TO:	Justin Schreiber Transportation Planner, Mobility Division Mayor's Office of Strategic Planning & Community Development	DATE:	September 2019
FROM:	Keri Pyke, P.E., PTOE, Elizabeth Flanagan, AICP, Casey Uy, Sarah Davis	HSH PROJECT NO.:	16145.02
SUBJECT:	Somerville On-Call: Central Hill Parking Study		

Executive Summary

The City of Somerville's Central Hill Campus is the area bordered by Highland Avenue, the commuter rail tracks, School Street, and Walnut Street and is home to the City Hall, High School, and Public Library. The Campus is currently undergoing several exciting changes, including the reconstruction of the High School and the construction of the Green Line Extension Gilman Station, with the Community Path extension just to the north. The anticipated elimination of a large portion, or even all, of the Central Hill Campus parking lots as part of the Somerville High School reconstruction triggered the need for a comprehensive parking study to assess the impact of the project on the existing and future parking needs of employees, students, and patrons who currently are able to use off-street lots on the Campus, and the impacts to the surrounding neighborhood. The City of Somerville has contracted ***Howard Stein Hudson (HSH)*** to conduct this study and provide recommendations for parking demand management that may include reducing demand for or increasing supply of parking.

Although the construction has provided the impetus for this study, residents have on-going concerns with parking availability. The study area is unique because of the volume of incoming staff and students to the Campus, whose arrival and departure times often coincide with residential departure and arrival times during the work week. In addition, the City Hall, High School, and, to a lesser extent, the Public Library, host frequent evening events and meetings that add pressure to the on- and off-street parking system. Part of this memo addresses the extent to which these perceptions are reality and identifies particular locations where high occupancy is found.

Projections of parking supply during the upcoming phases of construction and the performance of the parking system indicate that parking in the Central Hill area will face new challenges in coming years, specifically during constrained conditions. The focus of this study has been to provide insight into current parking conditions and to analyze the landscape of infrastructure, policy, and program

choices available to the City to ensure that the parking system can continue to function at a high standard and support the City's long-term development and livability goals.

This memorandum contains a detailed technical assessment that is used to guide and inform the parking demand management recommendations. The memorandum includes Appendices that provides additional data and materials related to the technical analysis performed during the study.

Study Area

The Central Hill Campus is characterized by the concentration of public facilities: Somerville City Hall, Somerville High School, and Somerville Public Library. This 16-acre site extends from Highland Avenue to the railroad tracks and from School Street to Walnut Street. The City of Somerville is currently building a new high school and an athletic field which will cover much of the area.

The study area includes a large area, approximately 18-blocks, bordered by Howe Street, Marshall Street, Pearl Street, Walnut Street, Summit Avenue, Vinal Avenue, Summer Street, Avon Street, Central Street, Willoughby Street, Sycamore Street, Richdale Avenue, Thurston Street, Medford Street, and School Street (**Figure 1**). Highland Avenue and Medford Street are characterized by a mix of residential and commercial uses, while the surrounding local streets are predominantly single-family homes and two-story apartments.

The parking study considers on-street parking throughout the study area as well as off-street parking in lots within the Central Hill Campus, which serve the City Hall, High School, and Public Library. A sub-set of the study area was also established as a more manageable area for high frequency counts in the morning when there is turnover in parking from residents to students and staff (**Figure 2**). The "rapid counts" are used to observe changes in occupancy at half hour intervals during times when there is maximum demand in the parking system.

At the time of the occupancy observations, the Somerville High School project was in Phase 1, in which much of the parking in front of the High School has already been removed.

Figure 1. ***Central Hill Campus Parking Study Area***

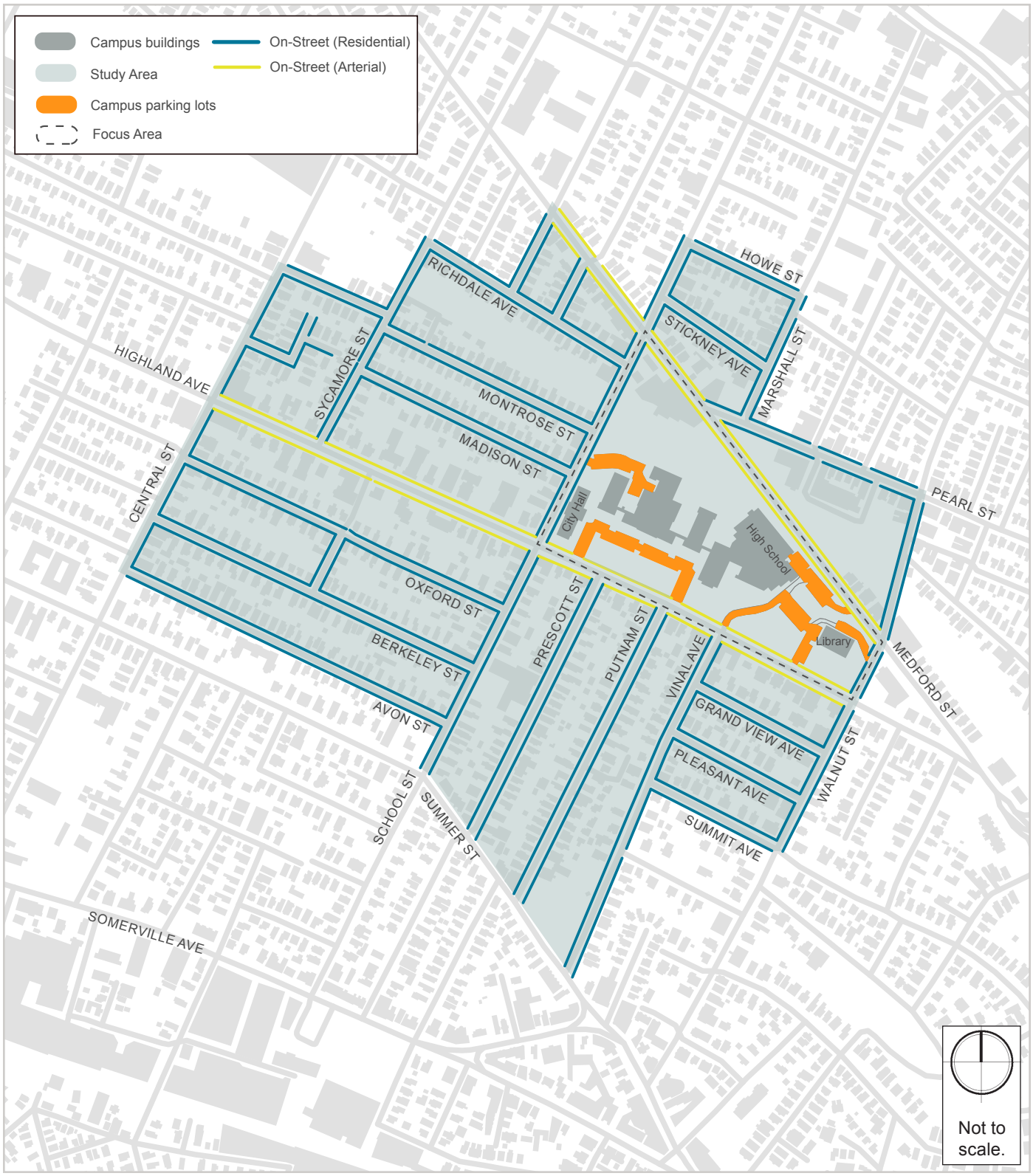
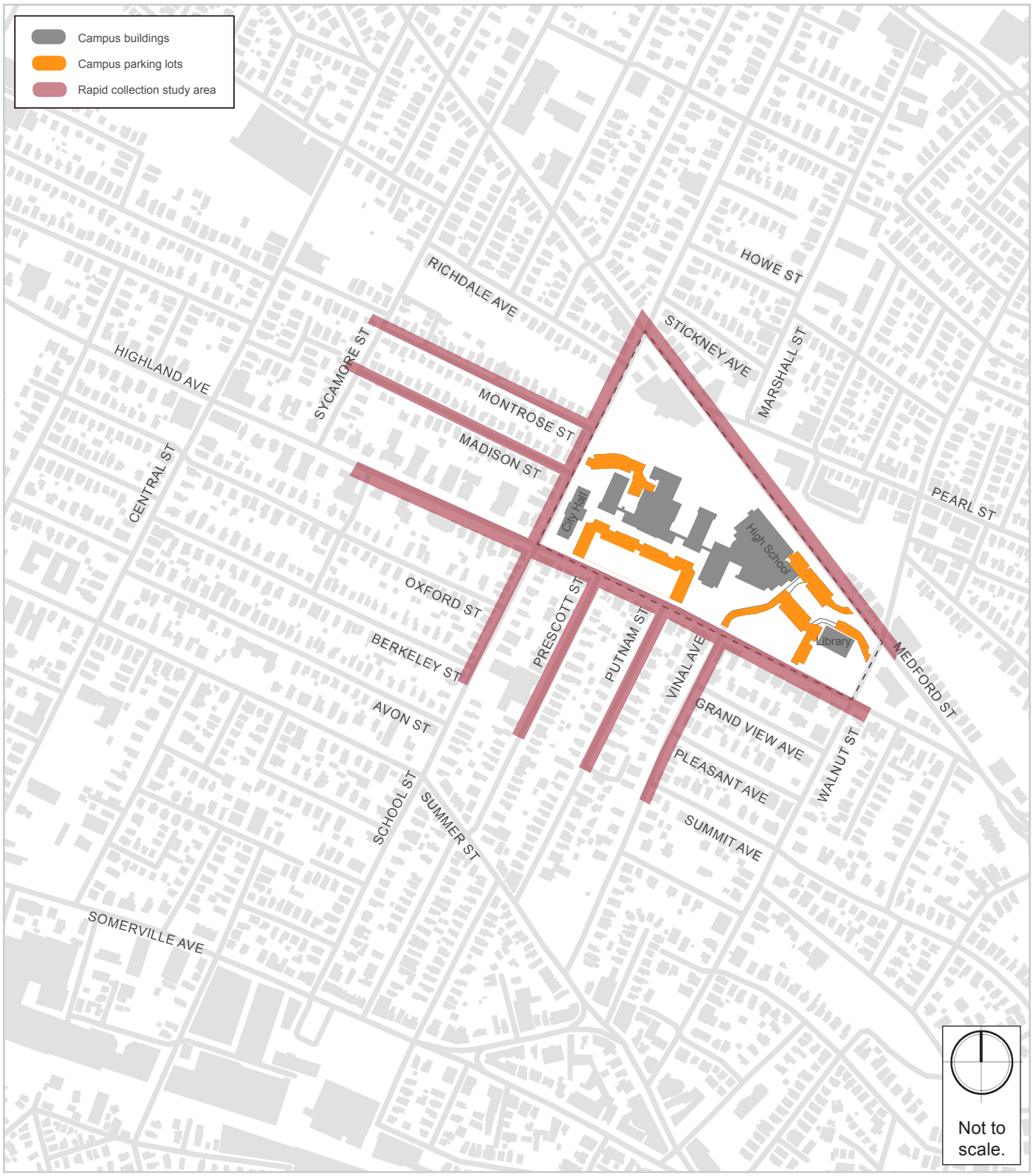


Figure 2. ***Central Hill Campus Rapid Collection Study Area***



Methodology

Parking Supply

Using Google Earth, each segment of available on-street parking was measured, excluding areas regulated as No Parking, Massachusetts Bay Transportation Authority (MBTA) bus stops, driveways, fire hydrants, or other curb space that is not legally available to be considered as on-street parking. 18 feet per vehicle was used as the standard parking space length. For sub-segments with less than 18 consecutive feet available for parking but greater than 15 feet, one vehicle was assumed to be able to park. For sub-segments greater than 18 feet, the parking supply was the length divided by 18 feet, rounded down to the nearest whole number. This set of calculations provides a conservative assessment of existing parking supply.

Parking Occupancy

FULL STUDY AREA

HSH staff collected parking occupancy data, including the permit of each vehicle, throughout the whole study area for three different time periods on the following days:

- Tuesday, May 8, 2018
- Monday, May 14, 2018
- Tuesday, May 15, 2018
- Thursday, May 17, 2018

Morning occupancy data was recorded between the hours of 6:00 a.m.-7:30 a.m.; midday occupancy data was recorded between 9:00 a.m.-12:00 p.m.; and evening occupancy data was recorded between 6:30 p.m.- 8:30 p.m. Counts were not completed during the evening on Tuesday the 15th due to inclement weather.

Additional evening counts were conducted on Tuesday, May 22nd and Thursday, May 24th at 6:30 p.m. to capture occupancy during typical evening events at the Somerville High School (Highlander Awards Night and Evening of Song, respectively). Finally, counts were conducted on Thursday, September 13th at 5 p.m., 6:45 p.m., and 8 p.m. to capture a major evening event that was expected to significantly impact parking demand outside of normal hours.

Data collection consisted of tallying the parking permit types for vehicles parked along each block. Data surveyors were not able to differentiate between vehicles belonging to employees or students who are also residents.

RAPID COLLECTION

Rapid Collection counts were conducted within a truncated study area at half hour intervals to capture the sequence in parking turnover associated with residents leaving for work in the morning, followed by school faculty or city staff arriving for work, and ending with students arriving for school. These counts were conducted at 7:30 a.m., 8:00 a.m., and 8:30 a.m. on the following days:

- Monday, May 14, 2018
- Tuesday, May 15, 2018
- Thursday, May 17, 2018

In addition, rapid collection counts were conducted on two separate evenings to capture the sequence in parking turnover associated with staff and students leaving the Campus area in the evening and residents returning home. These counts were conducted at 5:30 p.m., 6:45 p.m., and 8:00 p.m. on the following days:

- Thursday, May 24, 2018
- Thursday, September 13, 2018

For the Rapid Collection counts, data collection consisted of a tally of the total number of vehicles parked along each block.

Existing Conditions

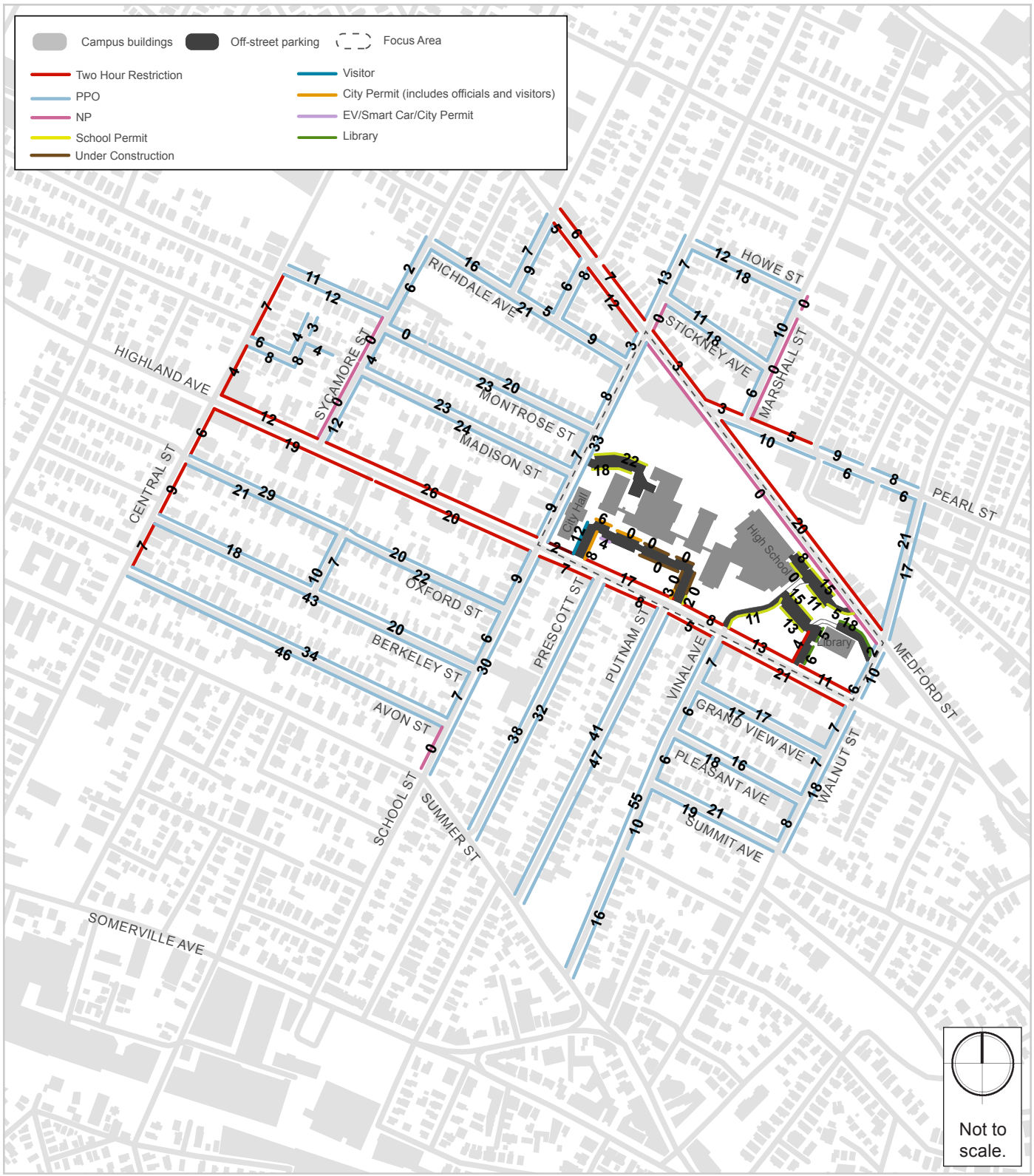
Existing Parking Supply

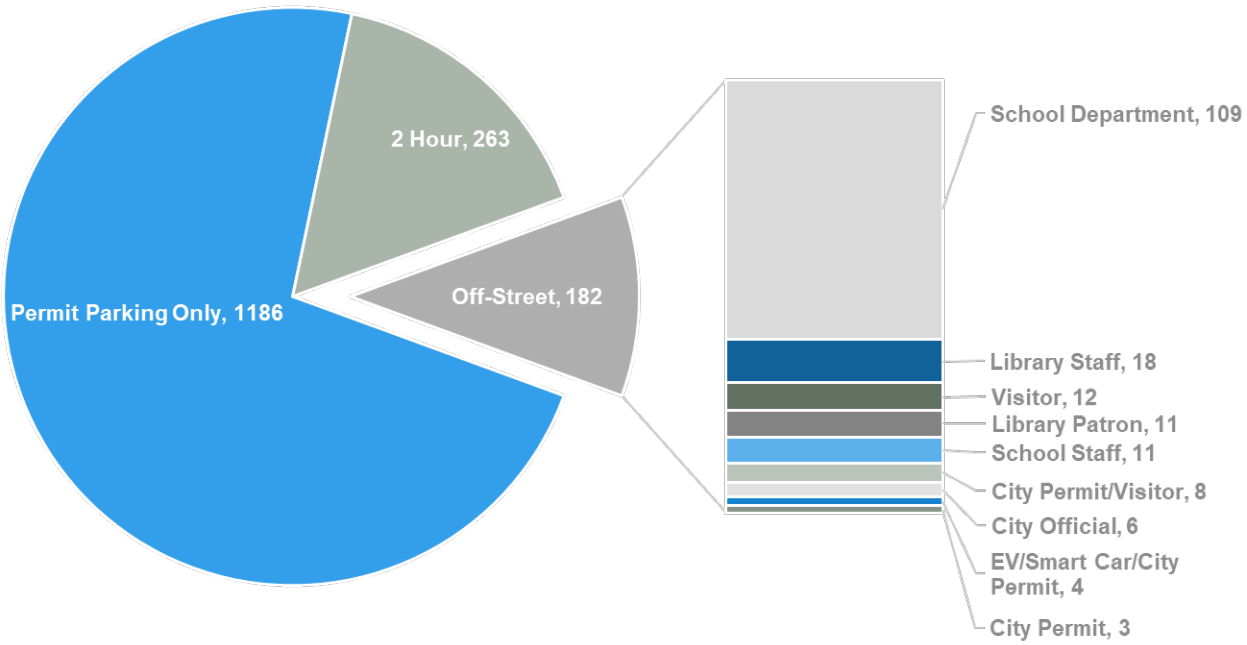
The supply of parking within the designated study area includes 1,449 calculated on-street parking spaces and 182 off-street parking spaces.

PARKING REGULATIONS

Much of the on- and off-street parking provided in the Central Hill study area is subject to time limits or other use restrictions. Most of the parking within the study area is Permit Parking Only (PPO), which is limited to residents with eligible permits issued by the City's Traffic and Parking Department. **Figure 3** shows the existing on-street and off-street parking regulations by location.

Figure 3. ***Existing Parking Supply and Regulations***





Parking supply within the off-street network is reserved for Somerville High School employees and students, Public Library employees and visitors, City of Somerville employees and visitors, and electric vehicles/smart cars. However, during the data collection, many vehicles with residential parking permits were observed in parking lot spaces. Highland Avenue, Medford Street, and Central Street, which are three of the study area's most heavily traveled roadways, have two-hour parking for non-permit holders. **Table 1** lists the variety of parking permits that were observed during on-street data collection.

