

Appendix J
Transportation Study

PRELIMINARY AND FINAL DESIGN SERVICES FOR THE **EAST SIDE COASTAL RESILIENCY PROJECT**

ITEM #3: NYCDOT TRAFFIC STUDIES FOR EAST 10TH AND EAST 23RD STREETS

SEPTEMBER 2018

BOROUGH OF MANHATTAN, NEW YORK



Prepared for

New York City Department of Design and Construction

In partnership with

New York City Mayor's Office of Recovery and Resiliency
and

New York City Department of Parks and Recreation

Project ID: SANDRESM1

Contract No. HWDRCW02

Submitted by



The AKRF-KSE JV

Prepared by



EAST SIDE COASTAL RESILIENCY

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Prepared for:

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New York City Mayor's Office of Recovery and Resiliency

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SEPTEMBER 2018

Memorandum

To: Thu-Loan Dinh, New York City Department of Design and Construction (DDC)

From: The AKRF-KSE JV

Date: Draft submission January 22, 2018
Final submission September 19, 2018

Re: East Side Coastal Resiliency
Project ID: SANDRESM1
Preliminary and Final Design Services for East Side Coastal Resiliency
Approved Additional Scopes of Work – Item 3: DOT Traffic Studies for East 10th Street and East 23rd Street Areas

A. INTRODUCTION

As part of the ongoing East Side Coastal Resiliency (ESCR) Project, the AKRF-KSE JV (JV) was tasked with preparing additional traffic and pedestrian studies to test and further develop various access alternatives for the Preliminary and Final Design at East 10th Street, East 18th Street, East 20th Street, East 23rd Street, and East 25th Street. These studies included traffic and pedestrian analyses, a pedestrian origin-destination study, and existing traffic volume data collection to determine the feasibility of converting the easternmost segment of East 10th Street between a traffic circle and the FDR Drive service road from two-way to one-way eastbound in association with the relocation of the East 10th Street pedestrian/bicycle bridge, and closing the service road in front of the BP Gas Station east of East 23rd Street and Avenue C to vehicular traffic.

Existing traffic and pedestrian analyses were prepared for three intersections on Avenue C, at East 18th Street Extension, East 20th Street, and East 23rd Street for the weekday AM, midday, PM, and Saturday peak hours. The project's preferred design would not affect the operations at any of those three intersections for traffic or pedestrians. Therefore, future with the proposed ESCR project (the With Action condition) and future without the ESCR project (the No Action condition) analyses were not prepared for the 2024 build year/estimated time of completion (ETC) or 2044 ETC+20 conditions. A modest number of vehicular trips resulting from the proposed closure of the service road in front of the BP Gas Station and pedestrian trips resulting from the proposed closure of the west sidewalk along the southbound FDR Drive Service Road between East 23rd and East 25th Streets described in a previous technical memorandum would create diversions of these trips at East 23rd Street and Avenue C, but the effects would be negligible, and the effects of these modifications are discussed below. The proposed closure of the west sidewalk along the southbound FDR Drive Service Road between East 23rd and East 25th Streets would result in the diversion of 18, 14, 15, and 6 pedestrians during the weekday AM, midday, PM, and Saturday peak hours, respectively, which are well below the *CEQR Technical Manual* analysis threshold of 200 pedestrians. Similarly, the proposed closure of the service road in front of the BP Gas Station to vehicular traffic would result in the diversion of 14, 9, 8, and 5 vehicles during the weekday AM, midday, PM, and Saturday peak hours, respectively, which are well below the *CEQR Technical Manual* analysis threshold of 50 vehicles.

The ESCR Draft Environmental Impact Statement (DEIS) is ongoing and the traffic and pedestrian analyses presented within this report will be used and incorporated as required.

