbound	15.7	B	15.1	B
	Southbound	15.7	B	15.1	B
Tenley Circle:					
A: Nebraska Ave & Fort Dr/Tenley Circle	Eastbound	41.4	E	41.4	E
	Southbound	31.2	D	31.2	D
D: Nebraska Ave & Wisconsin Ave	Eastbound	14.6	B	14.6	B
	Westbound	11.5	B	11.5	B
	Northbound	32.8	D	32.8	D
	Southbound	32.8	D	32.8	D
E: Nebraska Ave & Wisconsin Ave	Eastbound	11.5	B	11.5	B
	Westbound	14.6	B	14.6	B
	Northbound	32.8	D	32.8	D
	Southbound	32.8	D	32.8	D
K: Nebraska Ave Pedestrian Crossing	Eastbound	41.4	E	41.4	E

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
Improvement: Retime signal					
A: Nebraska Ave & Fort Dr/Tenley Circle	Eastbound	39.6	D	39.6	E
	Southbound	31.2	D	24.5	C
D: Nebraska Ave & Wisconsin Ave	Eastbound	14.6	B	19.8	B
	Westbound	11.5	B	16.2	B
	Northbound	32.8	D	25.9	C
	Southbound	32.8	D	25.9	C
E: Nebraska Ave & Wisconsin Ave	Eastbound	11.5	B	16.2	B
	Westbound	14.6	B	19.8	B
	Northbound	32.8	D	25.9	C
	Southbound	32.8	D	25.9	C
K: Nebraska Ave Pedestrian Crossing	Eastbound	39.6	D	39.6	D
Nebraska Ave & Van Ness St	Eastbound	32.8	D	31.2	D
	Westbound	32.8	D	31.2	D
	Northbound	11.0	B	12.0	B
	Southbound	11.0	B	12.0	B
Wisconsin Ave & Van Ness St	Eastbound	37.0	D	35.3	D
	Westbound	37.0	D	35.3	D
	Northbound	8.8	A	9.7	A
	Southbound	8.8	A	9.7	A

Table 31: Tenley Campus – Total Future Pedestrian Levels of Service for Unsignalized Intersections

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Albemarle St & 40th St	Westbound	N/A - Stop controlled crossing, LOS A			
	Southbound	33.5	E	60.2	F
Albemarle St & Fort Dr	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	50.1	F	64.0	F
Improvement: Convert to all-way stop	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
Tenley Circle:					
B: Nebraska Ave & Fort Dr	Southbound	N/A - Stop controlled crossing, LOS A			
F: Nebraska Ave & Yuma St	Northbound	N/A - Stop controlled crossing, LOS A			
H: Nebraska Ave & Yuma St	Southbound	N/A - Stop controlled crossing, LOS A			
42nd St & Yuma St	Eastbound	N/A - Stop controlled crossing, LOS A			
	Westbound	N/A - Stop controlled crossing, LOS A			
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			
42nd St & Warren St	Eastbound	14.7	C	22.4	D
	Westbound	14.5	C	18.2	C
	Northbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & Warren St	Eastbound	4,196.1	F	1,728.3	F
	Westbound	4,910.6	F	1,757.8	F
	Northbound	N/A - Stop controlled crossing, LOS A			
	Southbound	N/A - Stop controlled crossing, LOS A			

Intersection	Parallel Approach	Total Future Conditions (2020)			
		AM Peak Hour		*PM Peak Hour*	
		Delay	LOS	Delay	LOS
Van Ness & 45th St	Eastbound	N/A - Stop controlled crossing, LOS A			
Nebraska Ave & 42nd St	Southbound	N/A - Stop controlled crossing, LOS A			

The analysis results indicate that all signalized crosswalks in the study area operate at acceptable levels of service during both the morning and afternoon peak hours, except two located at Tenley Circle. However, the signal timing improvements at Tenley Circle bring all signalized crosswalks to acceptable LOS. This indicates a low (LOS A and B) to moderate (LOS C and D) likelihood of non-compliance by pedestrians, which is reflected by pedestrians jaywalking across the intersection.

The analysis results also indicate that the majority of the unsignalized crosswalks in the study area operate at acceptable levels of service during the morning and afternoon peak hours. This indicates a moderate (LOS C and D) likelihood of risk-taking behavior for pedestrians, which is reflected in occasional pedestrians dashing between vehicles during short gaps in traffic. As stated previously, pedestrians have the right-of-way in all crosswalks in the District, so vehicles must yield to pedestrians in the crosswalk at the study intersections listed in Table 22. However, the LOS E and F calculated indicate an unfriendly and intimidating environment for pedestrians. No new unacceptable LOS are observed for the future without the 2011 Plan scenario. Additionally, the conversion of the intersection of Albemarle Street & Fort Drive to all-way stop control brings the crosswalks to acceptable LOS since stop-controlled crossing have no pedestrian delay.

Recommendations and Mitigation Measures

As noted above, a few approaches operate under unacceptable conditions during one or more peak hour for the future with the 2011 Plan scenario. For Tenley Circle, signal timing improvements are suggested, as outlined previously, in order to improve the northbound approach of Nebraska Avenue at the Circle. These improvements are suggested for the future without the 2011 Plan scenario. Assuming that the signal timing improvements are undertaken, the Circle will operate under acceptable conditions with the 2011 Plan.

As stated above, no mitigation measures are presented to alleviate congestion generated by the new WCL garage on the Tenley Campus, since details regarding garage access and capacity have not been finalized. This report recommends that an updated traffic analysis be presented during the further processing submittal process, which will present the revised results and make recommendations on mitigation measures, if needed.