Table 1. Parking Permits[1]

Permit	Description
Residential parking	Residents of Somerville with personal vehicles; valid City-wide
Visitor Parking	Temporary residential permit for visitors of residents
City Hall Permit Zone 1	Allows on-street parking in the study area west of School Street
City Hall Permit Zone 2	Allows on-street parking in the study area east of School Street
City vehicle	Marked city vehicles (DPW, Police Department, IT, etc.)
High School Permit	On-site parking for students and employees
Public Library	On-site parking for employees
Non-Residential	Allows staff or students to park at certain spots throughout the city as if they are a resident

STREET SWEEPING

In addition to parking restrictions, residents within the study area also must consider street sweeping schedules that run from April 1 to December 31 each year. **Figure 4** shows the three street sweeping zones in the study area[2]. Sweeping occurs between 8 a.m. and 12 p.m. for Zones 1 and 2, impacting both the morning and midday time periods, and between 12 a.m. and 6 a.m. for Zone 3, impacting the morning and the prior evening time periods.

Each street sweeping zone has an impact on the overall supply of the study area (**Table 2**). As shown in **Table 3**, Monday, May 14 was most impacted by street sweeping. During the morning, residents are still leaving for work while employees and students are arriving. On the second and fourth Mondays of the month, vehicles in Zone 2 must be parked on the even side of the street, following the midnight to 6 a.m. regulations in Zone 3. Although the street sweeping restrictions for Zones 1 and 2 remain in effect until noon, overall demand in the study area during the midday period is lower, so the impact of street sweeping on parking is somewhat lessened.

[1] http://www.parksomerville.com/parking-permits.html
[2] https://www.somervillema.gov/departments/dpw-highway/street-sweeping

Figure 4. ***Street Sweeping Zones***

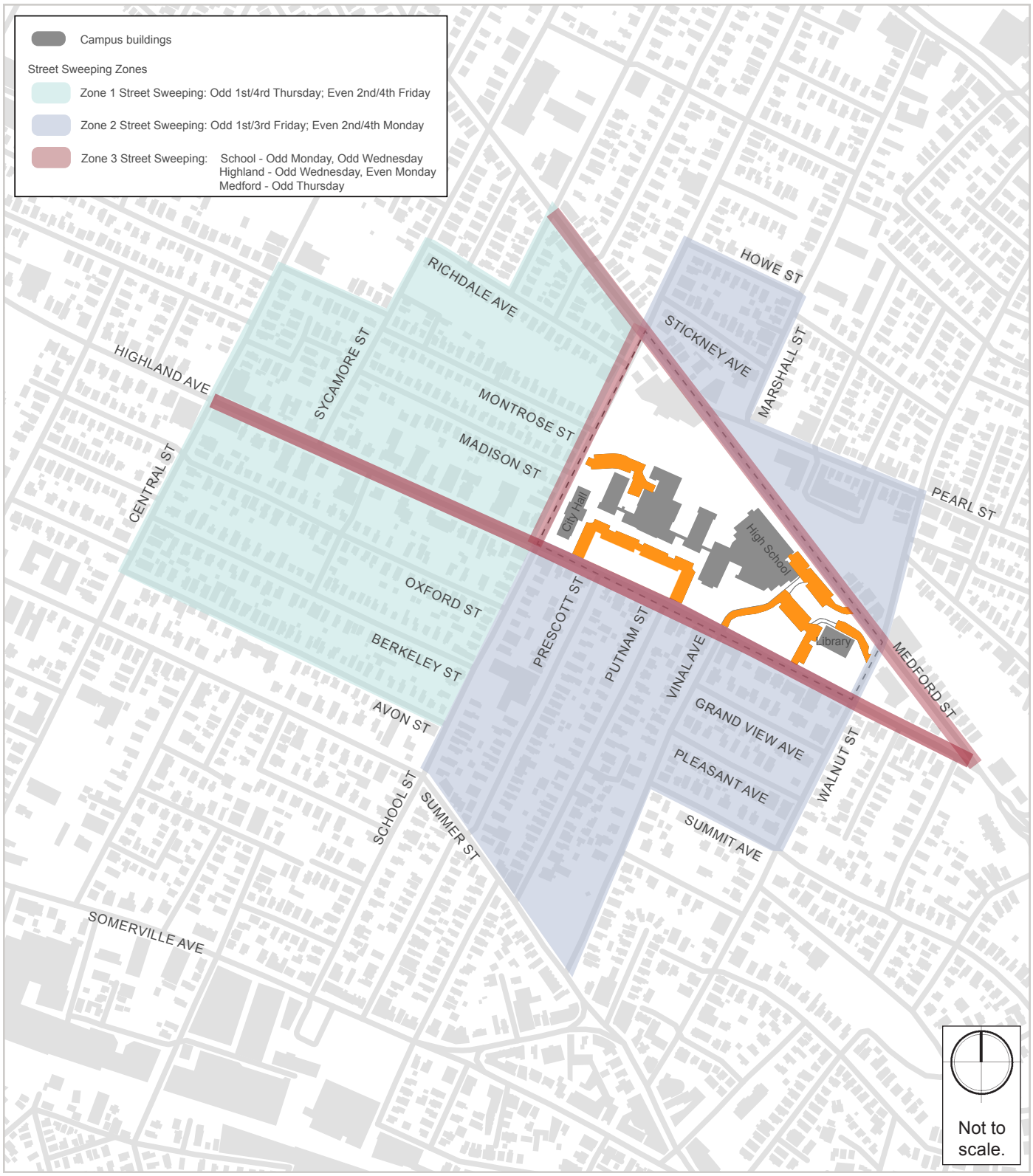


Table 2. Estimated Loss of Supply from Street Sweeping

Street Sweeping Zone	Estimated Loss of Spaces	Effective Time
Zone 1	267	8 a.m. to 12 p.m. Odd 1st and 3rd Thursday; Even 2nd and 4th Friday
Zone 2	316	8 a.m. to 12 p.m. Odd 1st and 3rd Friday; Even 2nd and 4th Monday
Zone 3 – School Street	40	12 a.m. to 6 a.m. Odd Monday; Even Wednesday
Zone 3 – Highland Avenue	85	12 a.m. to 6 a.m. Odd Wednesday; Even Monday
Zone 3 – Medford Street	36	12 a.m. to 6 a.m. Odd Thursday

Table 3. Street Sweeping Zones and Schedule

Data Collection Date	Street Sweeping Zone	Time of Day
Tuesday, May 8, 2018	None	N/A
Monday, May 14, 2018	Zone 2, Zone 3 (School Street, Highland Avenue)	8 a.m. to 12 p.m.; 12 a.m. to 6 a.m.
Tuesday, May 15, 2018	None	N/A
Thursday, May 17, 2018	Zone 1; Zone 3 (Medford Street)	8 a.m. to 12 p.m.; 12 a.m. to 6 a.m.
Tuesday, May 22, 2018	None	N/A
Thursday, May 24, 2018	Zone 3 (Medford Street)	12 a.m. to 6 a.m.

On non-street sweeping days, there is typically available supply. The 2nd and 4th Mondays of the month are most impacted by street sweeping as Zone 3 and 2 (Highland Avenue and School Street) coincide, resulting in the loss of 125 spaces between 12 a.m. and 6 a.m. and then 316 spaces between 8 a.m. and 12 p.m. The Zone 3 regulation ends at 6 a.m., leaving residents a two-hour window in

which to leave for work or move their car before the Zone 2 regulation begins at 8 a.m. Those who are not available or willing to move their vehicle during this window must park in accordance with both regulations on Sunday night.

The 1st and 3rd Thursdays of the month are impacted by the overlap of Zone 1 and Zone 3 (Medford Street) street sweeping schedules, although to a lesser degree than on Mondays. On Thursday mornings, approximately 36 spaces are unavailable between 12 a.m. and 6 a.m. and then 267 spaces from 8 a.m. to 12 p.m. On Zone 1 and Zone 2 street sweeping mornings, there is generally enough supply for parking in the other zone. However, much of this parking supply is not within convenient walking distance for residents of the regulated zone.

Parking Utilization

Three terms used throughout this memo are:

- Occupancy: The number of cars parked in a specified area during a period of observation. Occupancy is often expressed as the percentage of the total physical supply that is occupied by parked cars.
- Practical Capacity: The occupancy level or number of vehicles that can be parked in a facility or area before it becomes difficult for a driver to find a space without having to circle around for parking. Practical capacity is set at 85% occupancy.[3] For on-street parking, this is equivalent to approximately 1 vacant space per blockface.
- Peak Occupancy: The period associated with the highest observed level of occupancy in the study area.

STUDY AREA

Table 4 presents the overall occupancy for the entire study area on May 8, May 14, May 15, May 17, May 22, and May 24, 2018. The table also shows the division between on-street and off-street occupancy levels. Peak occupancy was observed in the morning period on May 14 between 6:00 a.m. to 7:30 a.m. when the study area's parking facilities were approximately 70% occupied (1,142 parked vehicles). Peak occupancy during the midday occurred on May 15 between 9:00 a.m. to 12:00 p.m. when the study area's parking facilities were approximately 66% occupied (1,077 parked vehicles). Lastly, peak occupancy in the evening period was observed on May 22 between 5:30 p.m. to 8:00 p.m. when the study area's supply was approximately 79% occupied (1,288 parked vehicles), which

[3] Donald Shoup, *Cruising for Parking, Pg. 20* (http://shoup.luskin.ucla.edu/wp-content/uploads/sites/2/2015/02/CruisingForParkingAccess.pdf)

coincided with an evening event at the High School. Demand was generally lowest in the midday and highest in the evening. The peak demand conditions for each time of day are used throughout this memo as a base condition for further analysis.

Table 4. Total Occupancy by Data Collection Periods

Space Type & Day	8-May	14-May	15-May	17-May	22-May	24-May
	Tues	Mon	Tues	Thurs	Tues	Thurs
Morning Occupancy						
Percent	68%	70%	66%	66%	-	-
Parked vehicles	1115	1142	1076	1069	N/A	N/A
On-Street	1003	1091	1022	1032	N/A	N/A
Off-Street	112	51	54	37	N/A	N/A
Midday Occupancy						
Percent	66%	64%	66%	61%	-	-
Parked vehicles	1072	1037	1077	998	N/A	N/A
On-Street	901	874	908	830	N/A	N/A
Off-Street	171	163	169	168	N/A	N/A
Evening Occupancy						
Percent	65%	76%	-	72%	79%	68%
Parked vehicles	1067	1239	N/A	1172	1288	1107
On-Street	998	1101	N/A	1069	1150	1007
Off-Street	69	138	N/A	103	138	100

SEGMENTS

While total parking occupancy – off-street and on-street – did not reach or exceed 85% practical occupancy during any of the collection periods, on-street parking occupancy varied widely throughout individual streets. Certain streets had ample parking available throughout the day while others were full in all three time periods. Differences in demand are partially a result of proximity to the Campus or commercial destinations on Highland Avenue or Medford Street. Street sweeping caused drivers to fill certain streets to avoid regulated streets before the regulation began; this condition carried over after the regulation ended as many vehicles are parked for the day. There were several streets that exceeded 100% parking occupancy rate. This was sometimes due to illegal parking such

as parking in front of a fire hydrant, across a crosswalk or driveway, or too close to an intersection, or due to vehicles parking more tightly than assumed in the supply calculations.

Maps of a.m., midday, and p.m. parking occupancy rates for the five collection dates are included in **Appendix A**. Many of the blocks with an occupancy rate of greater than 100% had only one vehicle more than the calculated parking supply. In the parking lots, specifically the areas near the High School back entrances, vehicles were observed parking in undesignated spaces, presumably for loading/unloading, maintenance, or other operational needs. The peak occupancy was mainly found to be during the evening counts (5:30 p.m. to 8:00 p.m.); May 15th was an exception; the highest parking occupancy rate was found to be true for midday (9:00 a.m. to 12:00 p.m.). **Figure 5, Figure 6,** and **Figure 7** show the peak occupancy condition for each time of day.

Figure 5. ***Peak a.m. Occupancy (Monday, May 14, 2018)***

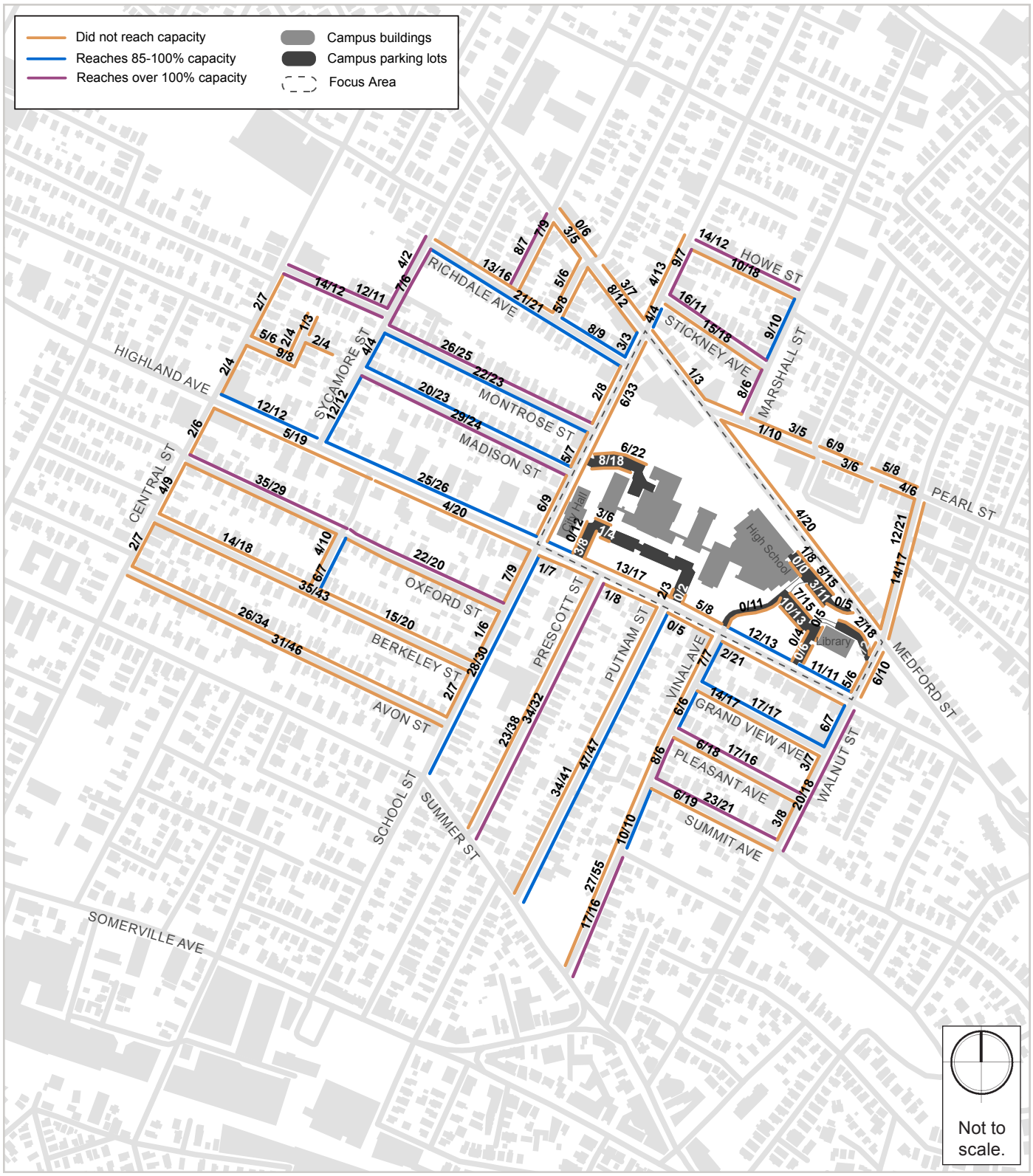


Figure 6. ***Peak Midday Occupancy (Tuesday, May 15, 2018)***

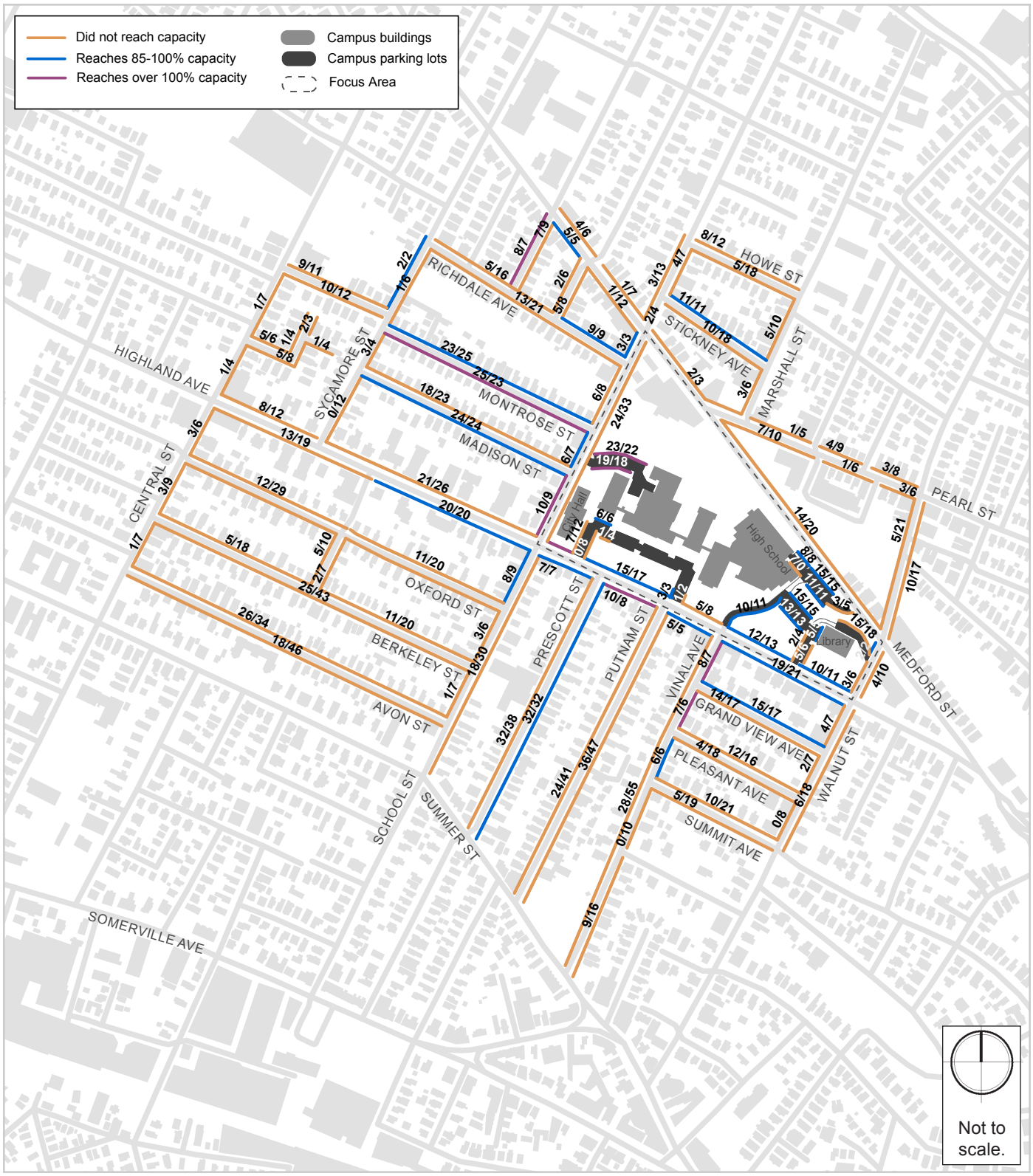
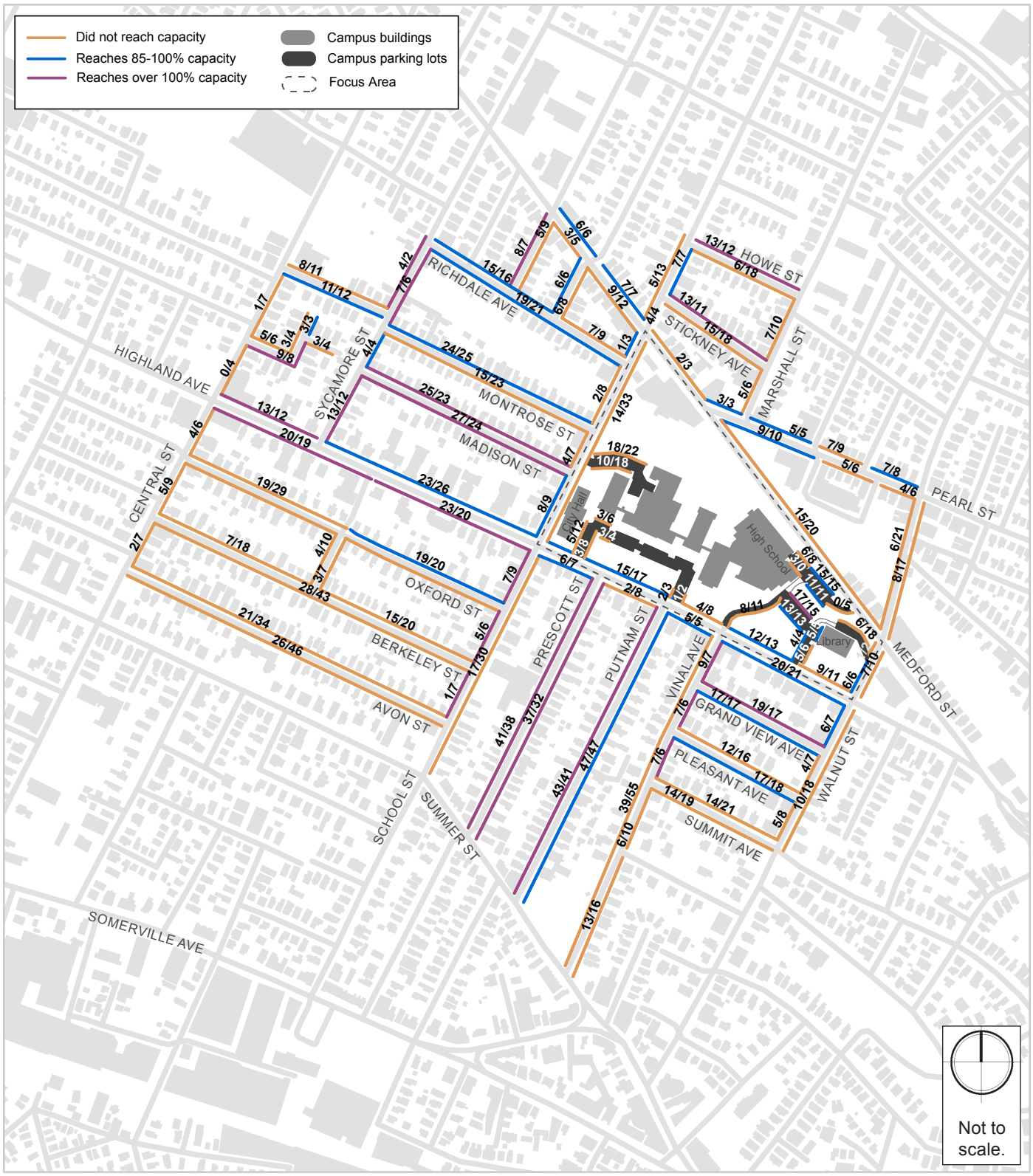