B. TRAFFIC AND PEDESTRIAN DATA COLLECTION

Traffic and pedestrian data were collected in June 2017 for the weekday AM, midday, PM, and Saturday peak periods. Existing peak period traffic volumes were developed based on manual intersection counts and 24-hour Automatic Traffic Recorder (ATR) counts. The highest peak hour traffic volumes (8:15 AM to 9:15 AM, 1:00 PM to 2:00 PM, 4:15 PM to 5:15 PM, and Saturday 4:00 PM to 5:00 PM) during the respective peak periods were analyzed at three intersections on Avenue C, at East 18th Street Extension, East 20th Street, and East 23rd Street. Crosswalks at these three intersections were analyzed for the highest peak hour pedestrian volumes (7:45 AM to 8:45 AM, 12:00 PM to 1:00 PM, 6:00 PM to 7:00 PM, and Saturday 4:00 PM to 5:00 PM) for the same four peak periods. Similarly, for the pedestrian origin-destination study at East 25th and East 23rd Streets, the highest peak hour pedestrian volumes (7:45 AM to 8:45 AM, 12:00 PM to 1:00 PM, 6:00 PM to 7:00 PM, and Saturday 12:00 PM to 1:00 PM) during the respective peak periods were analyzed. A technical memorandum describing the effects of the proposed closure of the west sidewalk along the southbound FDR Drive service road between East 23rd and East 25th Streets has been prepared separately; this technical memorandum references the results of that document.

Inventories of roadway geometry, traffic controls, bus stops, and parking regulations/activities were recorded to provide appropriate inputs for the traffic and pedestrian analyses. Official signal timings were also obtained from NYCDOT for use in the analyses.

C. EAST 10TH STREET CONVERSION TO ONE-WAY

In association with the relocation of the East 10th Street pedestrian/bicycle bridge, it has been proposed to convert the east end segment of East 10th Street between a traffic circle and the FDR Drive service road from two-way to one-way eastbound. There is an existing traffic circle on East 10th Street located midblock between Avenue D and the FDR Drive service road that provides two-way (eastbound and westbound) vehicular access to the buildings on the north and south sides of East 10th Street. However, east of the traffic circle, there is no turnaround, and the only outlet for eastbound traffic on this segment is to proceed on the one-way southbound FDR Drive service road. Therefore, the only vehicles traveling westbound on this segment of East 10th Street between the traffic circle and the FDR Drive service road are eastbound vehicles that have performed a multi-point turn at the east end of East 10th Street to U-turn westbound.

The existing hourly background traffic volumes traveling westbound along the East 10th Street segment are low, with an average of 15 vehicles per hour between 6:00 AM and 8:00 PM and a maximum of 35 vehicles in an hour within that same period. It is estimated that a portion of these vehicles would use the traffic circle to return to Avenue D, which is not a diversion from East 10th Street, and a portion would divert to the southbound FDR Drive service road; those existing vehicles would be diverted to surrounding intersections. Since the number of diverted vehicles in any hour would be fewer than 50 vehicle trips, which is the *CEQR Technical Manual* minimum threshold for further traffic analysis, it is anticipated that the conversion of East 10th Street between the traffic circle and the FDR Drive service road from two-way to one-way eastbound would not result in any significant adverse traffic impacts. Although pedestrian and bicycle traffic from the East 10th Street bridge over the FDR Drive would be diverted from the north side to the south side of East 10th Street, existing pedestrian and bicycle traffic on East 10th Street would not be diverted by the proposed street modifications.

D. EAST 23RD STREET AND AVENUE C SERVICE ROAD CLOSURE

As described above, it has been proposed to close the service road in front of the BP Gas Station east of East 23rd Street and Avenue C to vehicular traffic. Currently the service road operates one-way southbound and connects vehicles to the parking lot underneath the FDR Drive where they can exit onto Avenue C and travel northbound back towards East 23rd Street. According to observations, however, two-way traffic has been observed on this segment. With the service road closed to vehicular traffic, the existing roadway would be

able to be used solely by pedestrians and bicyclists, which would provide more width than the existing sidewalk between the BP Gas Station and the service road, and better align with the multi-use path segments to the north and south.

The existing hourly traffic volumes traveling southbound along the service road are low, with an average of 10 vehicles per hour between 6:00 AM and 8:00 PM and a maximum of 22 vehicles in an hour within that same period. These existing vehicles would be diverted to surrounding corridors as part of the closure. Since the number of diverted vehicles in a peak hour would be fewer than 50 vehicle trips, which is the *CEQR Technical Manual* minimum threshold for further traffic analysis, it is anticipated that closing the service road to vehicular traffic would not result in any significant adverse traffic impacts.

E. EAST 23RD STREET AND AVENUE C PEDESTRIAN ORIGIN AND DESTINATION STUDY

As described above, a pedestrian origin-destination study was prepared at East 25th and East 23rd Streets to determine the impact of closing and eliminating the west sidewalk along the FDR Drive Southbound Service Road between the two roadways and to better understand pedestrian movements across Avenue C at East 23rd Street. A technical memorandum describing the effects of the proposed closure of the west sidewalk at East 25th Street has been prepared separately, and this technical memorandum discusses the existing pedestrian travel patterns across Avenue C at East 23rd Street.