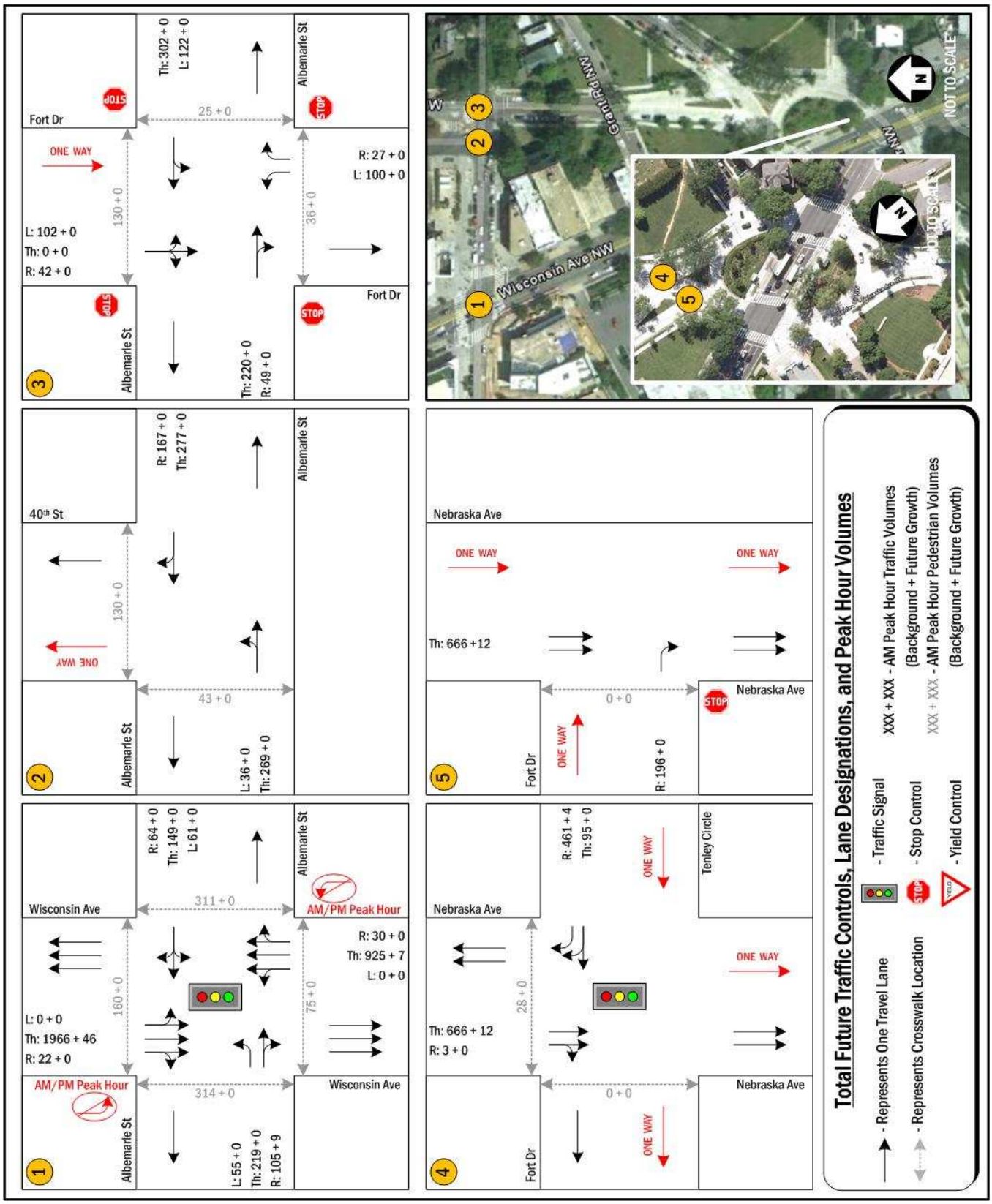

Figure 66: Tenley Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (1 of 5)

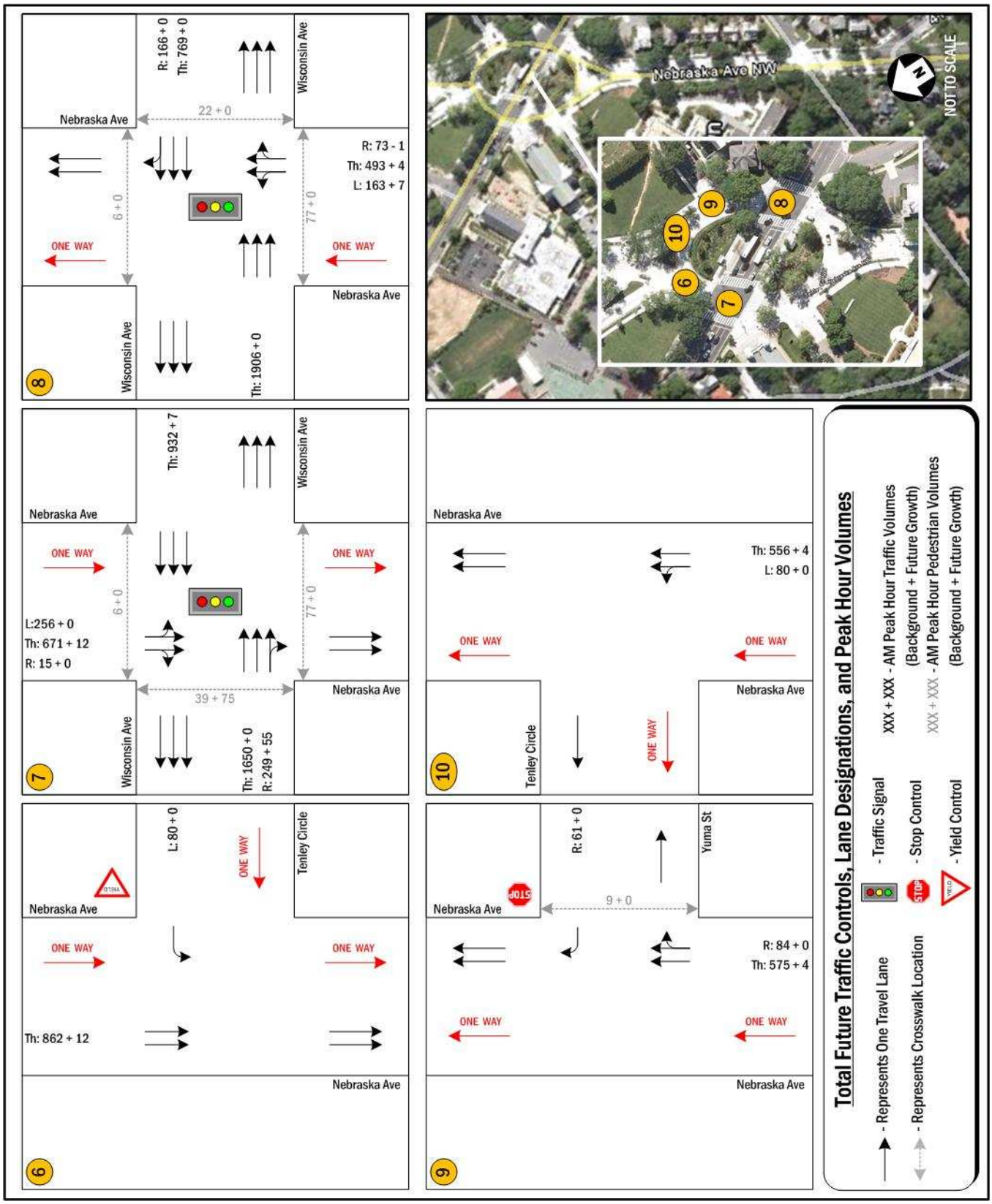

Figure 67: Tenley Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (2 of 5)

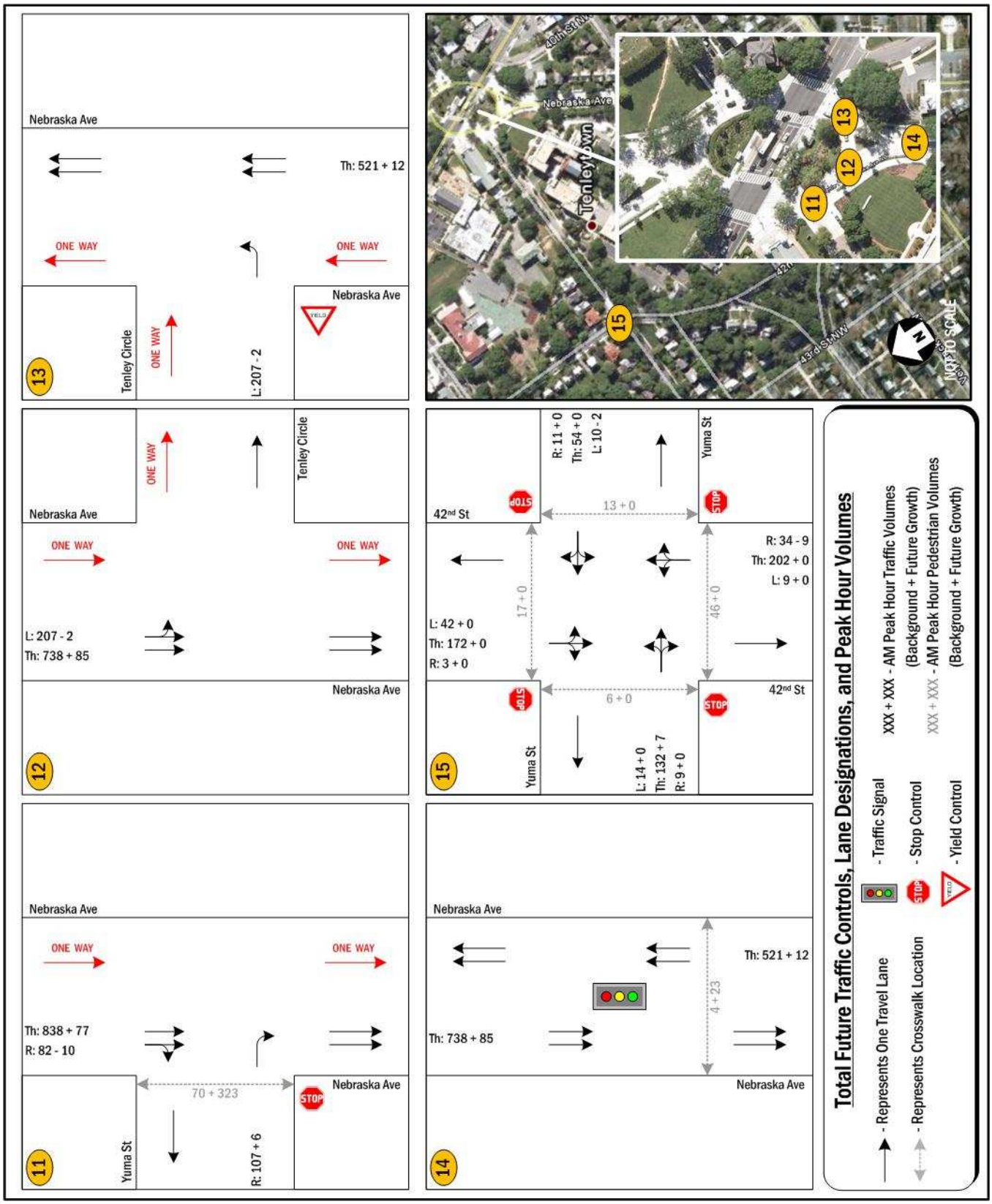

Figure 68: Tenley Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (3 of 5)