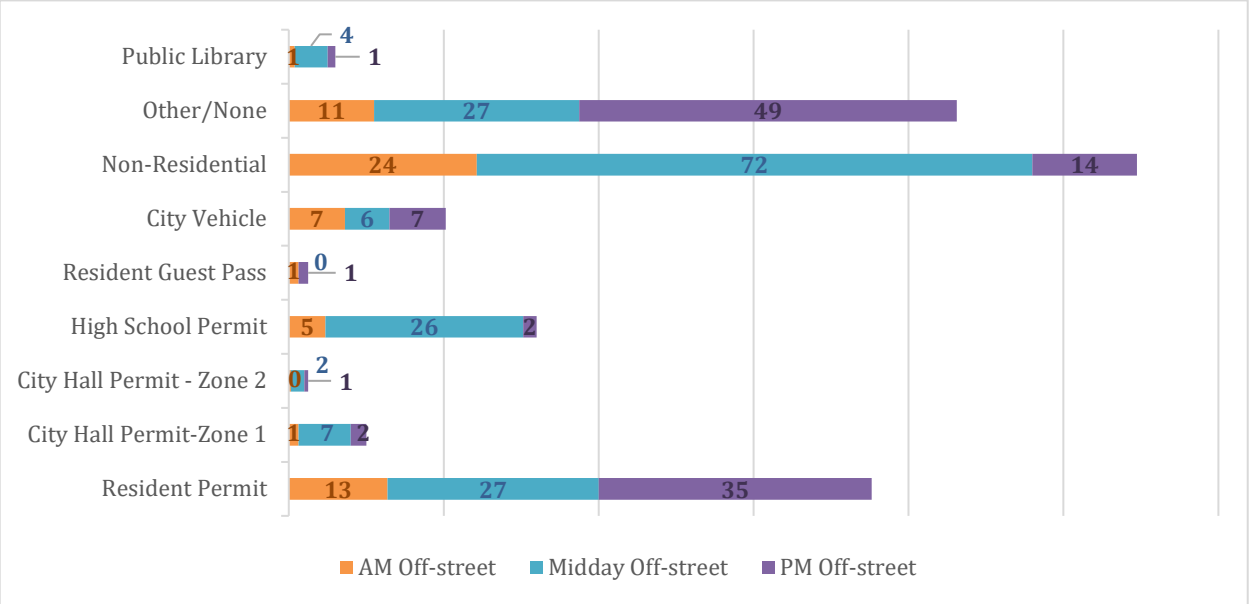
Figure 7. ***Peak p.m. Occupancy (Tuesday, May 22, 2018)***



PERMIT TYPE

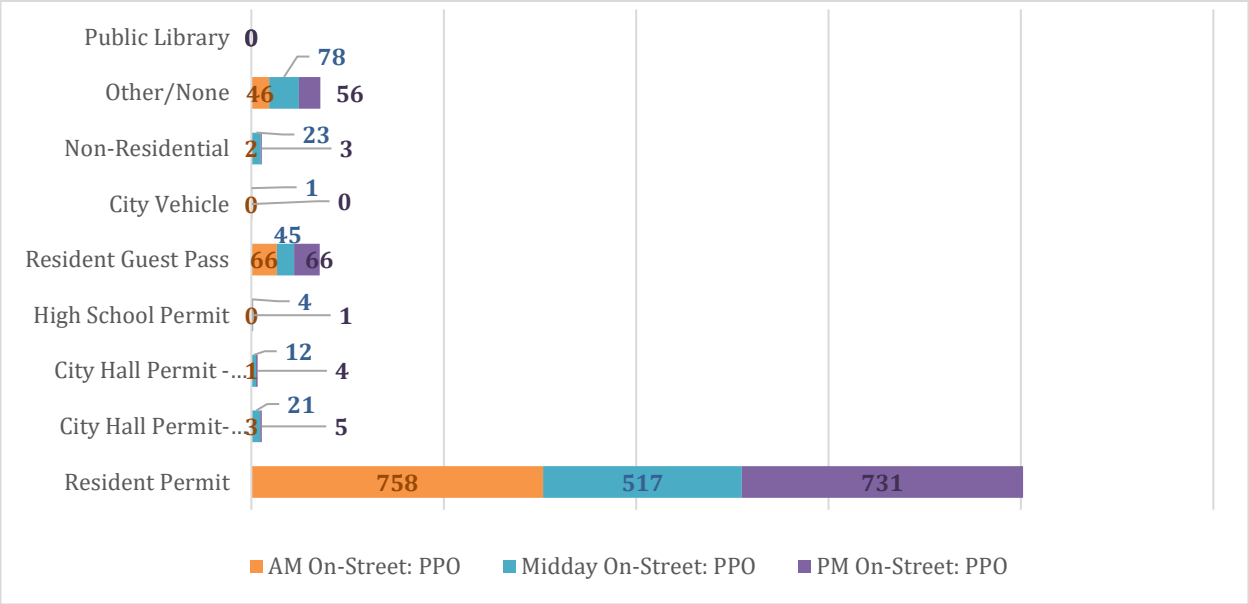
Parking in the study area falls within three main categories: on-street permit parking; on-street two-hour parking; and off-street parking. The permits observed within each of these categories shifted throughout the day. **Table 5, Table 6, and Table 7** illustrate the type and number of permits used in each category.

Table 5. Average Demand by Permit: Off-street Parking



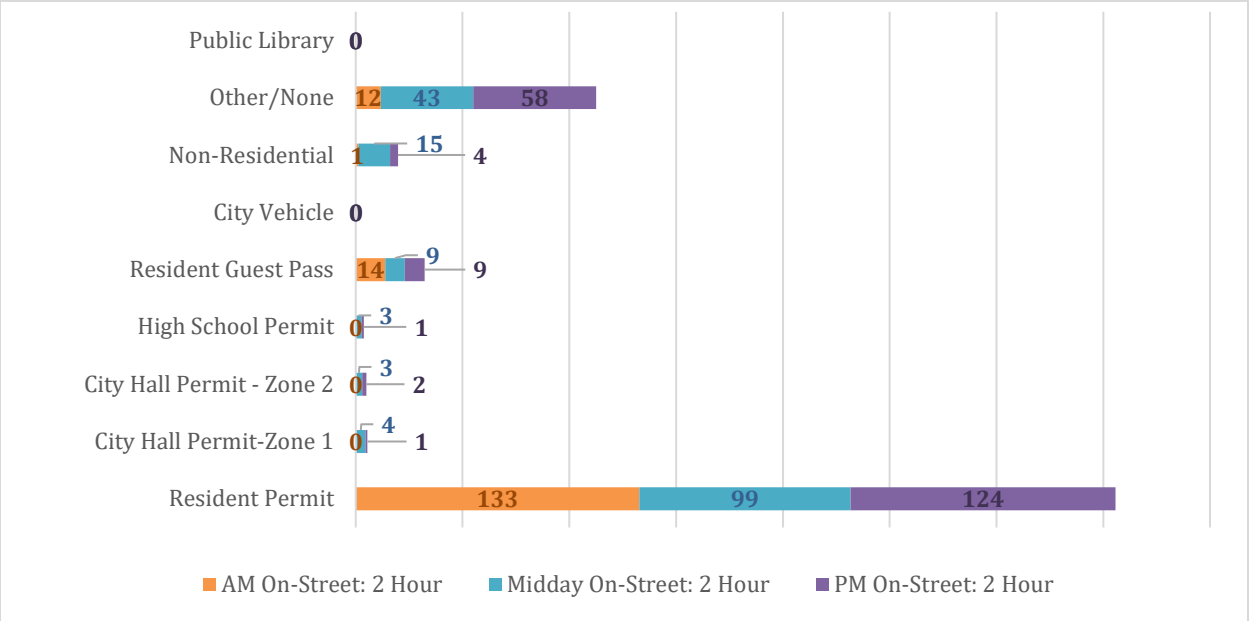
Off-street parking is characterized by lowest occupancy in the morning and highest occupancy in the midday period when Campus buildings are in use. The non-residential permit sticker used by City Hall and the High School was observed most frequently, followed by vehicles with no permit, likely visitors, and resident permit stickers. During the evening, the non-residential sticker was not observed as frequently, while resident permits and other/no permits were observed more frequently than at other times of day. This may be due to staff and students leaving the Campus and being replaced by those parking to use the Campus for meetings, events, or the library.

Table 6. Average Demand by Permit: On-street Resident Permit Parking



Streets regulated as residential permit parking were predominantly occupied by vehicles with residential stickers. Resident parking was observed to be highest during the morning observation period and lowest in the midday period, reflecting residents taking their vehicles to work. Resident guest pass usage was evenly distributed throughout the day, as were vehicles with Other/No permit. Some of the vehicles without a permit were observed to be commercial vehicles making deliveries or parked in front of homes where renovations or other work was being conducted.

Table 7. Average Demand by Permit: On-street Two-hour/Resident Permit Parking

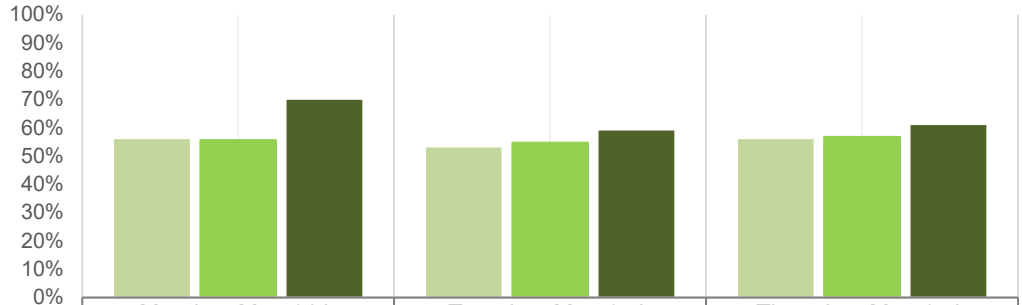


Highland Avenue, Medford Street, and Central Street are regulated as two-hour parking unless with the use of a residential permit. Around 20% of the total two-hour supply was used by non-residents with Other/No permit, while over 40% of the supply throughout the day was used by those with a residential permit sticker. Small numbers of High School permits, City Hall permits, and non-residential permits were observed.

Rapid Collection

The morning rapid collection periods did not see a significant increase in occupancy between 7:30 a.m. to 8:00 a.m.; however, from 8:00 a.m. to 8:30 a.m., all days saw at least a 4% increase from 8:00 a.m. occupancy. This increase can be explained by City, School, and Library employees arriving in the study area and residents leaving the area to commute outside for employment (**Table 8**). Turnover is at its highest between 8:00 a.m. and 8:30 a.m.

Table 8. Rapid Collection: Change in Occupancy (a.m.)



	Monday, May 14th	Tuesday, May 15th	Thursday, May 17th
7:30 a.m.	56%	53%	56%
8:00 a.m.	56%	55%	57%
8:30 a.m.	70%	59%	61%

May 14, 2018, had highest variability in morning turnover relative to the two other days that were measured. There was a total of 332 vehicles at the start of the rapid collection count and then 330 vehicles at 8:00 a.m., showing a 0.6% decrease. The percentage of vehicles that were counted 30 minutes later increased to 415 vehicles, showing a 25% increase. May 15 and May 17, 2018, showed similar change in parking turnover from 7:30 a.m. and 8:00 a.m. **Figure 8, Figure 9,** and **Figure 10** show the occupancy on segments in the rapid collection study area throughout the morning on May 14, 2018.

Figure 8. ***Morning Turnover - Rapid Collection (7:30 a.m. Monday, May 14, 2018)***

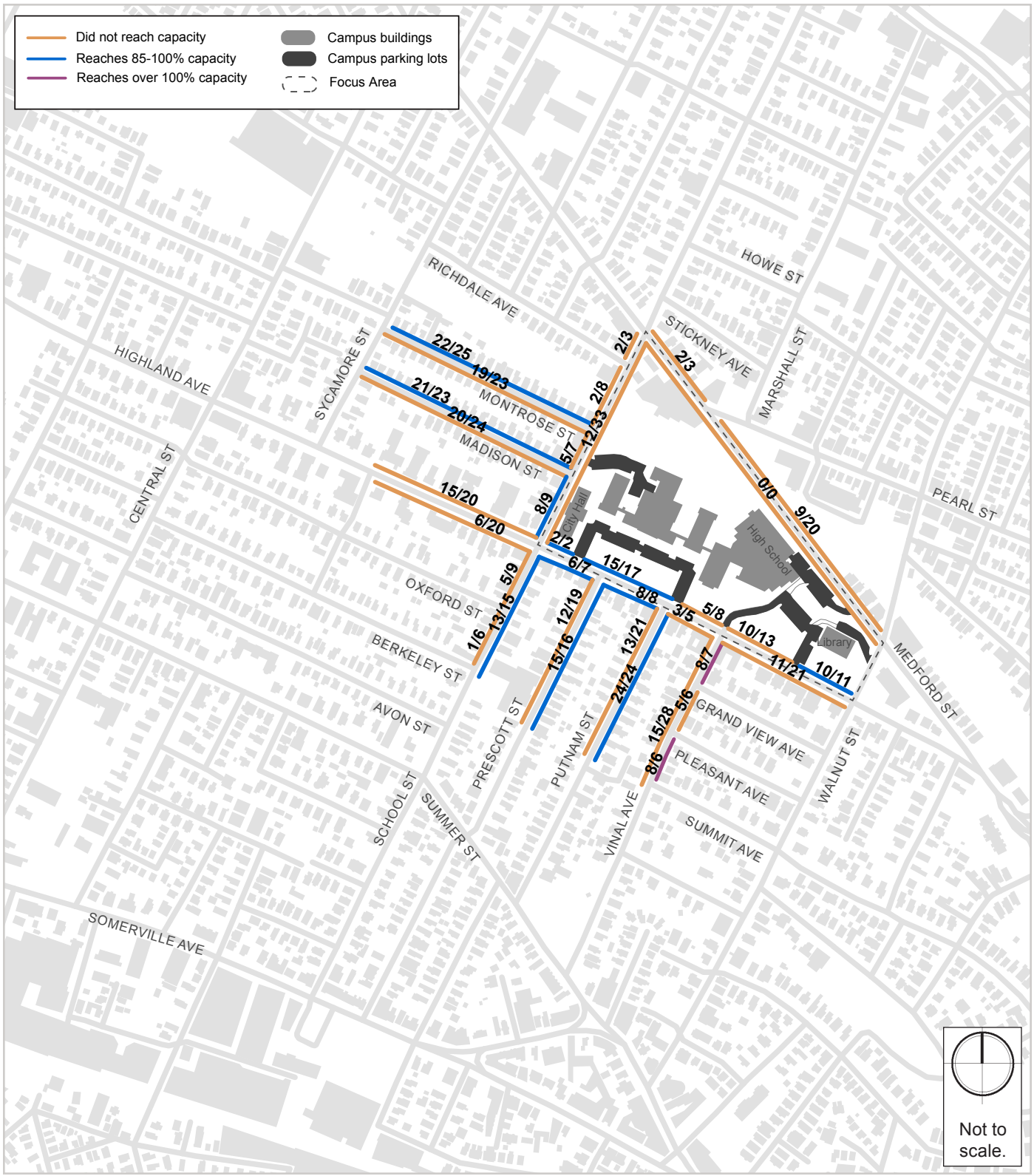


Figure 9. ***Morning Turnover - Rapid Collection (8:00 a.m. Monday, May 14, 2018)***

Figure 10. ***Morning Turnover – Rapid Collection (8:30 a.m. Monday, May 14, 2018)***

SPECIAL EVENTS

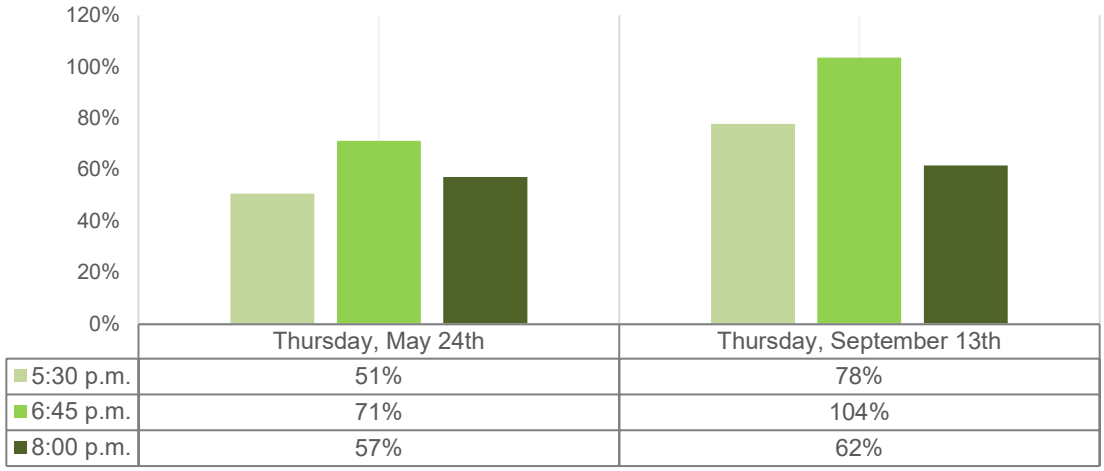
Three evening events were observed:

- Tuesday, May 22. 2018
  - Highland Awards Night
  - Full study area, 6:30 p.m.
- Thursday, May 24, 2018
  - Evening of Song
  - Full study area, 6:30 p.m.
  - Rapid Collection area, 5:30 p.m. and 8:00 p.m.
- Thursday, September 13, 2018
  - Somerville High School Parents' Night
  - Rapid Collection area, 5:00 p.m., 6:45 p.m., and 8:00 p.m.

The events on May 22 and 24 are considered "typical" events commonly held in the evenings at the High School. September 13 captures a "major" event where demand for parking is expected to far exceed normal conditions.

As with the morning turnover, there is added demand in the evening as people leave the Campus area after work or school and residents arrive home. This situation is exacerbated when there are evening events (**Table 9**). During a typical event such as the one on May 24 however, overall occupancy in the rapid collection study area is just over 70%. The High School Parents' Night, a major event, led to occupancy of over 100% in the rapid collection study area. Parents' Night at the High School was specifically referenced as a challenge for parking by community members; this perception was upheld by the field observations.

Table 9. Rapid Collection: Change in Occupancy (p.m. event)



	Thursday, May 24th	Thursday, September 13th
5:30 p.m.	51%	78%
6:45 p.m.	71%	104%
8:00 p.m.	57%	62%

Snow Emergency

This study considers the impact of a snow emergency on parking supply. A snow emergency was declared on March 4, 2019. Data for the full study area was collected on the second and third days following the snow emergency to observe the extent to which remaining snow reduced parking supply; March 6 and 7, 2019, respectively.