2017 EXISTING PEDESTRIAN VOLUMES

Pedestrian origin-destination data were collected in June 2017 when school was in session on all four legs of the Avenue C and East 23rd Street intersection. **Figures 1 through 4** present the 2017 existing pedestrian volumes across Avenue C at East 23rd Street for the weekday AM, midday, PM, and Saturday peak hours, respectively.

According to the figures, the total number of pedestrians traversing any of the four legs of the intersection ranges from 231 to 761 pedestrians per hour on weekdays and 95 to 464 pedestrians per hour on Saturdays. The northeast and northwest corners have the most pedestrian activity across all four peak hours with many pedestrians coming from/going to Waterside Plaza and/or Stuyvesant Cove Park. Overall, the existing pedestrian volumes are highest during the weekday PM peak hour.

EXISTING PEDESTRIAN ORIGIN-DESTINATION PATTERNS

The volume of pedestrians approaching and departing all four legs of East 23rd Street at Avenue C were counted by movement so that origin-destination patterns could be calculated for pedestrians at each corner. **Figures 5 through 8** show the origin and destination percentages by peak hour to/from each corner of the intersection. At the southwest corner of the intersection, the majority of pedestrians traveling eastbound and northbound, cross Avenue C to the southeast corner of the intersection (from 75 to 82 percent traveling eastbound and from 38 to 76 percent traveling northbound). At the southeast corner of the intersection, the majority of pedestrians traveling eastbound and northbound, cross East 23rd Street to the northeast corner towards Waterside Plaza (from 43 to 81 percent traveling eastbound and from 47 to 92 percent traveling northbound). At the northwest corner of the intersection, the majority of pedestrians traveling eastbound and northbound, cross Avenue C to the northeast corner towards Waterside Plaza (from 76 to 89 percent traveling eastbound and from 46 to 76 percent traveling northbound). At the northeast corner of the intersection, the majority of pedestrians traveling eastbound and northbound continue northbound towards Waterside Plaza (from 26 to 89 percent traveling eastbound and from 81 to 88 percent traveling northbound). At the northeast and southeast corners of the intersection, the majority of pedestrians traveling southbound continue southbound towards Stuyvesant Cove Park (from 40 to 91 percent). Similar to the conclusions of the East 25th Street pedestrian origin-destination study, the proposed closure of the west sidewalk along the southbound FDR Drive service road between East 25th and East 23rd Streets would affect very few pedestrians during peak hours, and the parallel walkway along Asser Levy Place would provide the same

connections for pedestrians as the west sidewalk along the southbound FDR Drive service road between East 25th and East 23rd Streets. Therefore, it is not anticipated that there would be any adverse transportation impacts related to the proposed sidewalk closure.

F. TRANSPORTATION ANALYSIS METHODOLOGIES

As described above, traffic and pedestrian analyses were prepared at three intersections on Avenue C, at East 18th Street Extension, East 20th Street, and East 23rd Street. The capacity analyses presented below were conducted pursuant to the methodologies outlined in the 2014 *City Environmental Quality Review (CEQR) Technical Manual*.

TRAFFIC OPERATIONS

The operations of the intersections were assessed using methodologies presented in the 2000 *Highway Capacity Manual (HCM)* using the *Highway Capacity Software (HCS+ 5.5)*. The *HCM* procedure evaluates the levels of service (LOS) for signalized intersections using average stop control delay, in seconds per vehicle.

The average control delay per vehicle is the basis for LOS determination for individual lane groups (grouping of movements in one or more travel lanes), the approaches, and the overall intersection. The levels of service are defined in **Table 1**.

Table 1
Level of Service Criteria for Signalized Intersections

| LOS | Average Control Delay |
|-----|--------------------------|
| A | ≤ 10.0 seconds |
| B | >10.0 and ≤ 20.0 seconds |
| C | >20.0 and ≤ 35.0 seconds |
| D | >35.0 and ≤ 55.0 seconds |
| E | >55.0 and ≤ 80.0 seconds |
| F | >80.0 seconds |

Source: Transportation Research Board. *Highway Capacity Manual*, 2000.