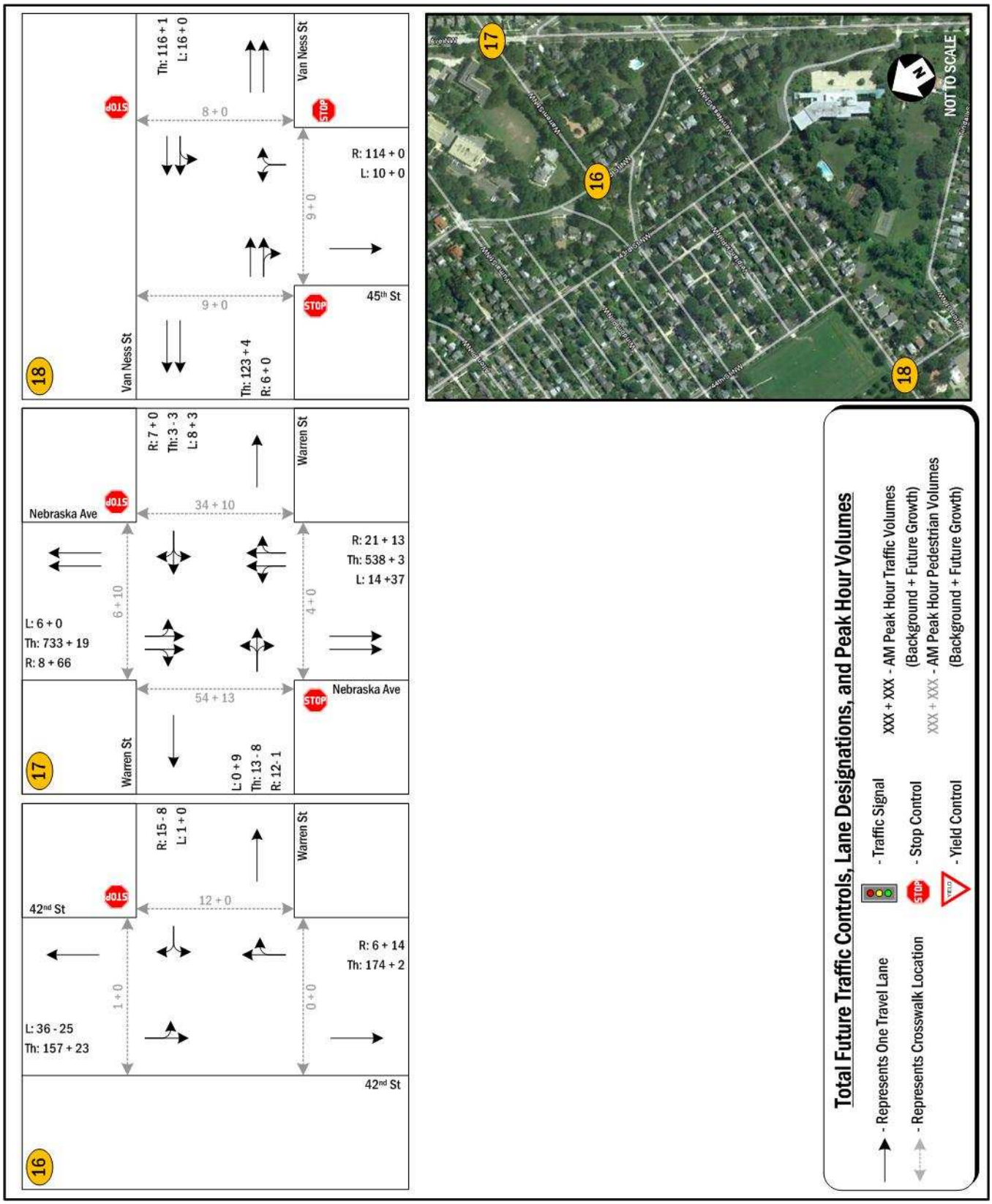

Figure 69: Tenley Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (4 of 5)

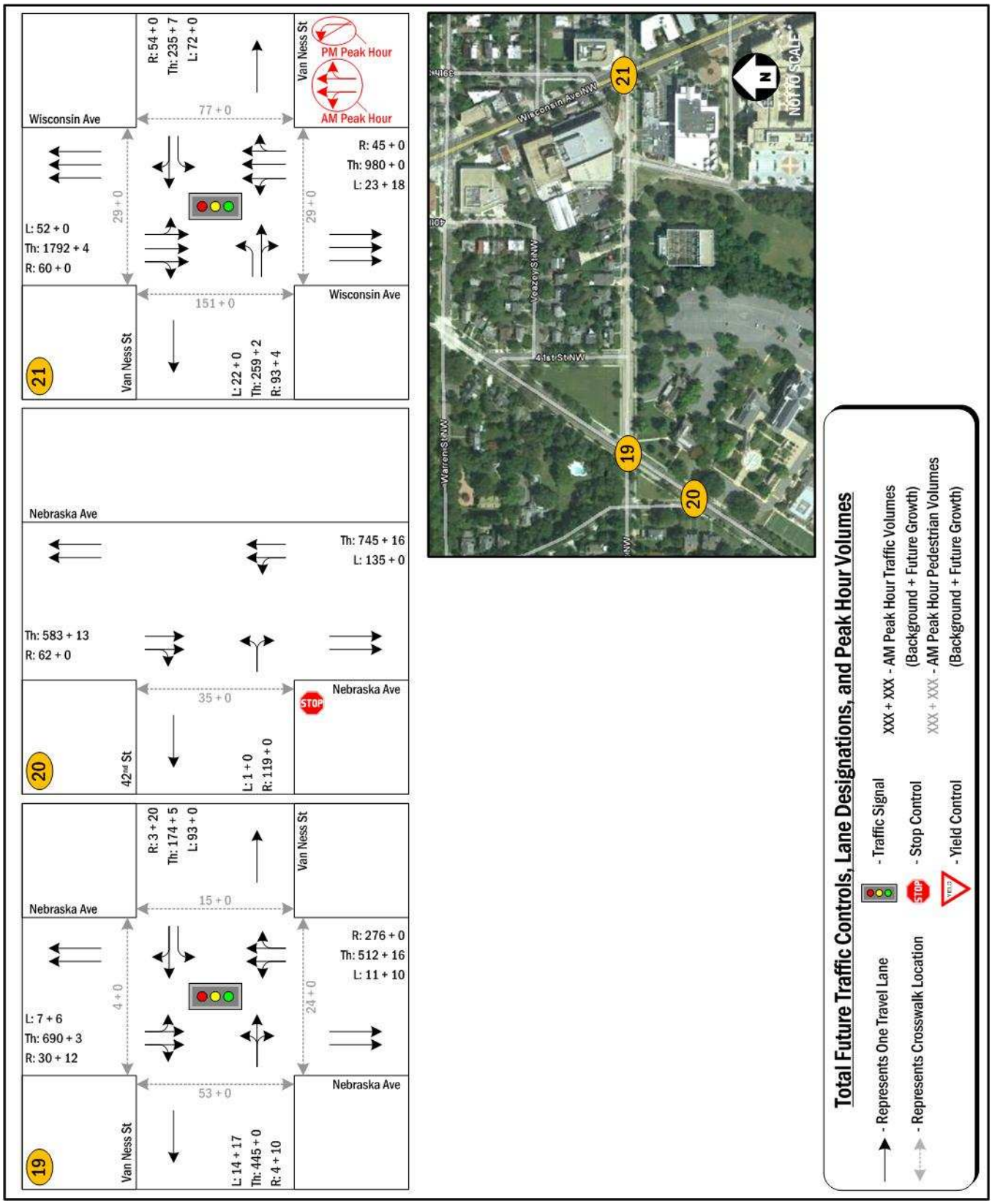

Figure 70: Tenley Campus – Total Future Traffic Controls, Lane Designations, and AM Traffic Volumes (5 of 5)