On the second day following the snow emergency, a total of 150 spaces were unavailable due to snow, or 10% of total supply. The loss of spaces was evenly distributed, with most streets losing fewer than four on-street spaces (**Figure 11**). The Campus parking lots were not observed to have any reduction in capacity. On the third day following the snow emergency, the number of unavailable spaces decreased to 125, or 9% of total supply (**Figure 12**). In the Campus parking lots, one space was observed to be unavailable due to snow, although none were recorded the day before. This may have occurred if a vehicle parked on low snow on March 6, 2019, and on March 7,2019, the space was empty, appearing unavailable due to snow.

During both days, the total number of vehicles parked on-street in the study area was lower than the average during the midday; it is possible this difference is due to lower demand on the observed days or a result of fluidity between the study area and adjacent streets. **Table 10** compares the average midday occupancy in the study area to the snow emergency days; despite a decrease in supply, a comparable decrease in demand resulted in stable occupancy rates.

Figure 11. ***Snow Emergency Occupancy - Wednesday, March 6, 2019 (midday)***

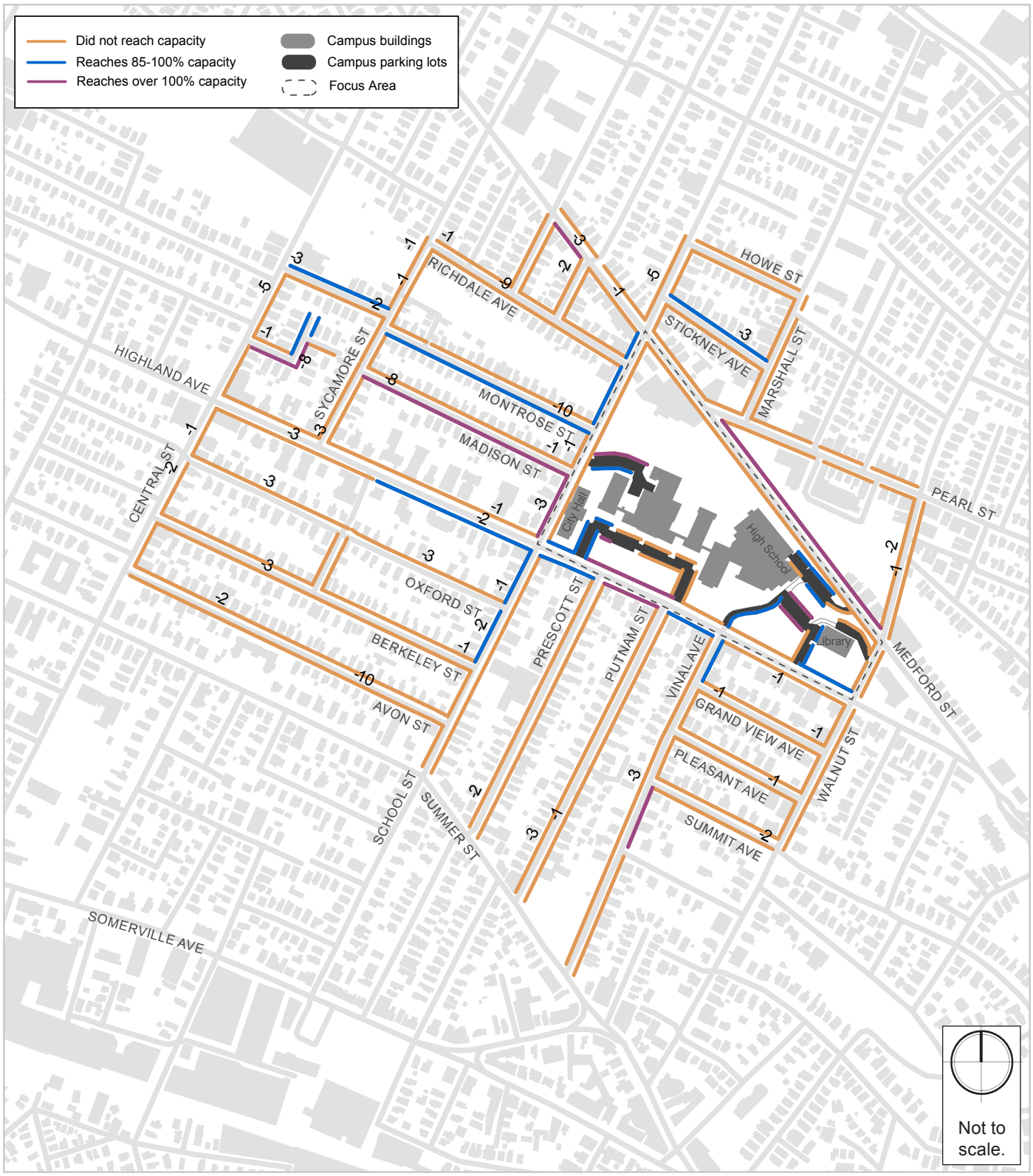


Figure 12. ***Snow Emergency Occupancy - Thursday, March 7, 2019 (midday)***

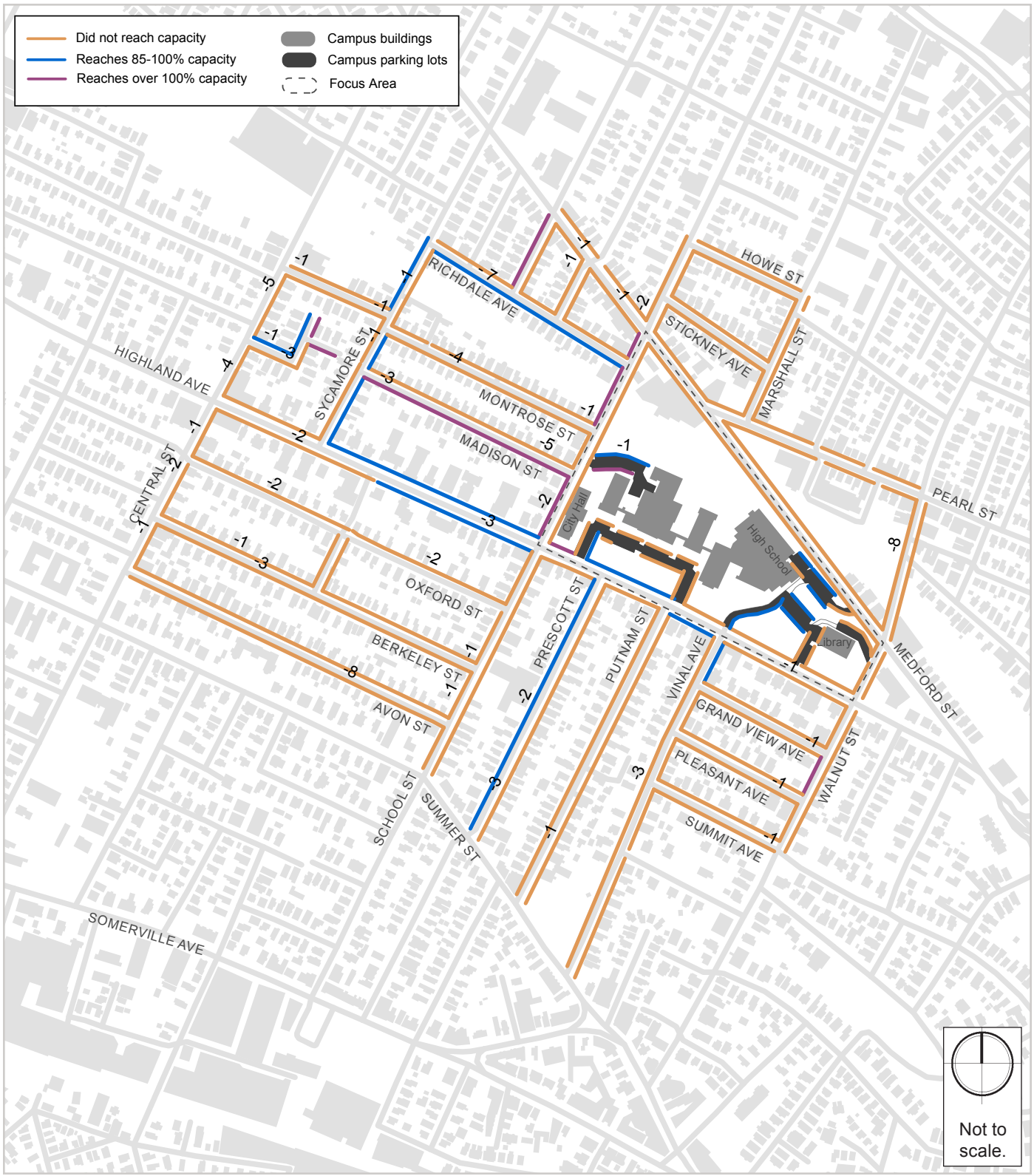


Table 10. Impact of Snow Emergency on Supply and Occupancy (Midday)

Snow Emergency – Impact on Occupancy				
	On-Street Vehicles/Supply	**On-Street % Occupancy**	**Off-Street Vehicles/Supply**	**Off-Street % Occupancy**
Average Midday (May 8, 12, 14, and 15, 2018)	878/1449	61%	168/182	92%
Snow Emergency (March 6, 2019)	790/1299	61%	179/182	98%
Snow Emergency (March 7, 2019)	779/1324	59%	156/181	86%

Future Parking Supply and Demand

Future Supply

HSH's analysis considers the impact of the Somerville High School Renovations throughout the three phases of the project. At the time of the occupancy counts taken for this study, the project was already in Phase 1, with a large portion of the parking in the shared City Hall and High School lot already removed. It is assumed that vehicles whose drivers would normally have parked in this lot have dispersed between the remaining parking lots and into the on-street parking network.

Phase 2A **(Figure 13, Figure 14, and Figure 15)** will see the removal of 93 spaces in lots on the eastern side of Campus. During this phase, only the 18 spaces directly behind the library used for Library Staff will remain on the eastern side of the Campus.

Renovations during Phase 2 on the High School will allow students currently using modular units in front of the School to move back into the main building, thus opening 13 spaces in the parking lot closed in Phase 1. Some relief to off- and on-street parking is expected at this time as no additional spaces are removed. Specific analysis of Phase 2 is not shown here as the focus of the study is on the most conservative scenarios.

During Phase 3 **(Figure 16, Figure 17, and Figure 18)** of the reconstruction, a total of 48 parking spaces in the shared City Hall/High School parking lot (45 for City Hall, 3 for the High School), 12 spaces in the lot in front of the High School main entrance, the original 18 spaces behind the library,

and five spaces on the lower level behind the High School adjacent to Medford Street will remain. The parking lot off School Street will be removed completely.

Using the peak occupancy scenario for each time of day (May 14, 2018, for the morning, May 15, 2018, for midday, and May 22, 2018, for the evening), Phases 2A and 3 were simulated by shifting observed demand in areas of parking that will be removed to other lots or into the on-street network. Existing regulations were considered; since most users in the lots have non-resident permits, which allow parking in the school district off-street spaces or in on-street permit areas, observed demand was shifted to remaining school department lots first and then onto the on-street network. No parking was shifted to two-hour regulated streets or special permit areas, such as City Staff parking or EV charging stations. Available space in parking lots was filled to 100% occupancy, but each block of on-street parking was only filled to practical occupancy, or 85%. At this level of occupancy, there would still be spaces available, minimizing time that people need to spend searching for a free space. While vehicles shifted to the on-street network were not added in excess of 85%, some segments exceeded 85% in the initial observations; these segments were not changed.

Overall, total parking supply will decrease from 245 off-street spaces (pre-condition to this study) down to 83 spaces. The reallocation of parking required to accommodate Phase 3 is shown in the figures below using the peak occupancy scenario for each time of day and building off the reallocation from Phase 2. Reallocated parking does not exceed 85% occupancy (practical occupancy).

Figure 13. ***Parking Reallocation – Phase 2A a.m. (Monday, May 14, 2018 base)***

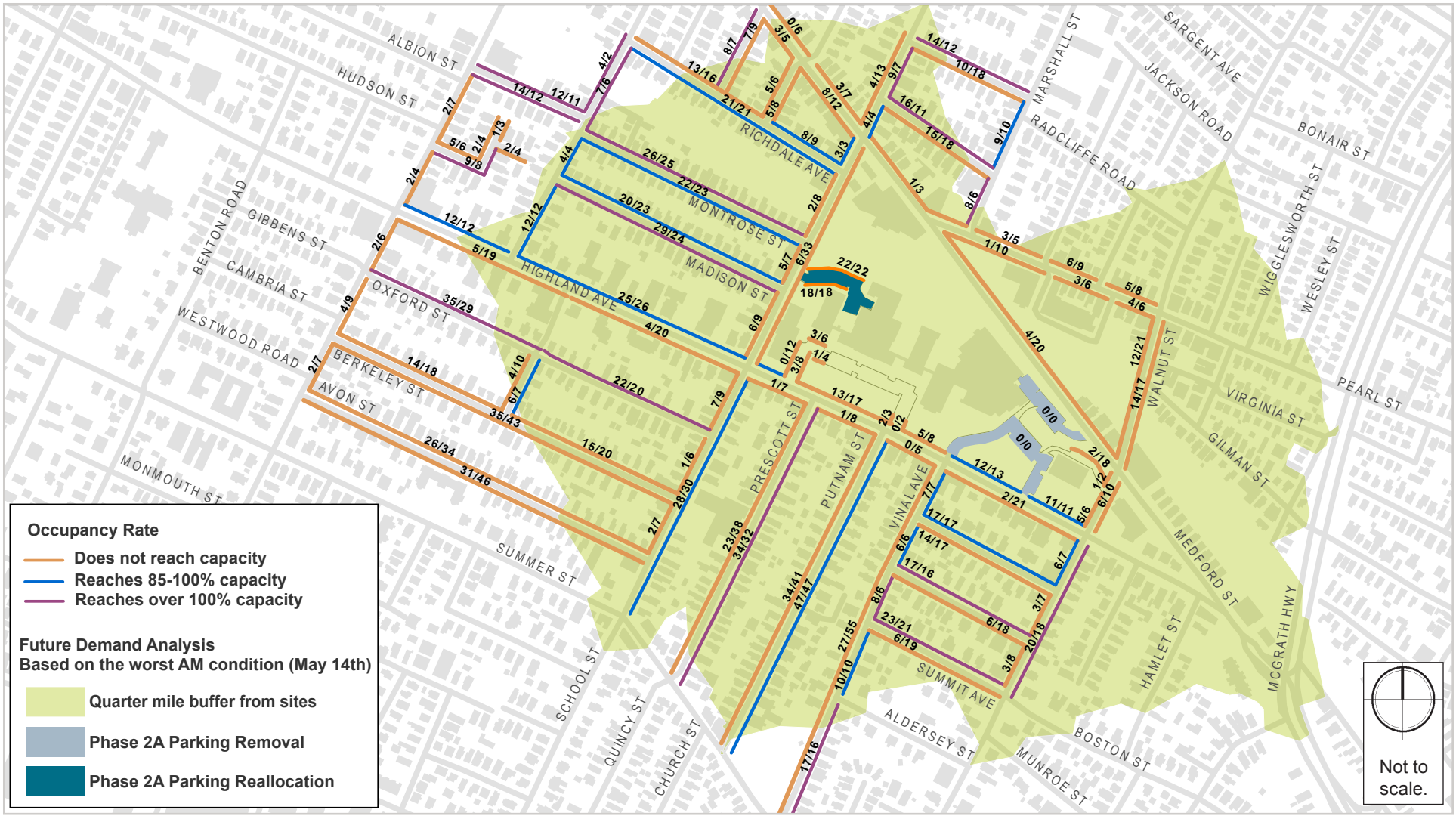


Figure 14. ***Parking Reallocation – Phase 2A Midday (Tuesday, May 15, 2018 base)***

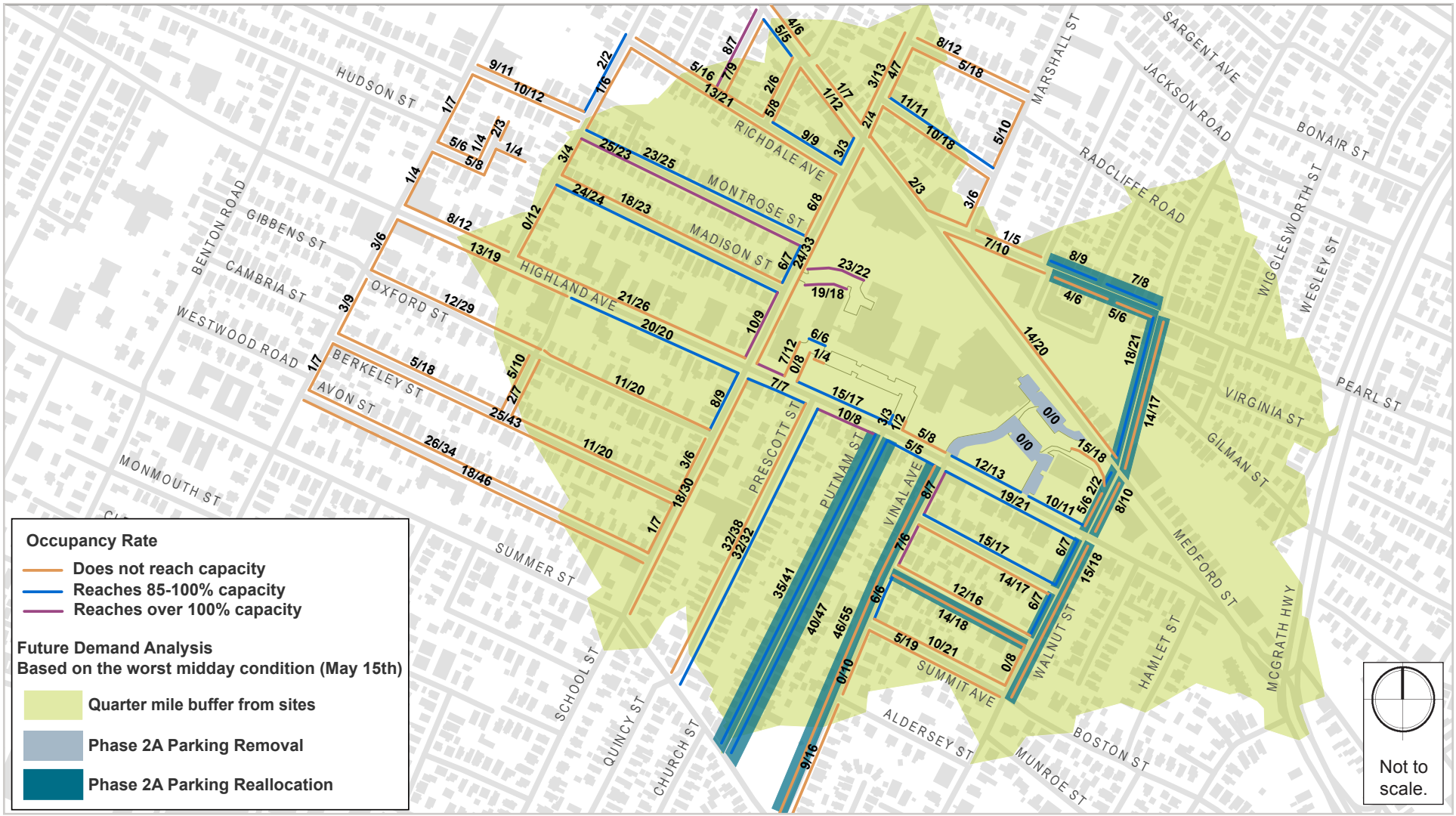


Figure 15. ***Parking Reallocation – Phase 2A p.m. (Tuesday, May 22, 2018 base)***