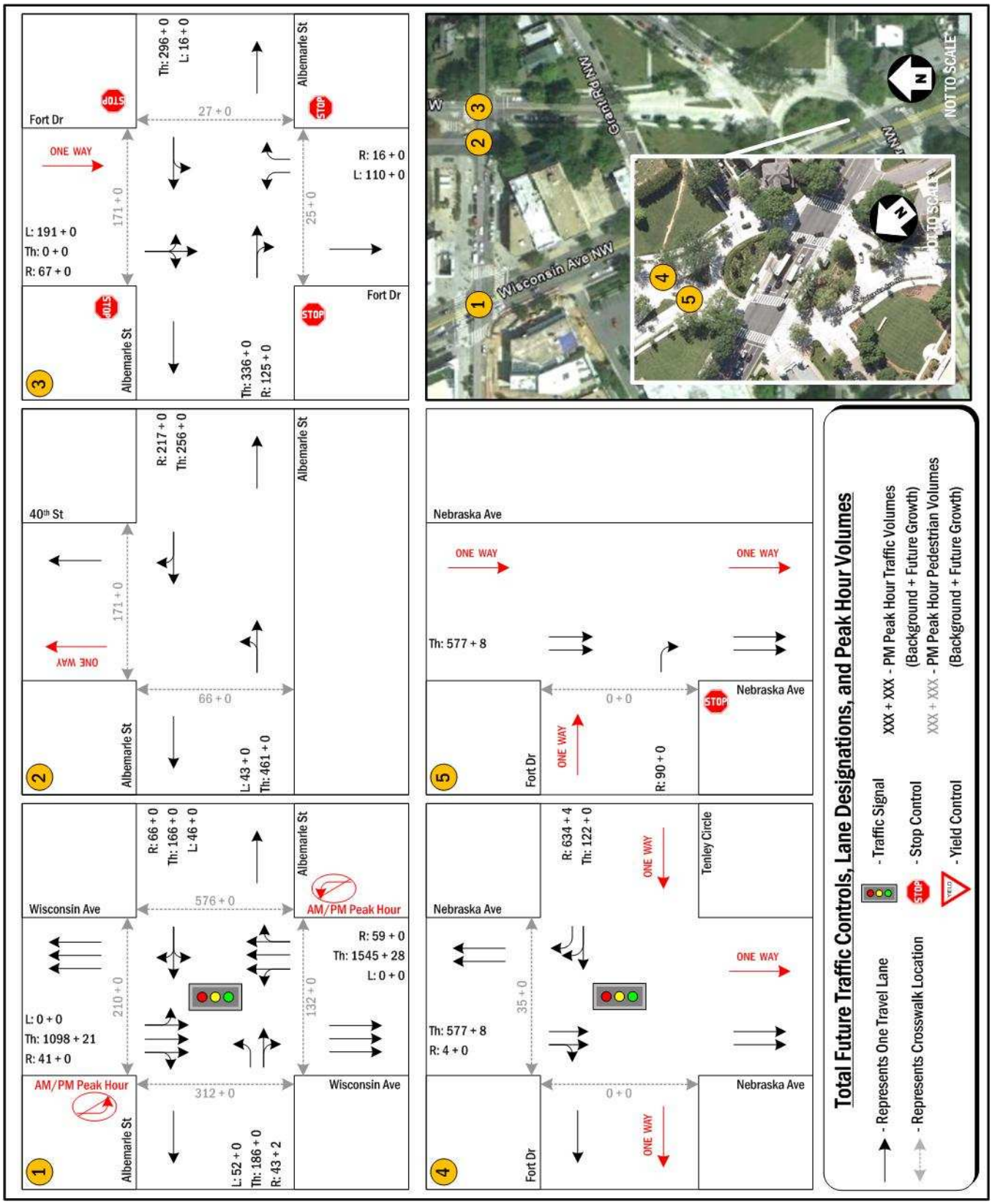

Figure 71: Tenley Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (1 of 5)

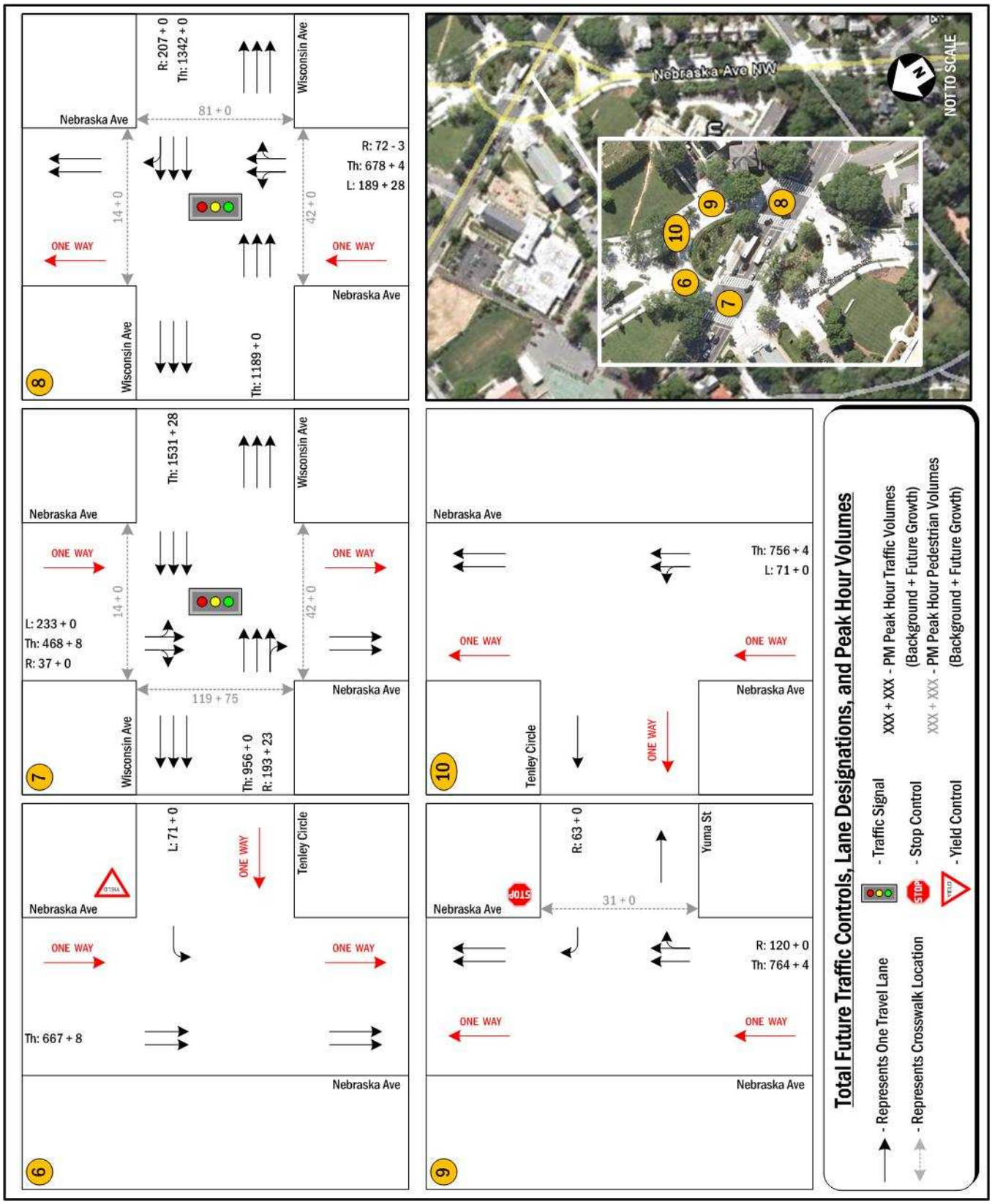

Figure 72: Tenley Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (2 of 5)