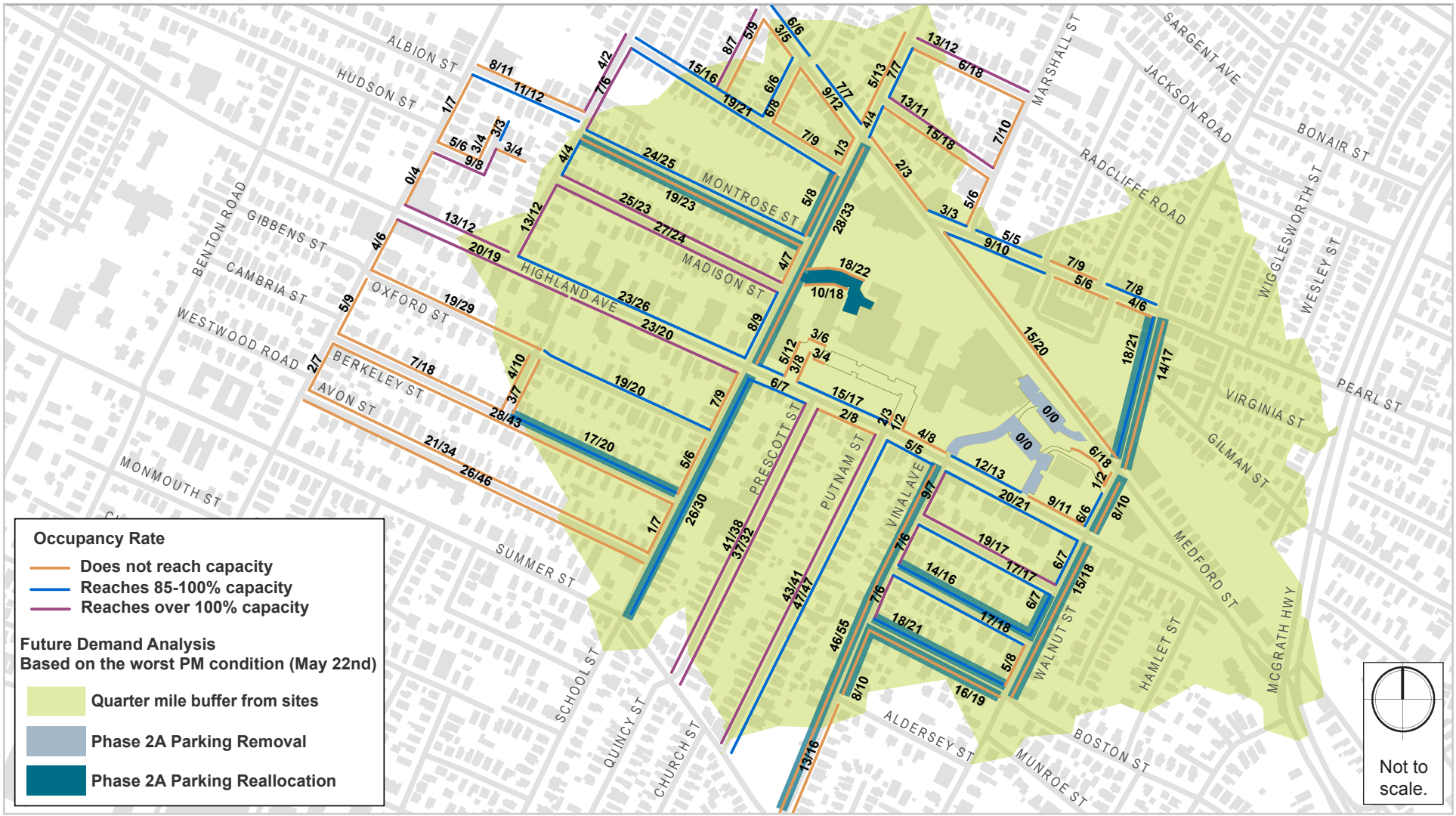


Figure 16. ***Parking Reallocation – Phase 3 a.m. (Monday, May 14, 2018 base)***

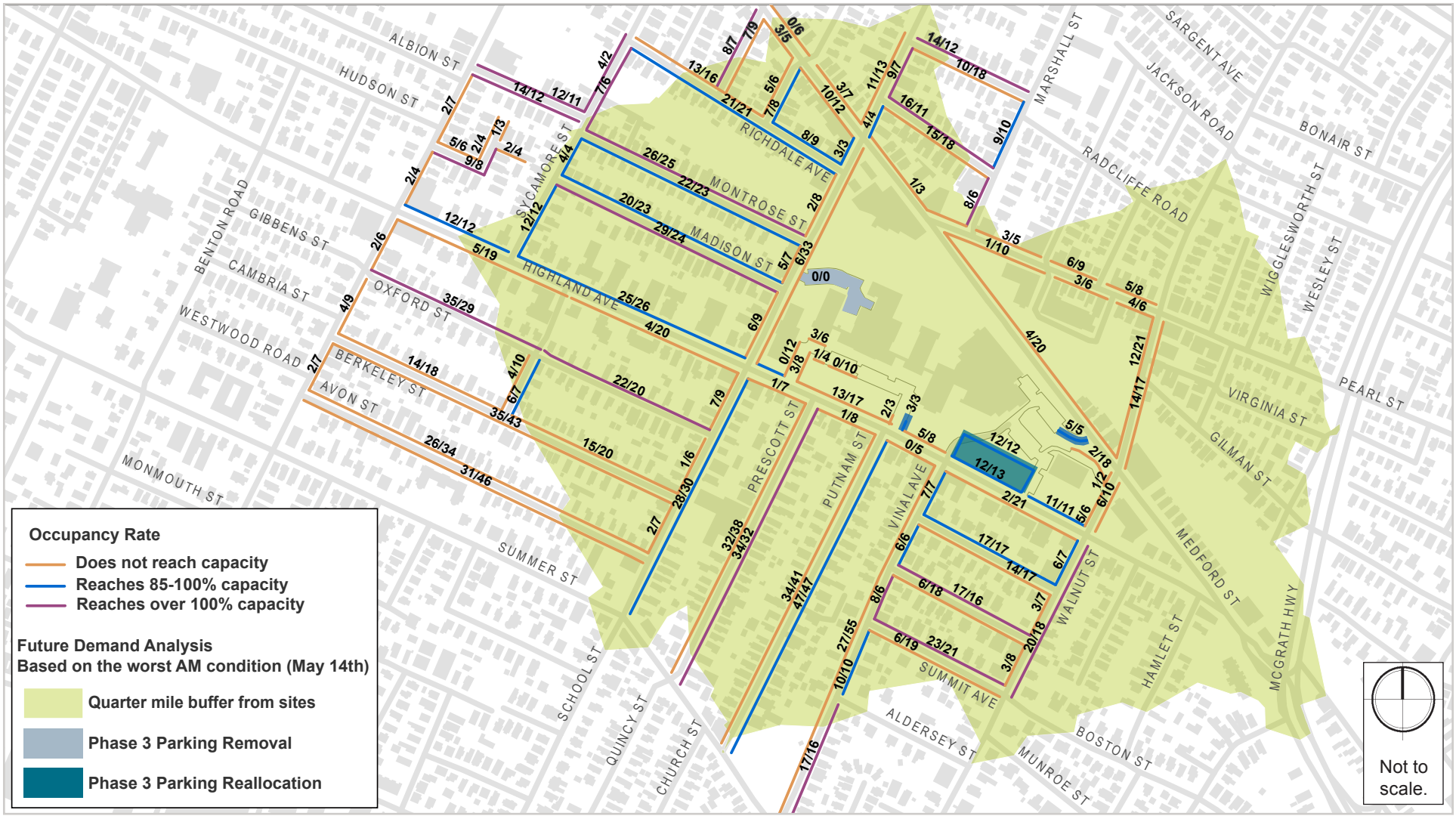


Figure 17. ***Parking Reallocation – Phase 3 Midday (Tuesday, May 15, 2018 base)***

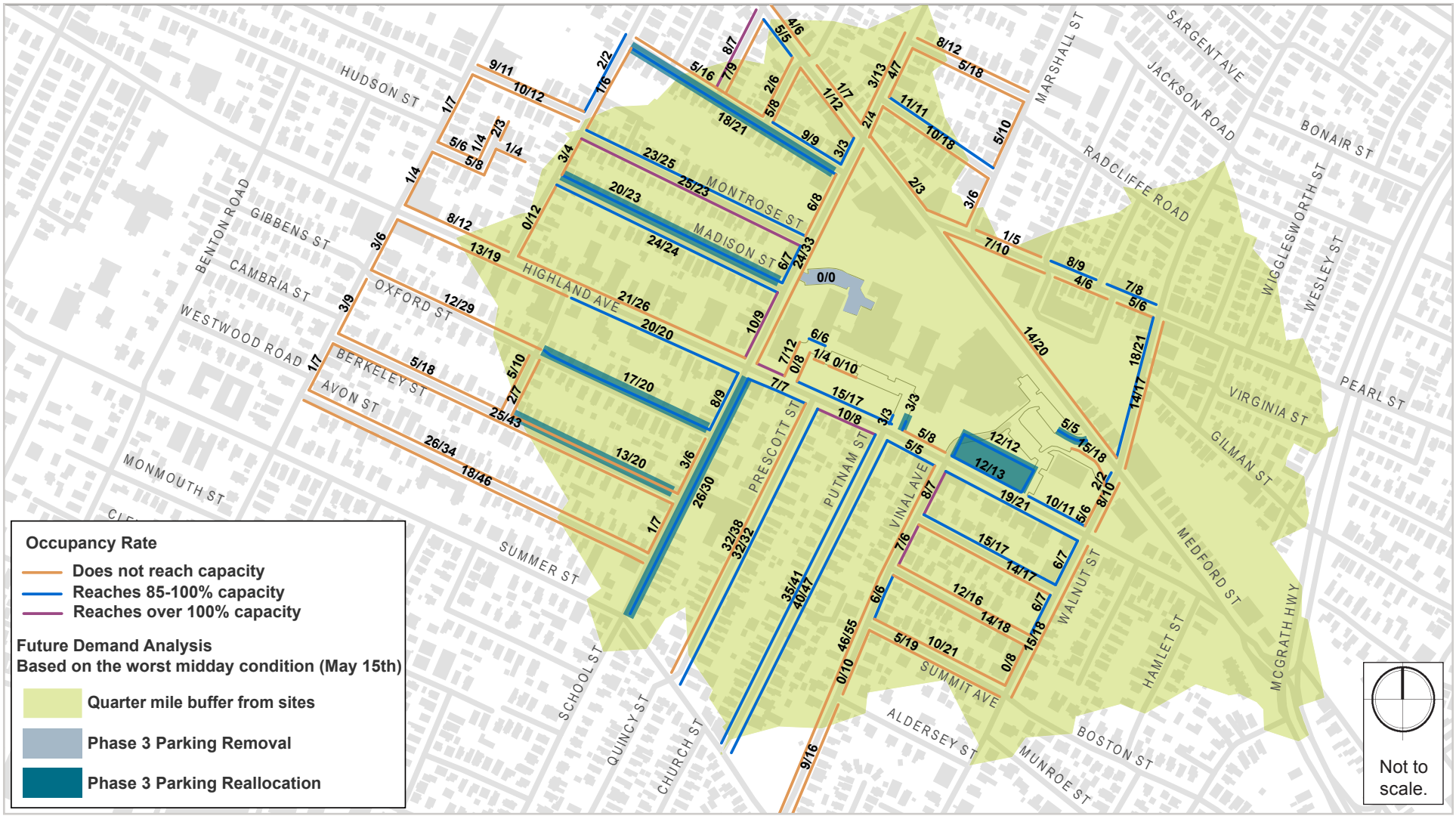
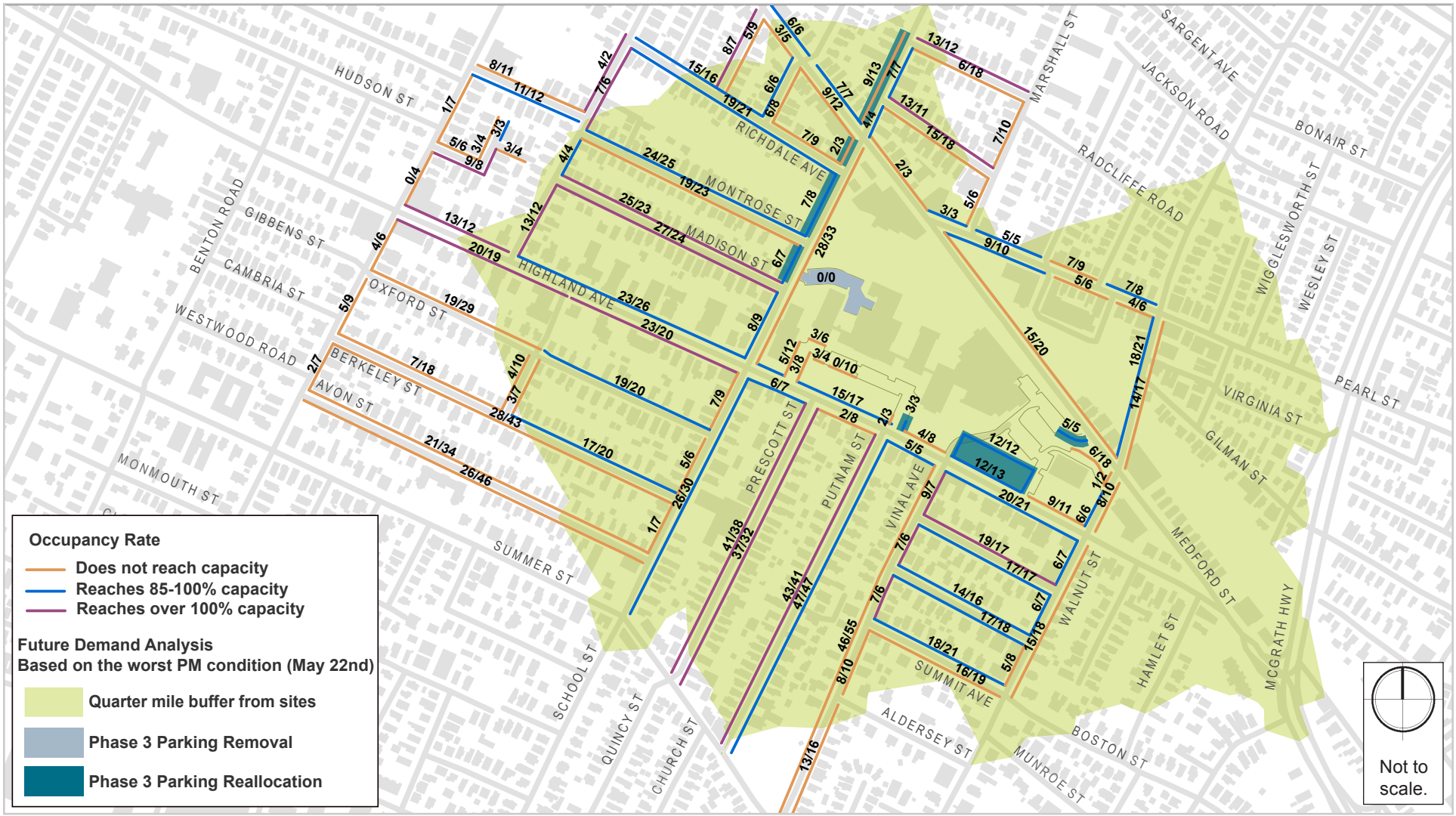


Figure 18. ***Parking Reallocation – Phase 3 p.m. (Tuesday, May 22, 2018 base)***



The impact of street sweeping under the peak occupancy condition for each time of day was assessed. Zone 2 sees the highest estimated amount of parking loss while street sweeping is in effect from 8 a.m. to 12 p.m. In the evening, the loss of parking on Mondays and Wednesdays on School Street and Highland Avenue totals to 125 spaces. To emulate the additional stress on the system, the highest loss of parking from street sweeping for each time of day was subtracted from the total parking supply. The following tables (**Table 11, Table 12, and Table 13**) illustrate overall occupancy for existing peak occupancy conditions as a base for current demand, future conditions, and future conditions with maximum impact from street sweeping. Drivers on mornings preceding Zone 2 street sweeping and evenings preceding Zone 3 street sweeping (Highland Avenue and School Street) may be challenged to find convenient parking with overall occupancy in the study area having the potential to exceed 90%.

Finally, we extrapolate the impact of a snow emergency event on supply to the future condition scenarios used to demonstrate the highest anticipated occupancy. This analysis uses the highest observed occupancy during the midday as the base (May 15, 2018).

Each set of analysis uses the most conservative options as metrics. During observations following the snow emergency, flexibility between the study area and neighboring streets was observed – the study area is not a closed system. This permeability leads to a consistent occupancy rate, even though parking supply varied. Drivers are likely to shift out to other areas for parking rather than filling the study area on-street parking to capacity. With this phenomenon in mind and the overall conservative nature of the analysis, the projected occupancy rates listed below should be considered a ceiling and are likely higher than what will be realized.

Table 11. a.m. Existing and Future Occupancy

Morning. - May 14, 2018 base	
	Overall Percent Occupancy
Existing Condition	70%
Post Construction Typical Condition	73%
Post Construction Constrained Condition	92%

Table 12. Midday Existing and Future Occupancy

Midday - May 15, 2018 base	
	Overall Percent Occupancy
Existing Condition	66%
Post Construction Typical Condition	70%
Post Construction Constrained Condition	89%

Table 13. p.m. Existing and Future Occupancy

Evening - May 22, 2018 base	
	Overall Percent Occupancy
Existing Condition	79%
Post Construction Typical Condition	84%
Post Construction Constrained Condition	92%

Future Demand

The impacts of future changes to parking demand are also considered generally. Factors that may increase or decrease future demand for parking in the study area include:

- Additional staff at the Somerville High School, City Hall, or Public Library;
- Construction of Gilman Square Station as part of the Green Line Extension project; or
- Incoming development.

The introduction of the new Green Line station will result in complex behaviors. Improved transit service will encourage students, employees, and visitors to take the train to the Central Hill Campus and surrounding area instead of driving. However, it may also result in more residents using transit and thus leaving their cars parked in the study area throughout the day. While transit use should be encouraged for its many transportation and environmental benefits, it is unclear whether the new station will ease or further constrain on-street parking during the day. This parking study does not attempt to unpack these impacts other than to recommend that tracking of conditions will be necessary following the completion of the Green Line Extension project.

The City of Somerville is experiencing rapid residential and commercial growth; this general trend in combination with the introduction of the Gilman Square Green Line Station suggests that the study area may experience infill development. The City should ensure that developers have progressive parking policies and programs to ensure that new tenants and patrons do not cause on-street parking challenges. Specific strategies are discussed in the Recommendations section.

For every 15 vehicles added to the study area, overall study area occupancy increases by 1%. As more is known about each of these variables, efforts should be made to balance incoming demand with additional supply or programs.

Summary of Findings

This parking study has looked at the existing conditions of on-street parking supply and demand within the Central Hill Campus study area, taking into account variation throughout the day and the impact of street sweeping, special events, snow emergency conditions. The following are key takeaways of existing conditions:

- On-street parking closest to the Central Hill Campus is most densely filled. At all observed times of the full study area, which included street sweeping and a snow emergency, total occupancy for the full study area never exceeded 80%. Parking is available further from the site, within a ten-minute walking distance, but drivers may have to circle in order to find a space. The northwest and southeast quadrants of the study area consistently had the highest on-street occupancy.
- There was little observed spillover of Campus permitted vehicles parking on-street.
- The late morning period had the highest turnover as residents leave for work and employees and students enter the study area, creating a short time period around 8:00 a.m. – 8:30 a.m. of relatively high occupancy.

- Evenings had the highest occupancy, likely due to similar turnover between employees and students and residents as the morning, in addition to evening events and local trips to restaurants and other commercial destinations on the arterials through the study area.
- The parking system can handle "typical" events, but major events like Parents' Night pose a challenge. Within the Rapid Collection study area that focuses directly on the area surrounding the Campus, evening occupancy during Parents' Night exceeded full capacity of calculated spaces.
- On-street supply can absorb the loss of Campus off-street spaces within walking distance of Campus during base conditions but will face challenges during restricted conditions (i.e., Zone 1 and Zone 2 street sweeping) or increased demand conditions, such as major evening events.

Recommendations

The following section outlines different strategies for managing parking supply and demand that were considered to meet the needs of the study area.

INCREASE SUPPLY

HSH evaluated opportunities to increase parking supply within the study area to alleviate future pressures to the parking system. Every 20 spaces of added supply to the current pool would result in a 1% reduction in overall occupancy. Efforts to increase parking supply should be targeted to specifically serve Campus users and short-term parking in the evenings so that on-street permit parking remains more available for residents.

LICENSED OFF-STREET PARKING

The City is investigating opportunities to license off-street parking facilities both on- and off-site; 20 off-street spaces have already been confirmed at the site of the former Homans Building, on the north side of the Campus. Licensed facilities would likely be reserved for Campus permitted vehicles during the day. Facilities may be either within or outside of the study area; frequent shuttle service is recommended for locations outside of the study area. While the process of acquisition can be complex, it is likely the most effective way to increase parking supply to an extent that will meaningfully decrease occupancy, compared to bus stop consolidation or relocation, or closing curb cuts. It would provide predictable parking for Central Hill Campus staff, which would alleviate the on-street parking impacts to residents and time spent by staff looking for parking.