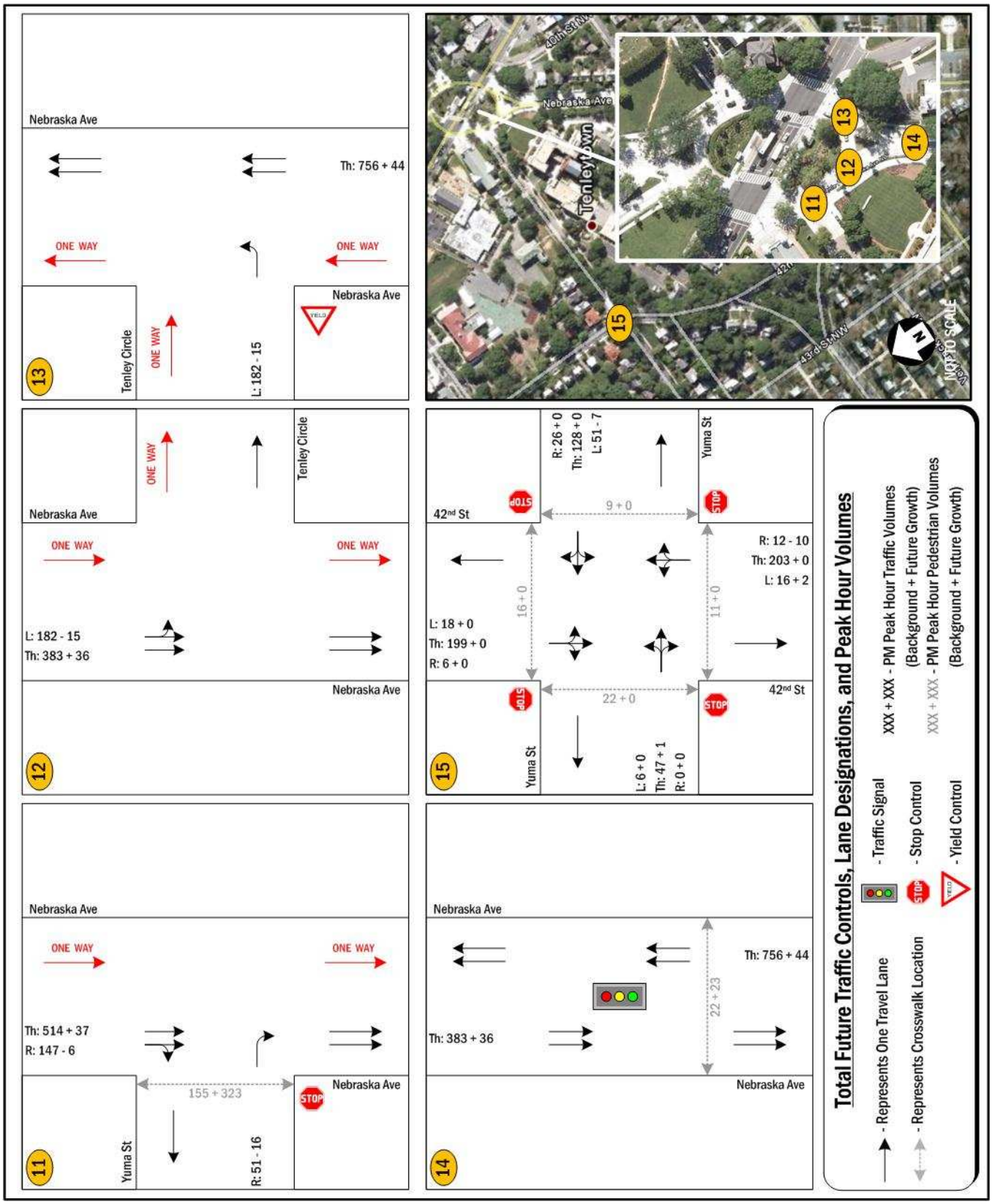

Figure 73: Tenley Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (3 of 5)

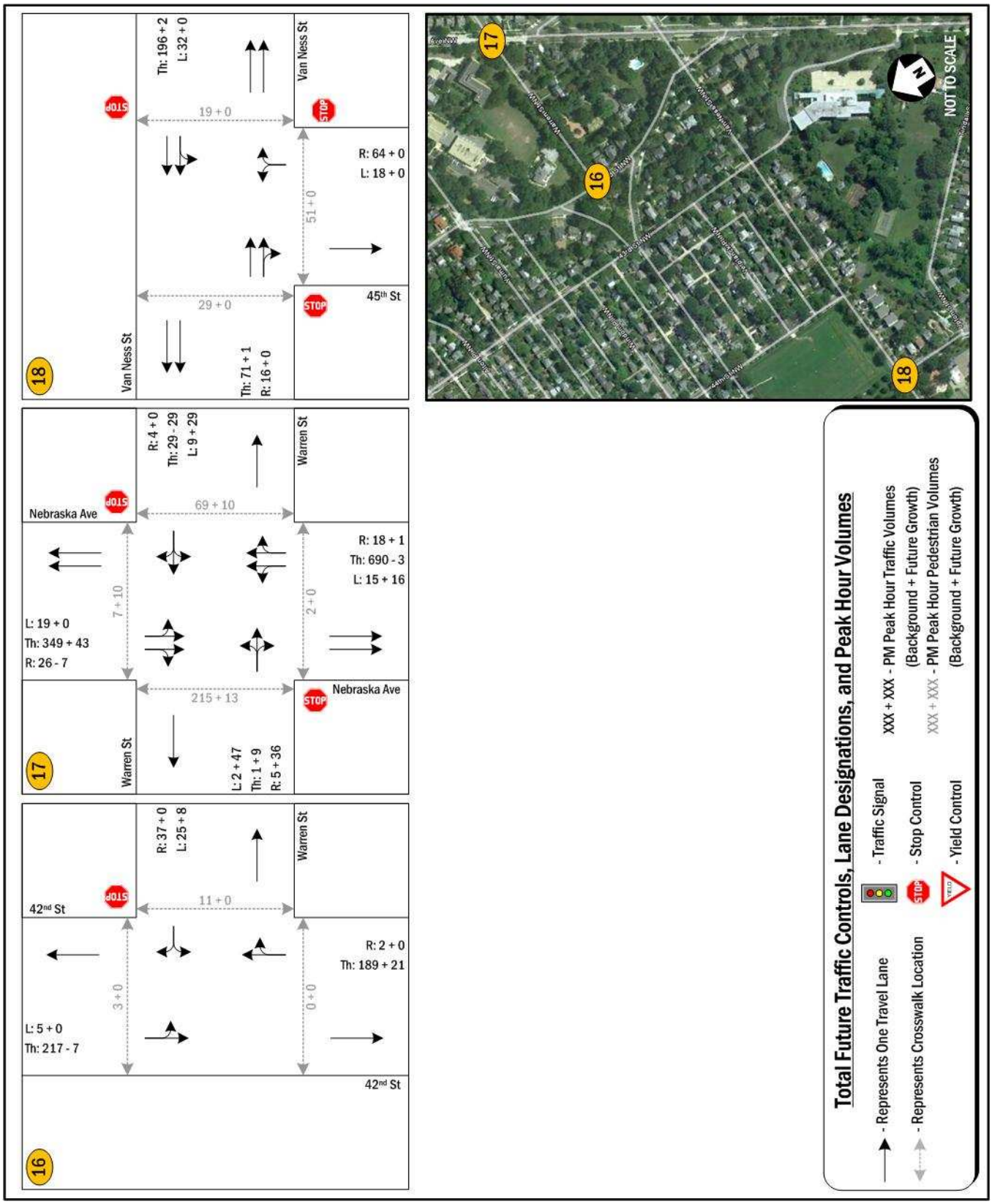

Figure 74: Tenley Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (4 of 5)

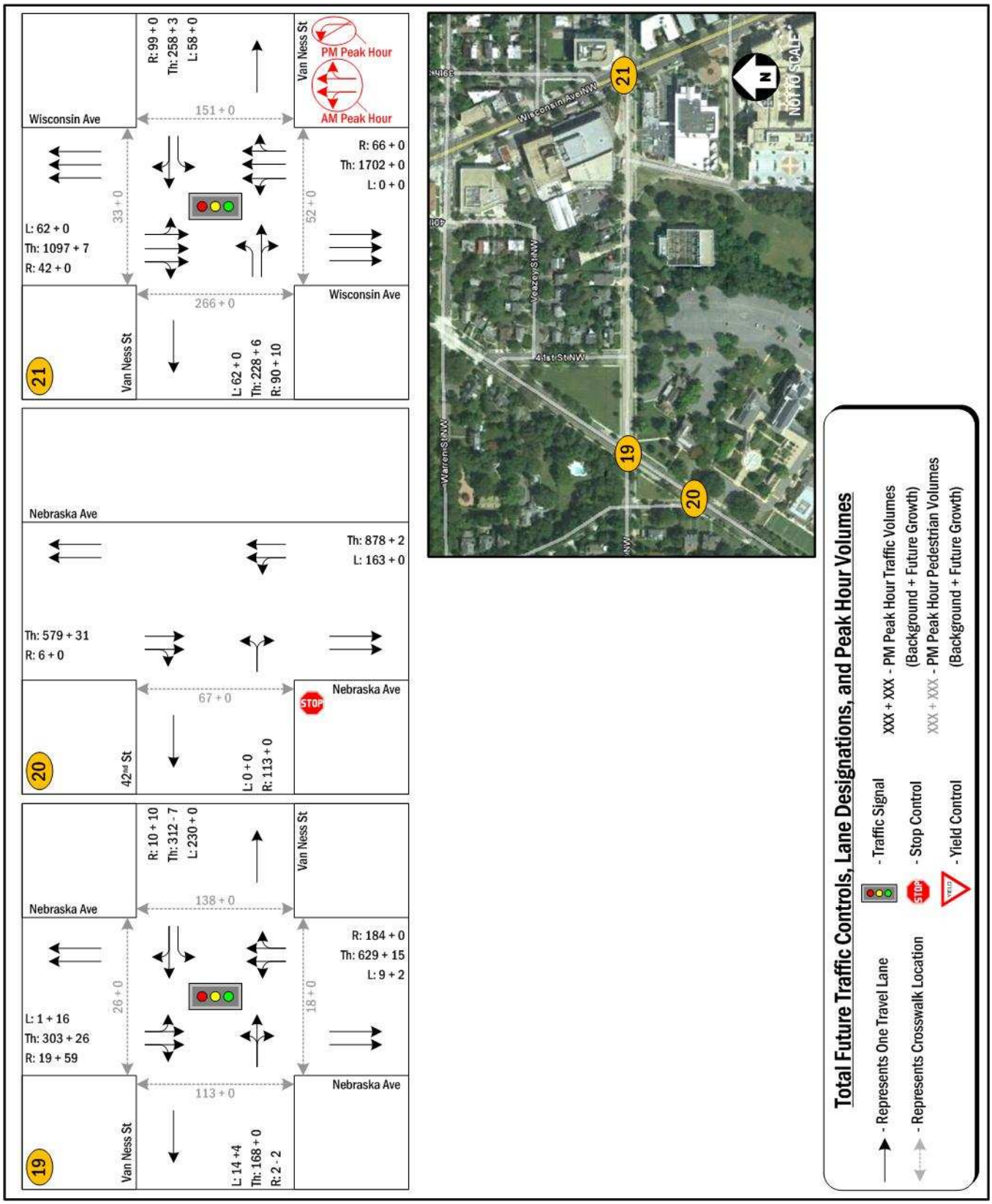

Figure 75: Tenley Campus – Total Future Traffic Controls, Lane Designations, and PM Traffic Volumes (5 of 5)

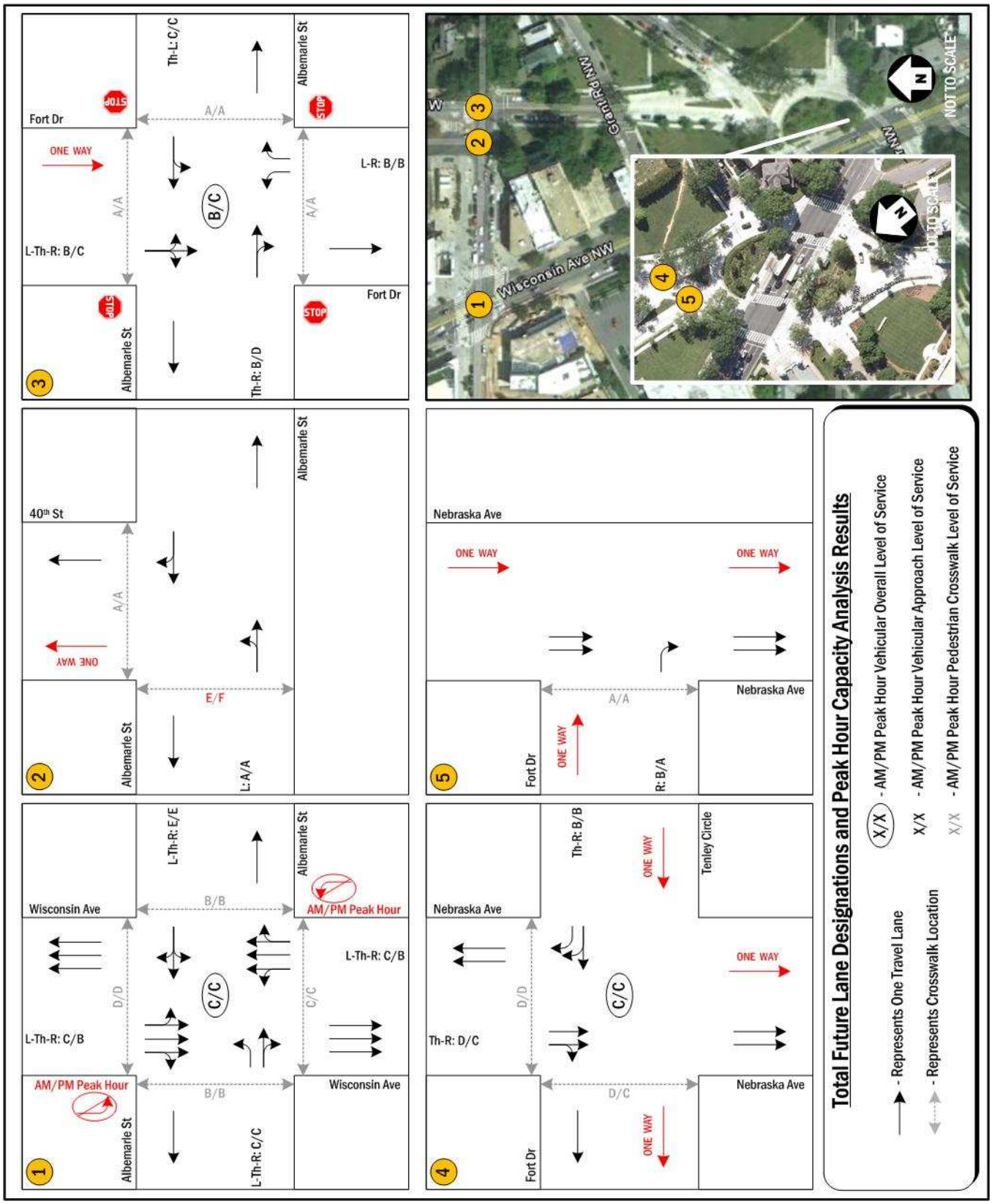

Figure 76: Tenley Campus – Total Future Lane Configurations and Capacity Analysis Results (1 of 5)