BUS STOP CONSOLIDATION

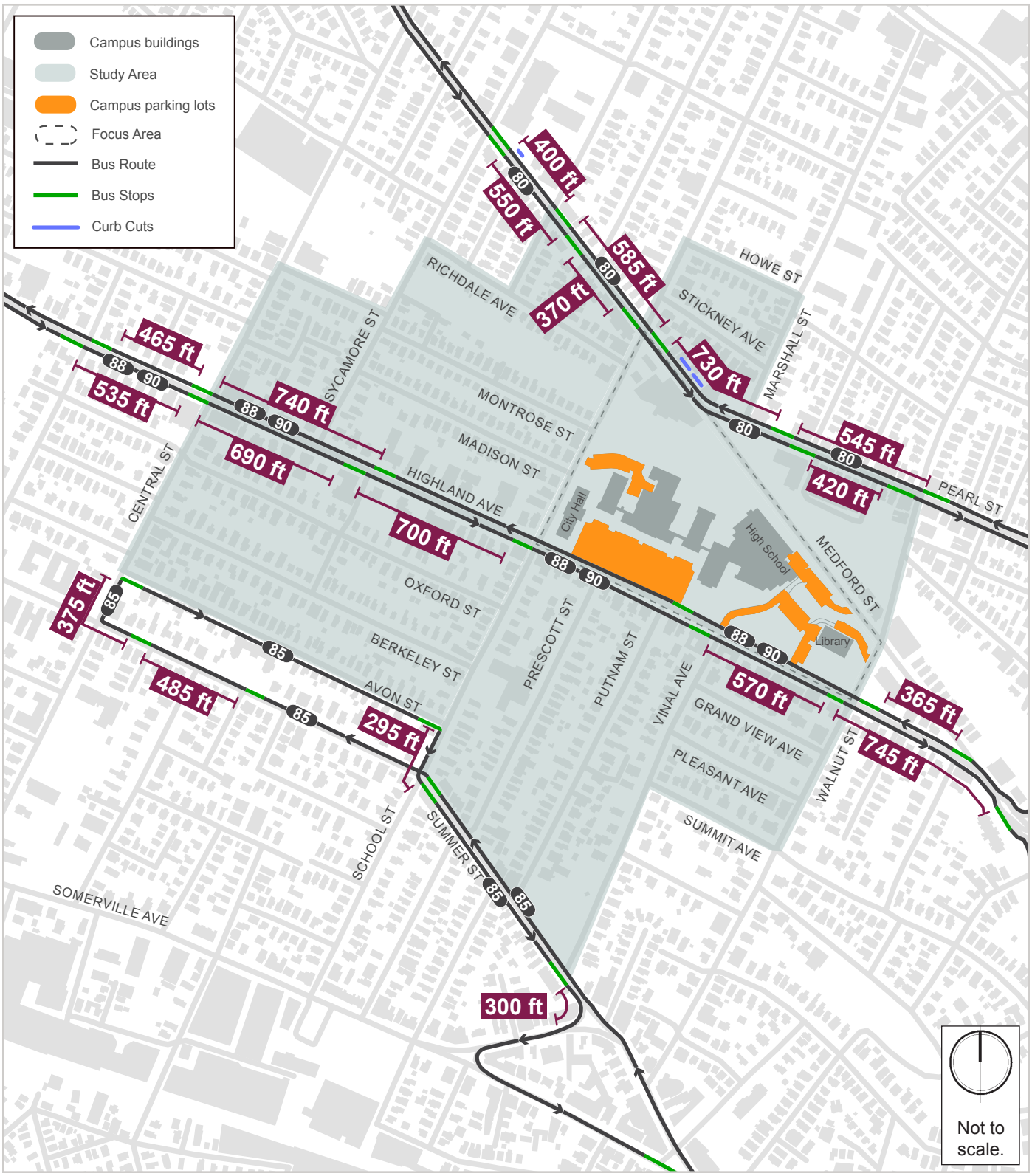
Bus routes with more stops than necessary can be consolidated to free up curb space and improve operations. MBTA Bus Routes 80, 85, 88, and 90 provide transit connectivity for the Central Hill Campus Area. With frequent stops along Medford Street, Pearl Street, Highland Avenue, Avon Street, and Summer Street, these routes cumulatively impact the curb supply available for parking. HSH identified all bus stops within and directly adjacent to the study area and the distance between these stops. The MBTA's Bus Stop Design Standards and Guidelines[4], lay out a minimum recommended average distance between stops of 1,000 feet for Central Business Districts and 750 feet for areas falling within the "Urban outside CBD and Key Bus Routes" category. Most bus stops in the study area are placed much more closely than recommended; the typical distance between stops in the study area falls between 500-600 feet (**Figure 19**). Bus stops can range from 60 – 120 feet, depending on the configurations; or three to six parking spaces.

Bus Operating Environment	Average # of Stops per Mile	Average Distance Between Stops
Central Business District (CBD)	4-5	1,000-1,300 feet
Urban outside CBD and Key Bus Routes	4-7	750-1,300 feet
Suburban	4-5	1,000-1,300 feet
Bus Rapid Transit/Limited Stop Service	2-4	1,300-2,600 feet

Table from the MBTA's Bus Stop Design Standards and Guidelines regarding bus spacing. Source: MBTA

[4] Massachusetts Bay Transportation Authority (MBTA). *Bus Stop Planning and Design Guide*. 2018. https://cdn.mbta.com/sites/default/files/engineering/001-design-standards-and-guidelines/2018-04-01-bus-stop-planning-and-design-guide.pdf

Figure 19. ***Opportunities to Increase On-Street Parking in and Around Study Area***



BUS STOP PLACEMENT

MBTA and other leading design guidelines, such as NACTO, recommend that bus stops should be placed "far side" at intersection for safety and operations benefits. Far side stops also reduce the necessary bus stop length. All stops assessed were either mid-block or near-side stops. Each bus stop that can be converted to a far-side stop could free up to 20 feet of curb space, enough to accommodate one additional on-street parking space.

Further investigation and coordination with the MBTA are recommended to identify which bus stops are candidates for consolidation and/or relocation. These efforts will allow the City of Somerville to accommodate MBTA standards, increase transit service quality and speed, and increase on-street parking supply. Corridor-wide improvements to the bus routes, such as signal timing adjustments or queue jump lanes, should be considered in cooperation with the MBTA; efforts to improve transit service generally will serve as another way to encourage trips to the study area by means other than driving.

Stop Placement	40' Bus		60' Bus	
	Standard [1]	Minimum [2]	Standard [1]	Minimum [2]
Curb Extension/ Bulb out	50'	40'	70'	60'
Near-side	100'	90'	120'	110'
Far-side [3]	80'	60'	100'	80'
Mid-block [3]	12'	100'	140'	120'

[1] Standard dimensions should always be used where feasible. They are especially crucial along roadways with high traffic volumes and stops with high boardings and alightings.

[2] The minimum dimensions should only be used when the standard dimensions aren't feasible. They should only be used at low speed roadways and at low volume bus stops. In situations where providing even the minimum bus stop length is not allowed by the controlling entity, the length may be reduced contingent on approval by the MBTA. However, the stop length must be sufficient to enable at least the front door to be 6-12" from the curb in order to facilitate access ramp deployment.

[3] Dimension can be reduced by 7' if there is no obstruction (parking space etc.) directly in front of the bus stop.

Table from the MBTA's Bus Stop Design Standards and Guidelines regarding stop placement. Source: MBTA

CLOSE CURB CUTS

Unnecessary or overly wide curb cuts - breaks in the curb line caused by driveways - provide an additional mechanism to reclaim curb space for parking. HSH visually reviewed the study area; very few opportunities to eliminate or narrow curb cuts were observed. Much of the study area is residential, with frequent, narrow curb cuts. Gas stations located on either side of Medford Street east of School Street and at School Street and Summer Street each have multiple large curb cuts. Out of these three, only the gas station on the north side of Medford Street is adjacent to a legal on-street parking regulation. Narrowing the curb cuts at this address would result in up to one additional parking space. One other location was identified slightly outside of the study at the Medford Street entrance to the Winter Hill Community School, where the right turning movement out of the school has a wide radius. Being conscious of space needed for trucks to make this turn, the curb cut could potentially be narrowed enough for an additional parking space. Overall, narrowing curb cuts is an ineffective way to achieve significant additional parking. Somerville should pride itself on the fact that that few excessive curb cuts can be found, but there remains little opportunity to increase usable curb space physically.

ON-STREET PARKING MANAGEMENT

RESERVED ON-STREET PARKING

The loss of off-street parking during and as a result of the High School reconstruction will cause Campus employees and students to shift onto the on-street parking system. This study has found that the existing supply of on-street parking can accommodate such a shift within walking distance of Campus. However, as discussed, the highest demand for parking is closest to Campus and drivers may have to circle to find an available space. The City has considered the possibility of reserving on-street parking at certain locations for Campus permitted vehicles. This approach would give Campus users specific places to seek parking and would concentrate Campus-related parking. Designated areas for Campus permitted vehicles could be located near the Campus or even outside of the study area, if combined with frequent shuttle service. This approach could be implemented on a pilot basis and adjusted as needed.

METERED PARKING

Medford Street and Highland Avenue, the main arterials through the study area, are regulated as two-hour parking except by permit from 8:00 a.m. – 2:30 p.m. and permit parking only the rest of the time. On Highland Avenue east of Central Street, short-term turnover is encouraged through metered parking. As a long-term strategy to manage on-street parking, City could consider implementing metered parking at other key locations, such as Medford Street west of School Street,

where short-term parking related to commercial activity can be anticipated. Frequent turnover is most needed in the evening. These spaces could still be reserved for permit parking overnight.

OFF-STREET MANAGEMENT

The Future Demand section of this study discusses the potential for infill development in the area and suggests that the City should ensure that developers have progressive parking policies and programs to ensure that new tenants and patrons do not cause on-street parking challenges. Plentiful on-site parking is not necessarily the only or best solution; methods to reducing parking demand include:

- Providing adequate safe bike parking and other amenities to encourage biking to development sites;
- Financial incentives for employees of commercial development to use transit;
- Implementing a shared parking program, in which on-site parking is reserved for incoming employees to the area during the day while residents are away and reserved for residents the rest of time, thus limiting spillover into the on-street parking system. Shared parking programs can also be used to consolidate parking between sites and can be negotiated with existing off-street facility owners.

POLICIES AND PROGRAMS

PARKING REIMBURSEMENT

A key theme to come out of this study is the impact that street sweeping has on the on-street parking supply. In general, the system would be able to accommodate existing and future parking needs during unrestricted conditions; street sweeping reduces the available legal supply of parking dramatically. Adjusting the street sweeping zones so that the loss of spaces between Zones 1 and 2 are more evenly distributed would need to be part of a much larger discussion, as the zones extend out of the study area. An alternative solution to accommodate the relatively short-term impacts the Somerville High School construction could be to offer reimbursement to drivers who park in paid parking spaces on street sweeping days.

SHUTTLE SERVICE

Shuttle service between pickup locations out of the study area to the Central Hill Campus could be implemented to relieve parking demand in the study area. If pursued, the shuttle should be run regularly and frequently during peak times so that employees can rely on this service and make its use a habit. Shuttles should accommodate events with an extended schedule. A possible pick-up point could be Porter Square, to accommodate Red Line and Commuter Rail passengers who would otherwise drive. Alternatively, a shuttle could be paired with a parking lot outside of the study area.

TRANSIT SERVICE IMPROVEMENTS

In addition to considering shuttle services, it will be beneficial to also examine opportunities to improve transit service to the study area. Route 88 connects from Davis Square to the Campus and then on to Lechmere, connecting to the Green Line and other bus routes. Route 90 connects from Davis Square to the Campus and then to points north via the Orange Line at Assembly Square and Wellington. Route 80 connects from Arlington and West Medford through the study area along Medford Street and then to Lechmere. Connections to the Green Line will be best served by the future Gilman Station, but run time and reliability improvements to bus lines connecting to other key areas that attracts new riders will help reduce vehicle trips into the study area.

As discussed in the recommendations for Increasing Supply, the conversion of bus stops from near-side to far-side would have both space and operational benefits. In addition, corridor-wide improvements to the bus routes could be considered in cooperation with the MBTA; these could include signal timing adjustments or queue jump lanes. Improvements to bus runtimes and reliability that attract new riders will help reduce vehicle trips into the study area.

FINANCIAL INCENTIVES

Incentives can be considered to discourage driving to the Central Hill Campus or encourage use of services like the proposed shuttle. For instance, a fee could be charged for non-residential permits; a rebate could be issued for the activation of a free shuttle pass. Similarly, MBTA passes for Campus employees and students could be partially subsidized to encourage use of the new Green Line Extension and the MBTA bus routes. Lastly, Bluebikes memberships for Campus employees and students could be subsidized to encouraging biking to Campus. One station with 15 docks is located on Campus at the corner of Highland Avenue and School Street.

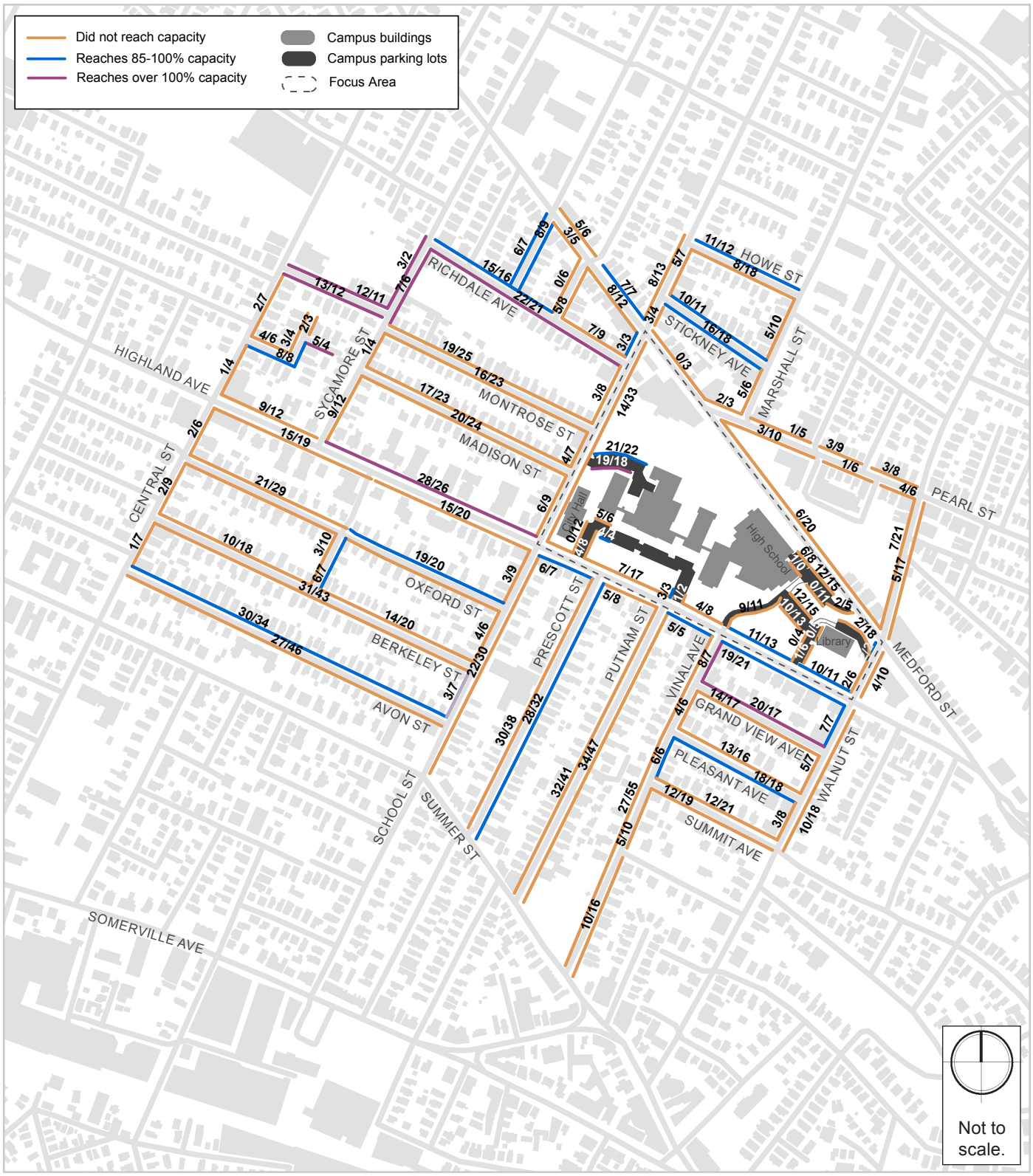
CONCLUSION

Some additional supply or reduction of parking demand is recommended to ensure that parking during times of high turnover, street sweeping, evening events, snow emergencies, or other constraining circumstances do not overly burden residents, local patrons and employees, or Campus employees and students. A combination of strategies will be needed to effectively manage parking in the study are. In the short-term, as construction is already well under way, we propose the following approaches as the most effective means for managing current and near-future demand:

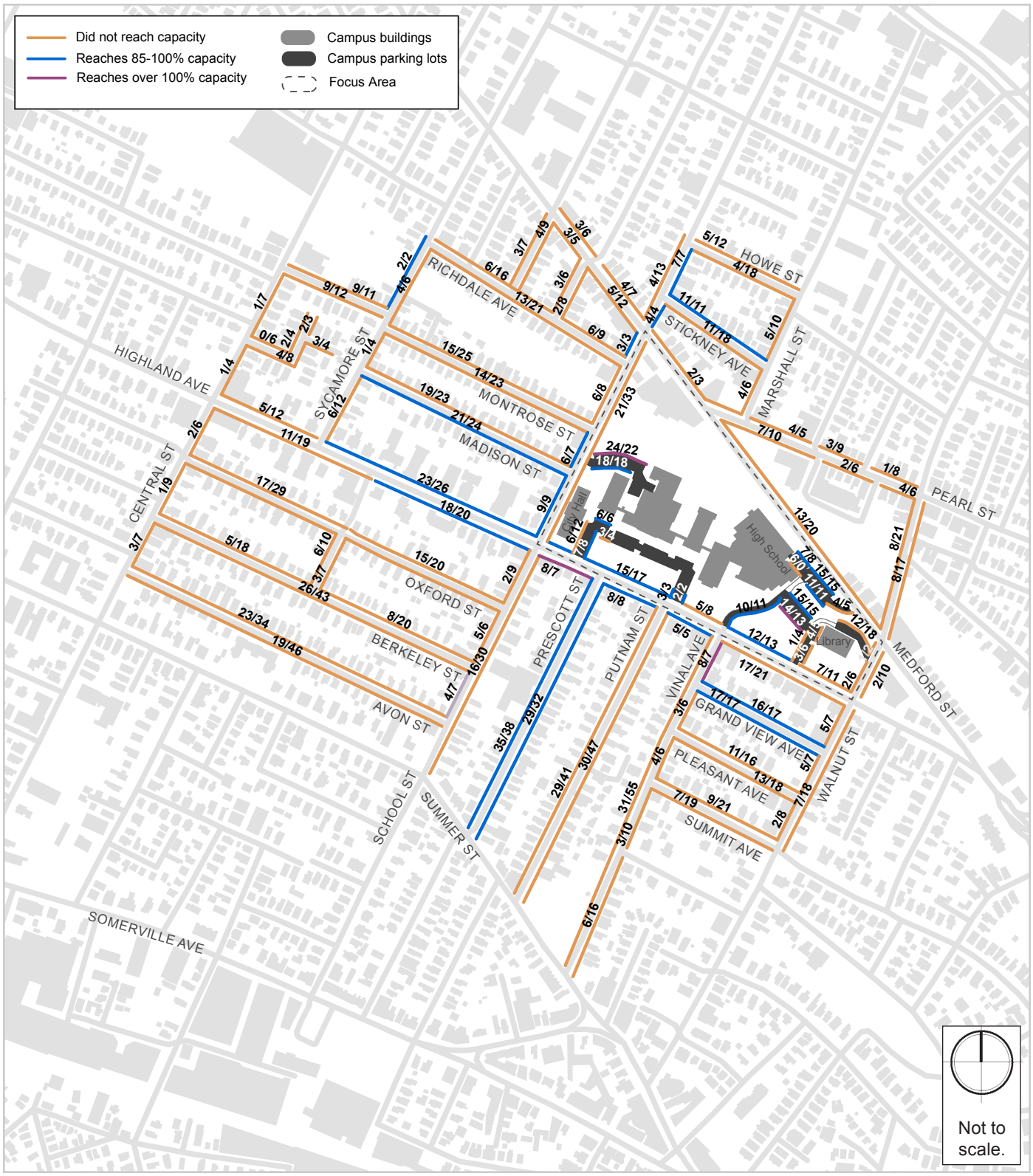
- Licensed off-street facilities for permitted Campus vehicles;
- Shuttle service to and from licensed facilities outside of the study area;
- Shuttle service to and from transit hubs during major evening events; and
- Parking reimbursement during street-sweeping regulations.