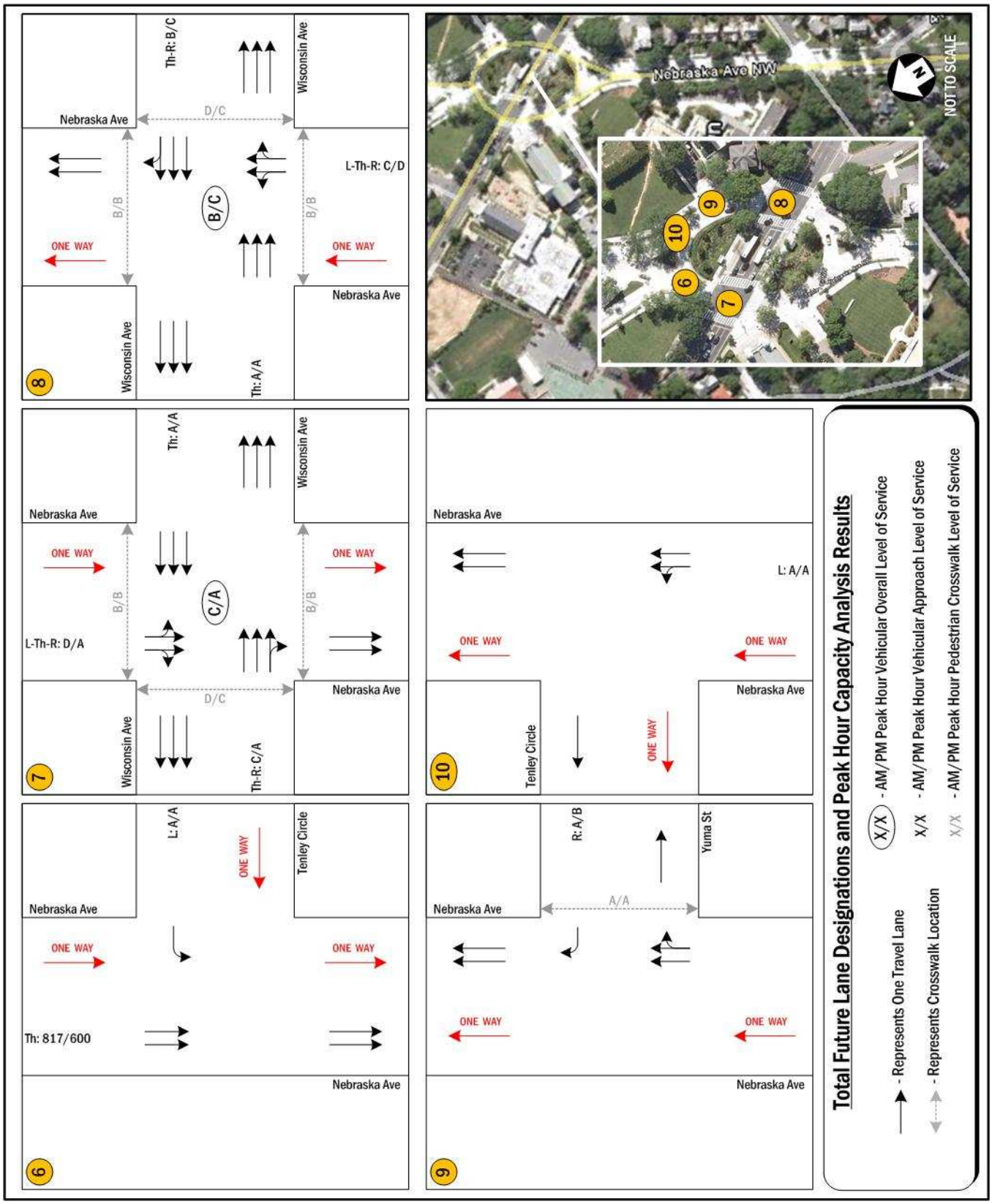

Figure 77: Tenley Campus – Total Future Lane Configurations and Capacity Analysis Results (2 of 5)

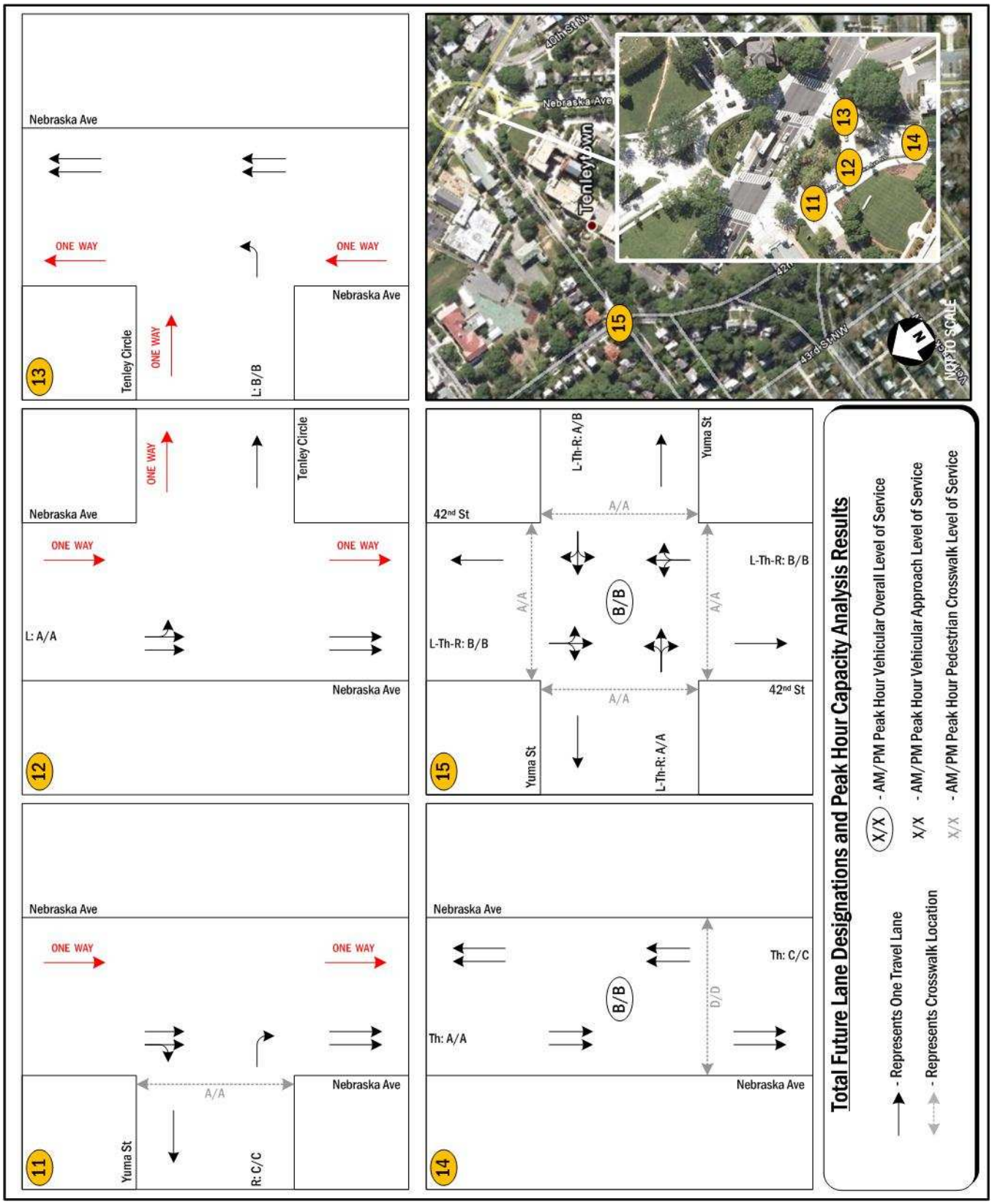

Figure 78: Tenley Campus – Total Future Lane Configurations and Capacity Analysis Results (3 of 5)