Appendix A – Full Study Area Occupancy

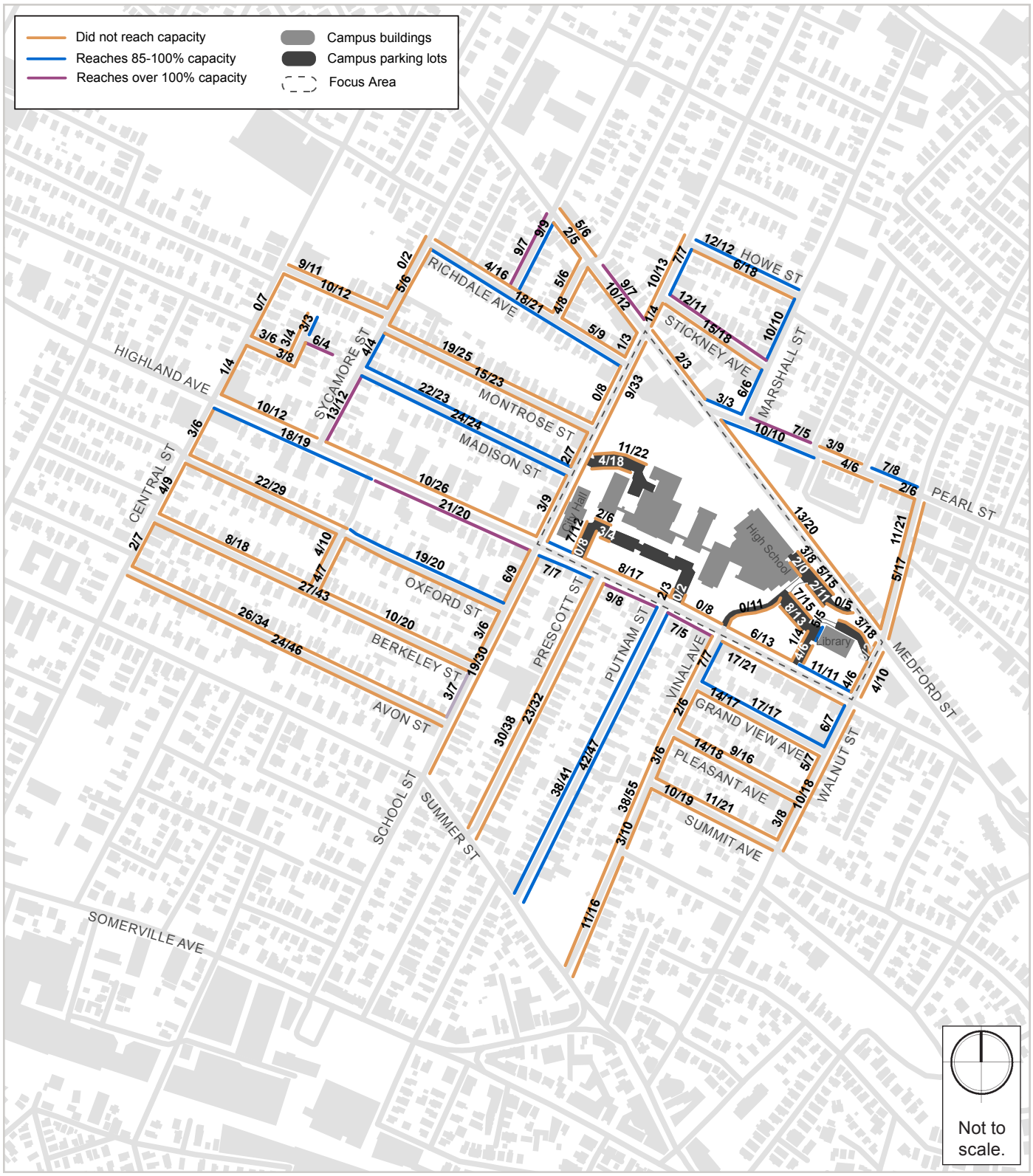
Appendix A. *Parking Occupancy - May 8, 2018 a.m.*



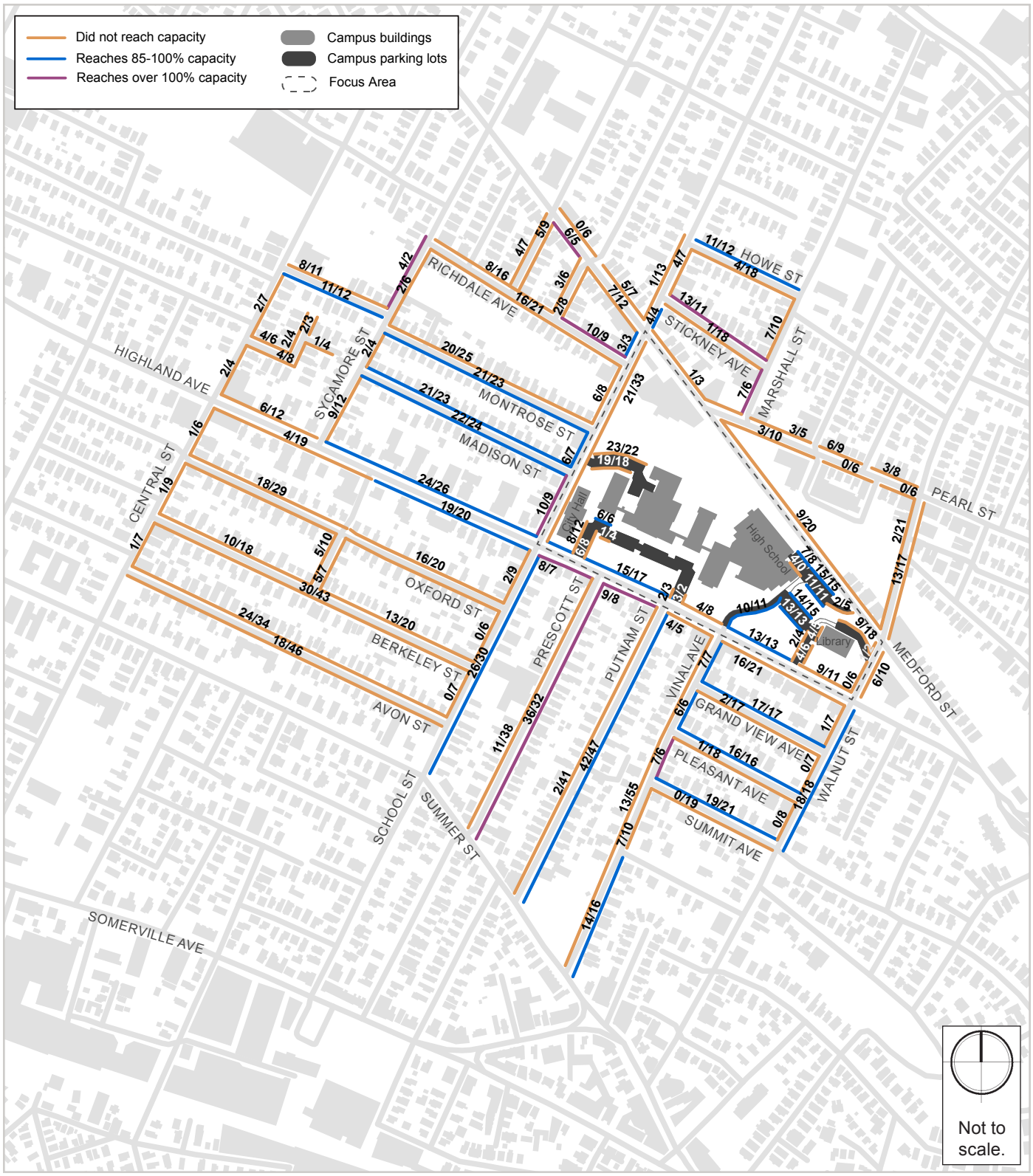
Appendix A. *Parking Occupancy - May 8, 2018 Midday*



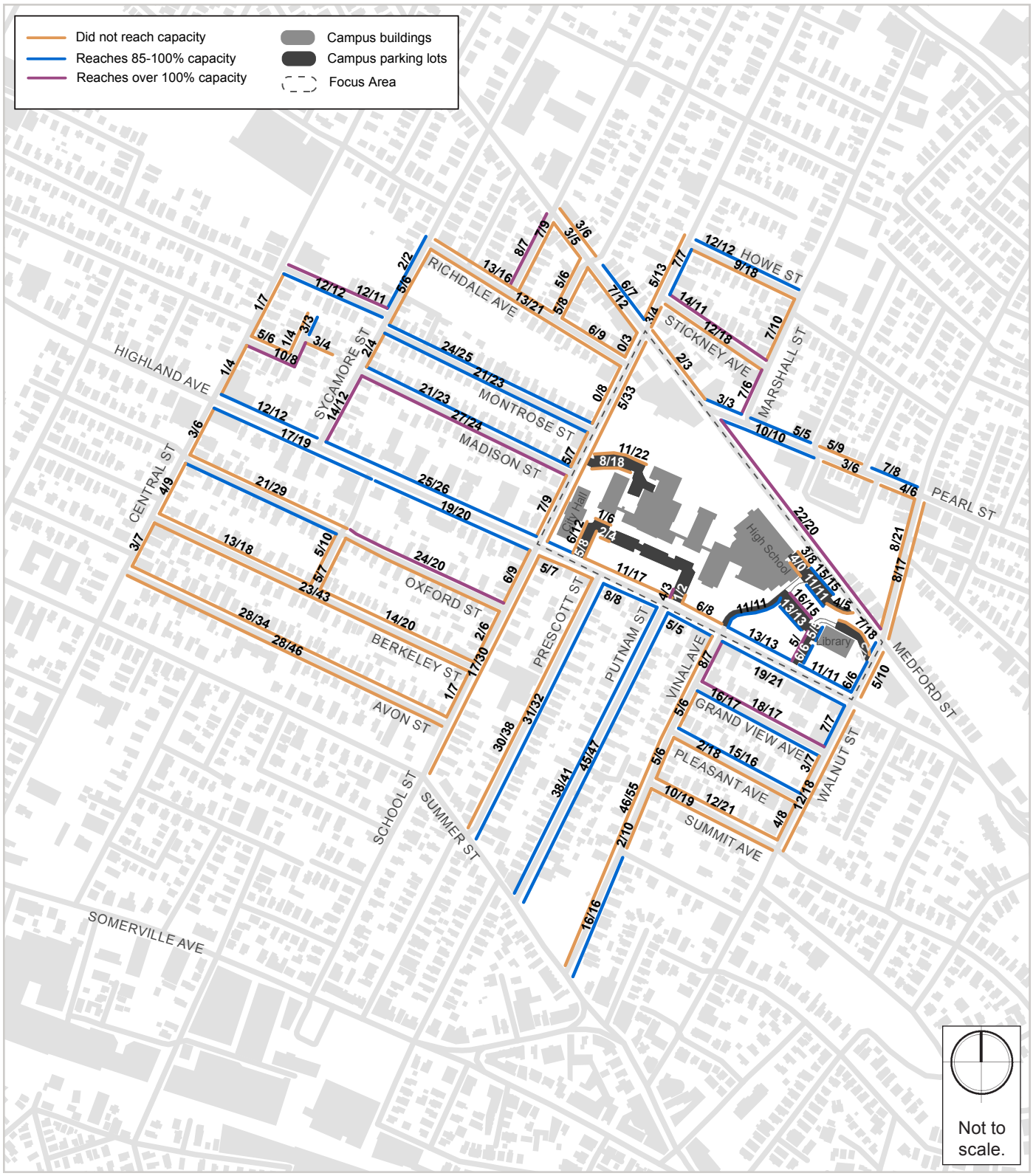
Appendix A. *Parking Occupancy - May 8, 2018 p.m.*



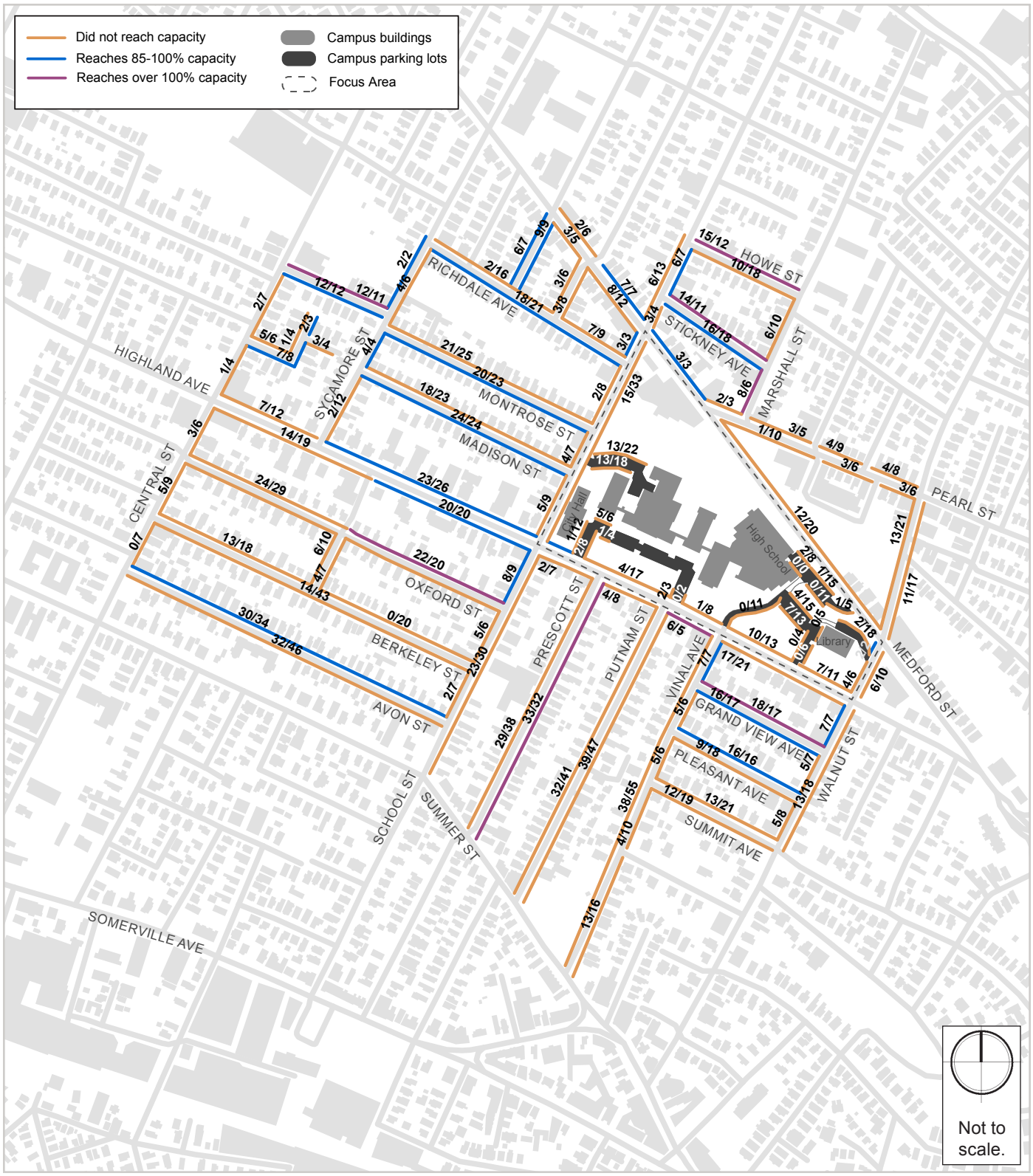
Appendix A. *Parking Occupancy - May 14, 2018 Midday*



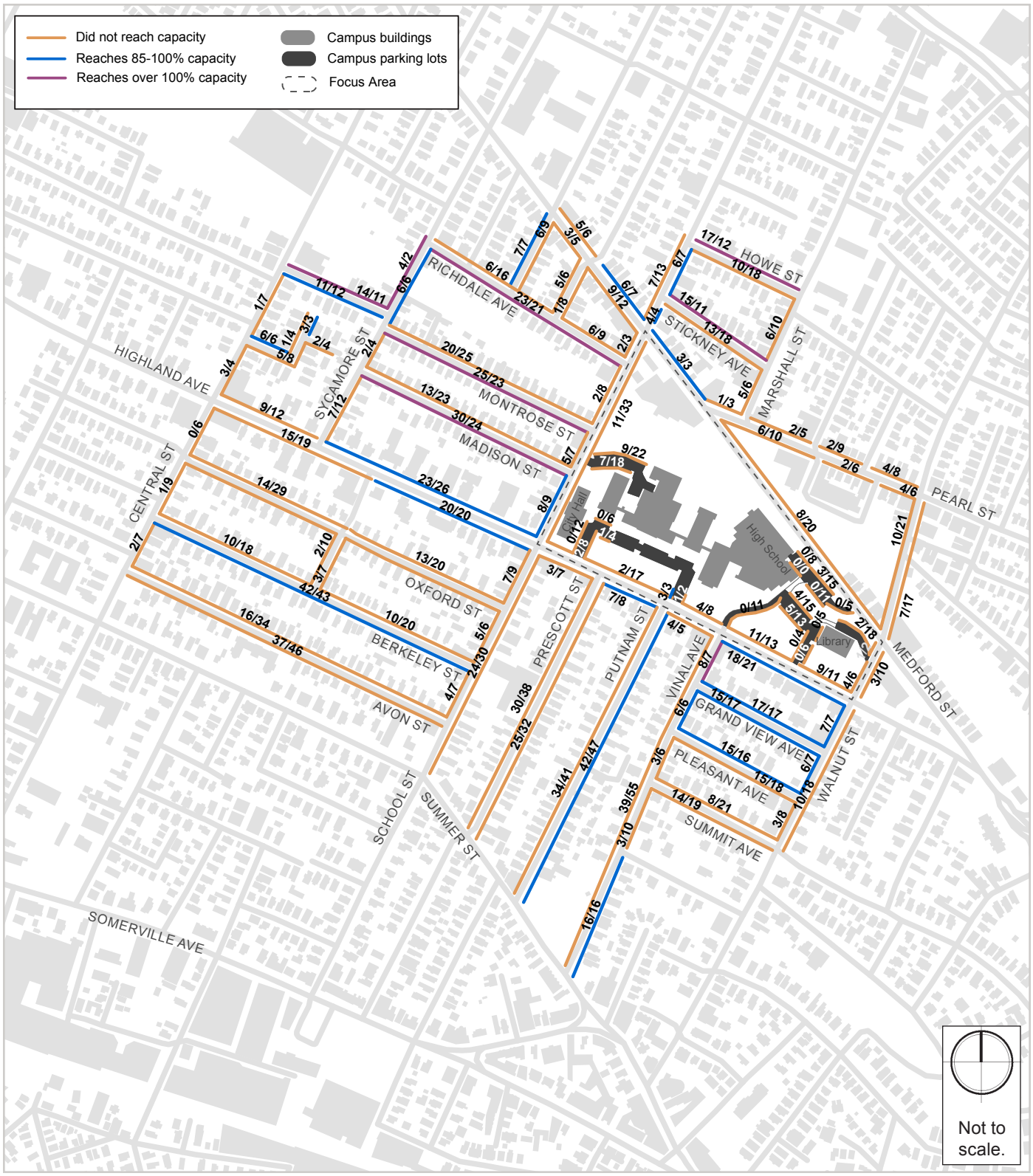
Appendix A. *Parking Occupancy - May 14, 2018 p.m.*



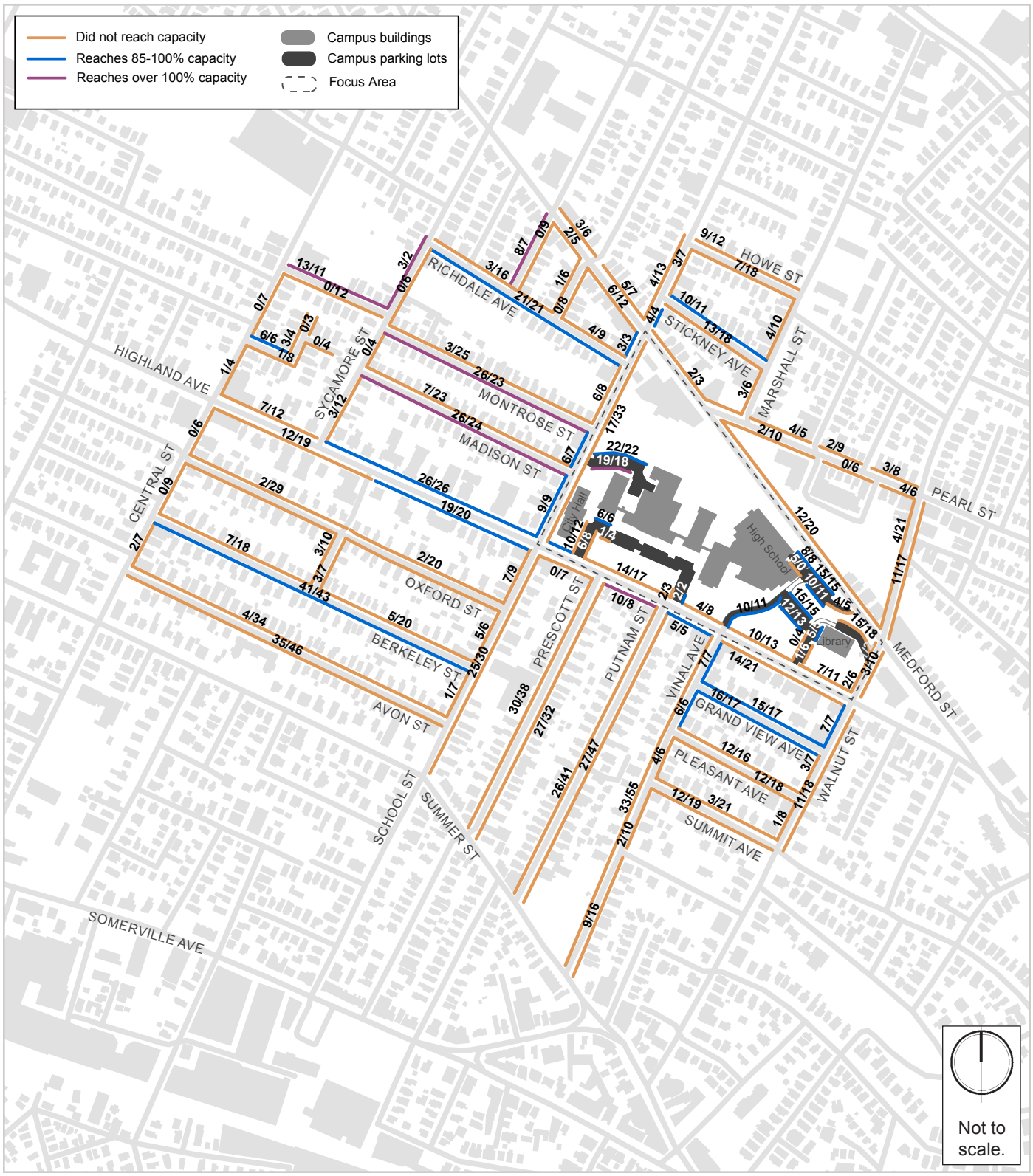
Appendix A. *Parking Occupancy - May 15, 2018 a.m.*