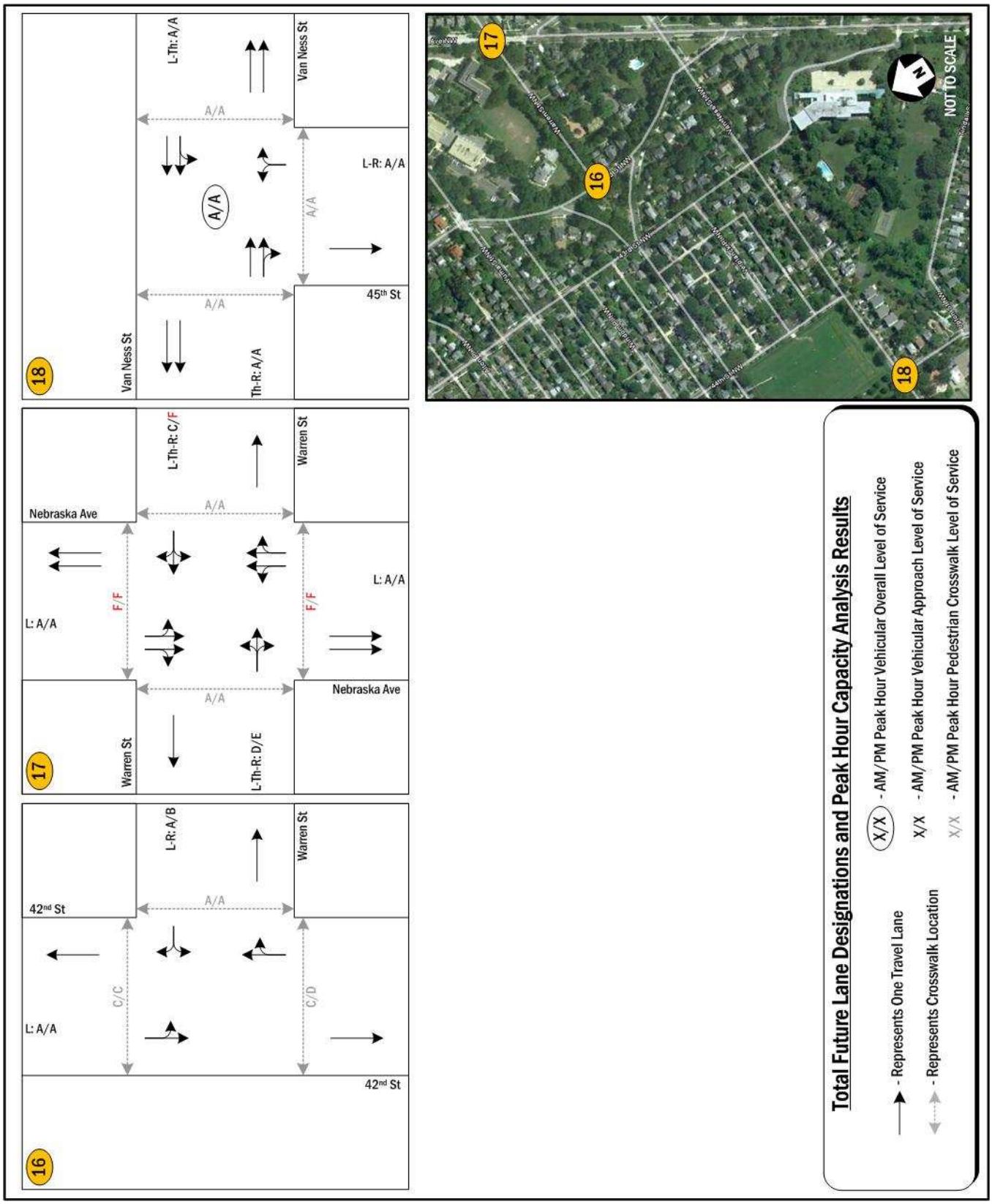

Figure 79: Tenley Campus – Total Future Lane Configurations and Capacity Analysis Results (4 of 5)

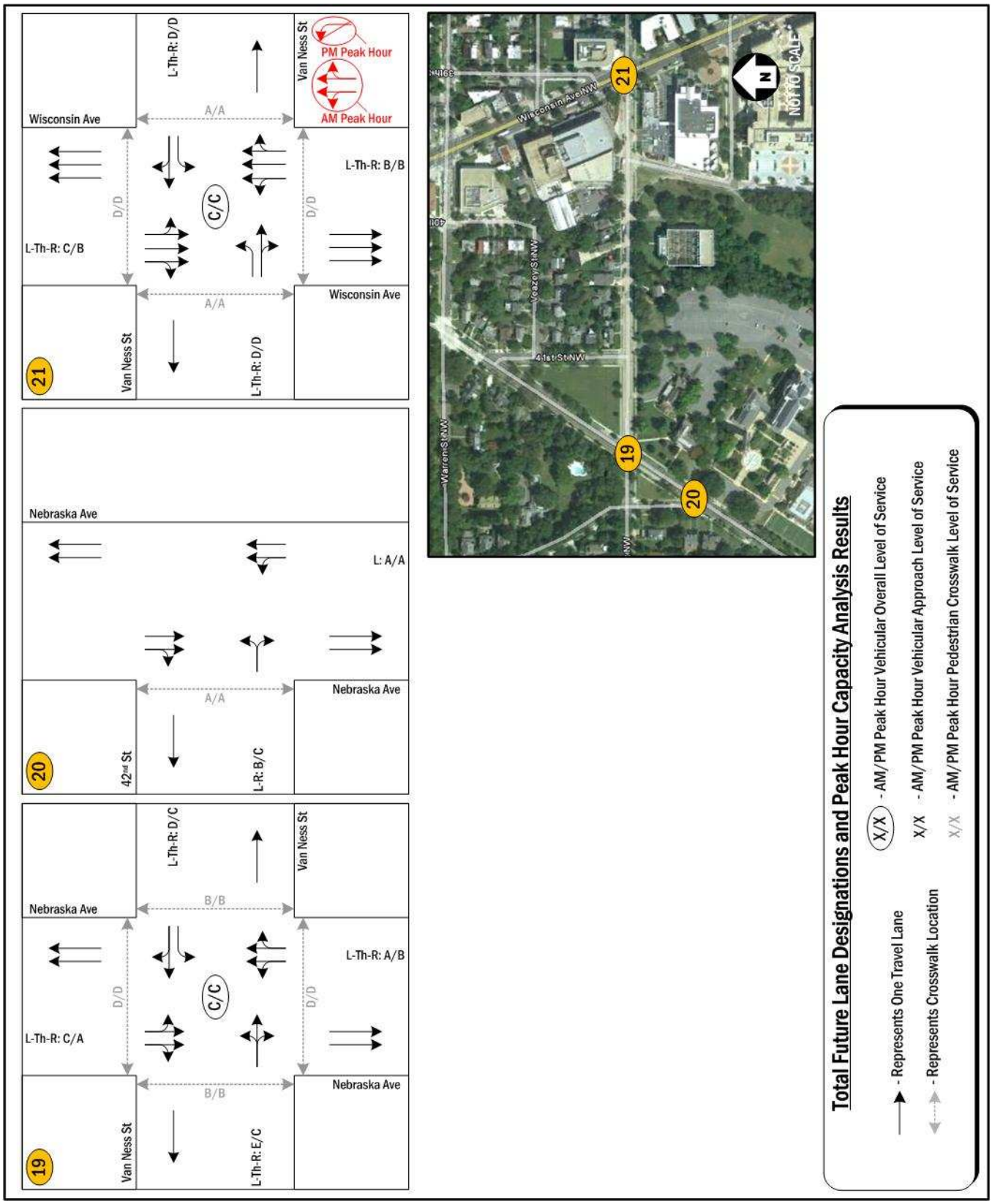

Figure 80: Tenley Campus – Total Future Lane Configurations and Capacity Analysis Results (5 of 5)