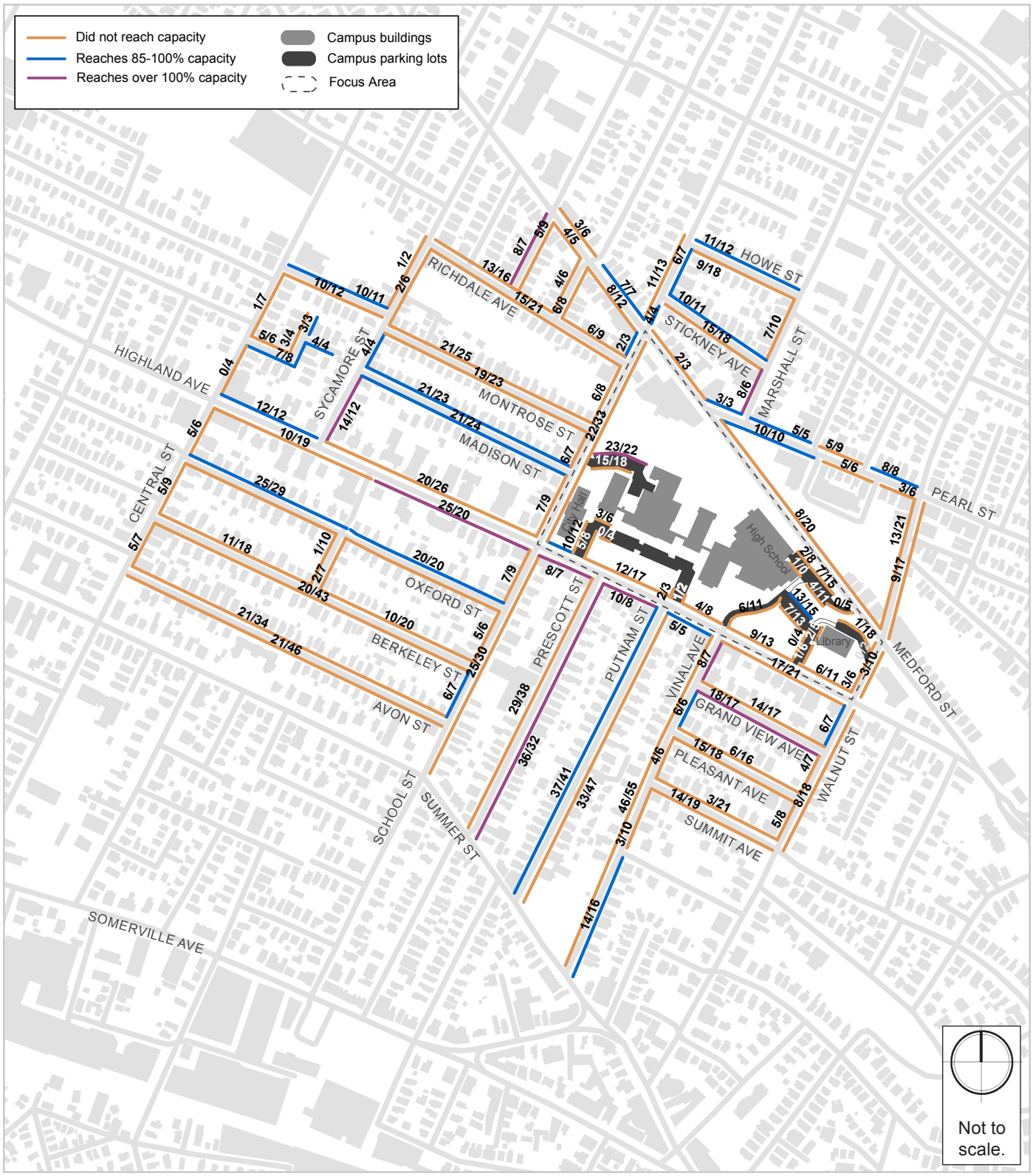
Appendix A. *Parking Occupancy - May 17, 2018 a.m.*



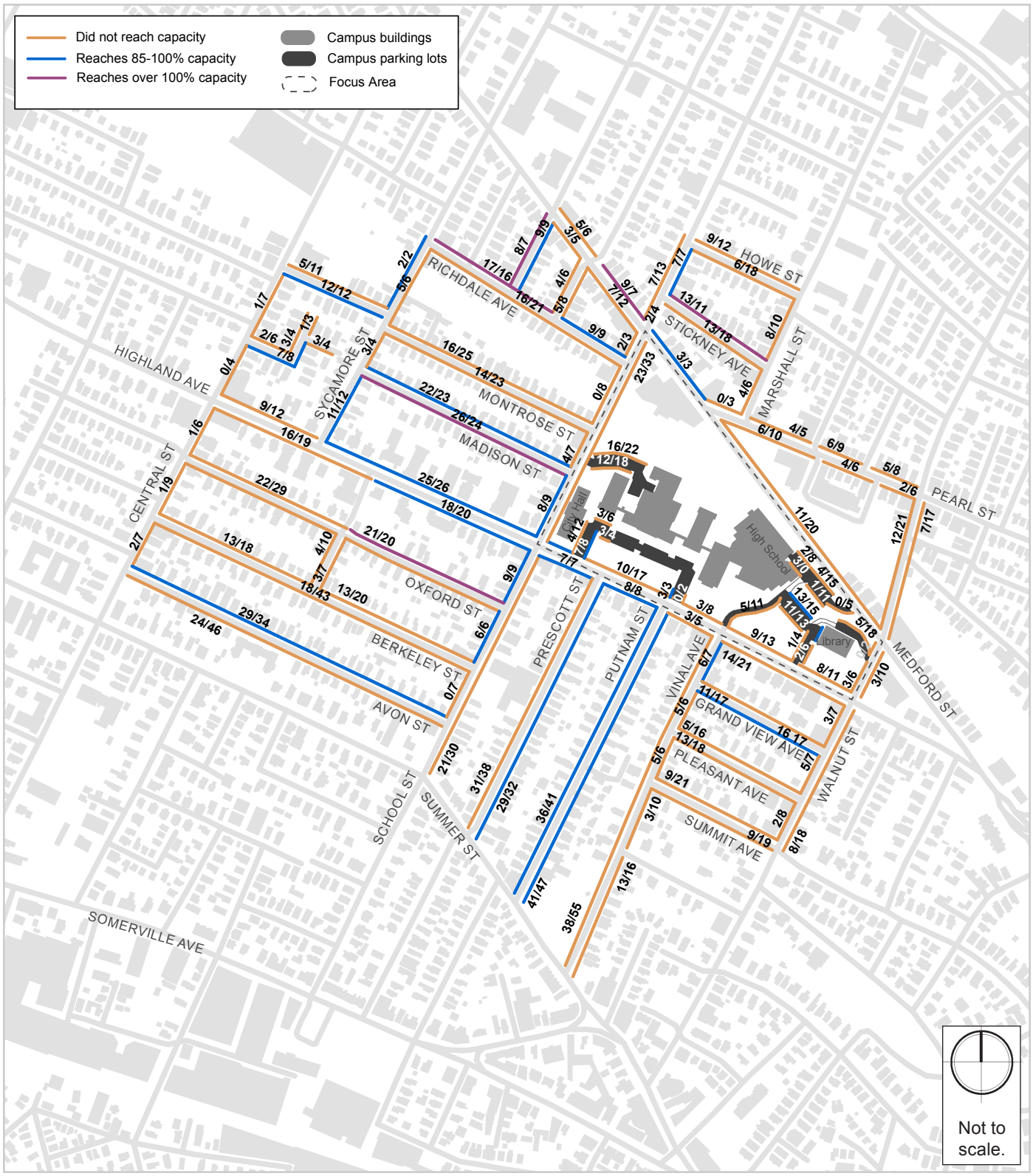
Appendix A. *Parking Occupancy - May 17, 2018 Midday*



Appendix A. *Parking Occupancy - May 17, 2018 p.m.*



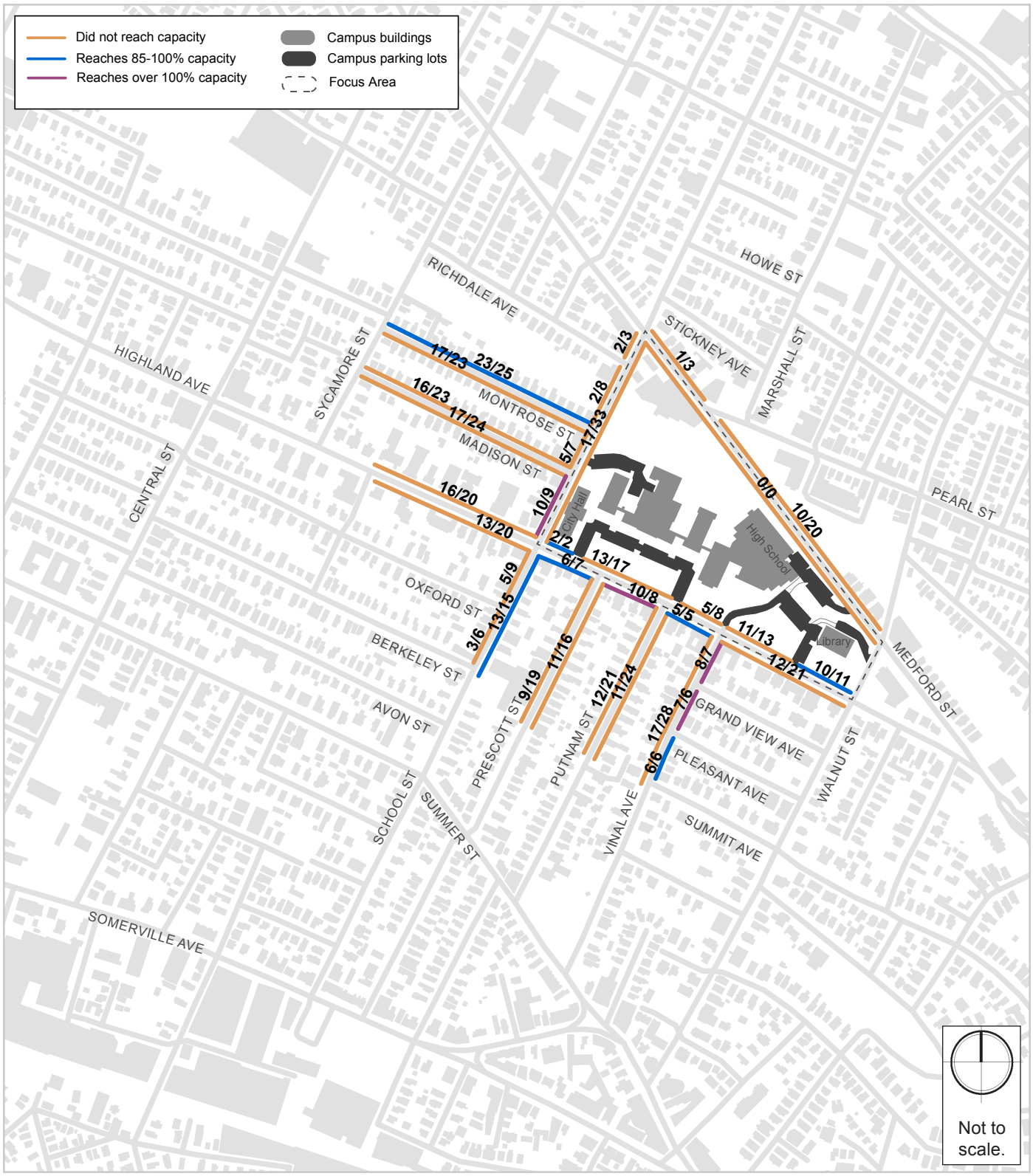
Appendix A. *Parking Occupancy - May 24, 2018 p.m.*



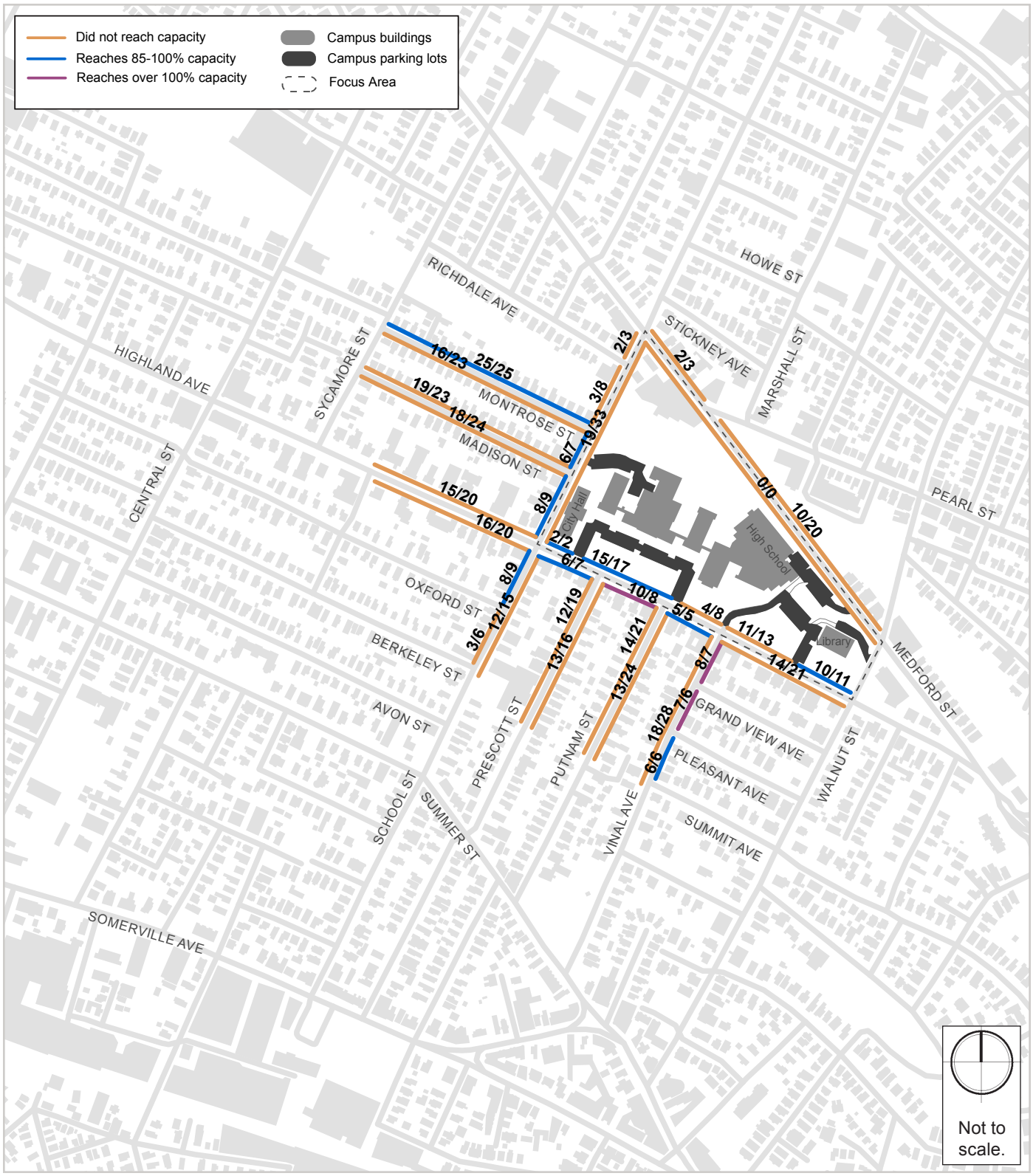
Appendix B – Rapid Count Occupancy

Appendix B. *Rapid Occupancy - May 15, 2018 7:30 a.m.*

Appendix B. *Rapid Occupancy - May 15, 2018 8:00 a.m.*



Appendix B. *Rapid Occupancy - May 15, 2018 8:30 a.m.*

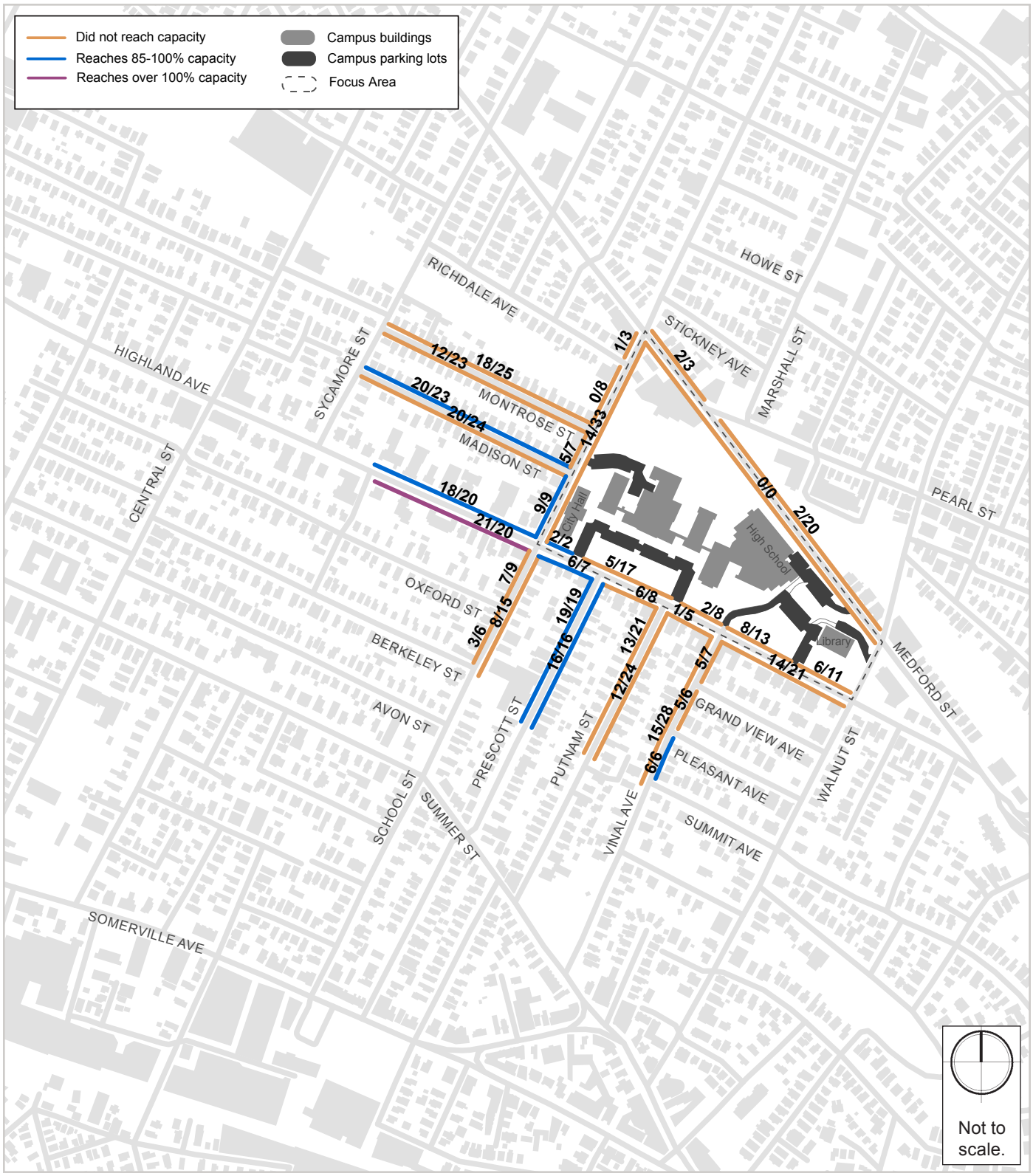


Appendix B. *Rapid Occupancy - May 17, 2018 7:30 a.m.*

Appendix B. *Rapid Occupancy - May 17, 2018 8:00 a.m.*

Appendix B. *Rapid Occupancy - May 17, 2018 8:30 a.m.*

Appendix B. *Rapid Occupancy - May 24, 2018 5:30 p.m.*



Appendix B. *Rapid Occupancy - May 24, 2018 8:00 p.m.*