Although the *HCM* methodology calculates a volume-to-capacity (v/c) ratio, there is no strict relationship between v/c ratios and LOS as defined in the *HCM*. A high v/c ratio indicates substantial traffic passing through an intersection, but a high v/c ratio combined with low average delay actually represents the most efficient condition in terms of traffic engineering standards, where an approach or the whole intersection processes traffic close to its theoretical maximum capacity with minimal delay. However, very high v/c ratios—especially those approaching or greater than 1.0—are often correlated with a deteriorated LOS. Other important variables affecting delay include cycle length, progression, and green time. LOS A and B indicate good operating conditions with minimal delay. At LOS C, the number of vehicles stopping is higher, but congestion is still fairly light. LOS D describes a condition where congestion levels are more noticeable and individual cycle failures (a condition where motorists may have to wait for more than one green phase to clear the intersection) can occur. Conditions at LOS E and F reflect poor service levels, and cycle breakdowns are frequent. The *HCM* methodology also provides for a summary of the total intersection operating conditions. The analysis chooses the two critical movements (the worst case from each roadway) and calculates a summary critical v/c ratio. The overall intersection delay, which determines the intersection's LOS, is based on a weighted average of control delays of the individual lane groups. Within New York City, the midpoint of LOS D (45 seconds of delay) is generally considered as the threshold between acceptable and unacceptable operations.

PEDESTRIAN OPERATIONS

The adequacy of crosswalk capacities in relation to the demand imposed on them is evaluated based on the methodologies presented in the 2010 *HCM*, pursuant to procedures detailed in the *CEQR Technical Manual*.

Crosswalks LOS measures pedestrian space, expressed as square feet per pedestrian (SFP), which is an indicator of the quality of pedestrian movement and comfort. Crosswalks are not easily measured in terms of free pedestrian flow, as they are influenced by the effects of traffic signals. The *HCM* methodologies apply a measure of time and space availability based on the time of the intersection signal, and the estimated space used by circulating pedestrians.

Crosswalk conditions are first expressed as a measurement of the available area (the crosswalk width multiplied by the width of the street) and the permitted crossing time. This measure is expressed in square feet-second. The average time required for a pedestrian to cross the street is calculated based on the width of the street and an assumed walking speed. The ratio of time-space available in the crosswalk to the total crosswalk pedestrian occupancy time is the LOS measurement of available square feet per pedestrian. The LOS analysis also accounts for vehicular turning movements that traverse the crosswalk.

The LOS standards for crosswalks are summarized in **Table 2**. The *CEQR Technical Manual* specifies acceptable LOS C or better (minimum of 24.0 SFP for crosswalks) in non-Central Business District (CBD) settings, which include the project study area.

Table 2
Level of Service Criteria for Pedestrian Elements

| LOS | Crosswalks |
|-----|-------------------|
| A | > 60 SFP |
| B | > 40 and ≤ 60 SFP |
| C | > 24 and ≤ 40 SFP |
| D | > 15 and ≤ 24 SFP |
| E | > 8 and ≤ 15 SFP |
| F | ≤ 8 SFP |

Notes: SFP = square feet per pedestrian.
Source: New York City Mayor’s Office of Environmental Coordination, *CEQR Technical Manual*.

G. DETAILED TRAFFIC ANALYSIS

2017 EXISTING CONDITIONS

As described above, traffic data were collected in June 2017 when school was still in session. **Figures 9 through 12** show the 2017 existing traffic volumes for the weekday AM, midday, PM, and Saturday peak hours, respectively.

LEVELS OF SERVICE

A summary of the 2017 existing conditions traffic analysis results are presented in **Table 3**. Details on level-of-service, v/c ratios, and average delays are presented in **Table 4**. Overall, the capacity analysis indicates that most of the study area’s intersection approaches/lane groups operate acceptably—at mid-LOS D or better (delays of 45 seconds or less per vehicle for signalized intersections) for all peak hours. Approaches/lane groups operating beyond mid-LOS D and those with v/c ratios of 0.90 or greater are listed below.

Table 3
Summary of 2017 Existing Traffic Analysis Results

| Level of Service | Analysis Peak Hours | | | |
|-----------------------------|---------------------|----------------|------------|----------|
| | Weekday AM | Weekday Midday | Weekday PM | Saturday |
| Lane Groups at LOS A/B/C | 9 | 10 | 9 | 10 |
| Lane Groups at LOS D | 3 | 4 | 4 | 5 |
| Lane Groups at LOS E | 2 | 1 | 1 | 0 |
| Lane Groups at LOS F | 3 | 2 | 3 | 2 |
| Total | 17 | 17 | 17 | 17 |
| Lane Groups with v/c ≥ 0.90 | 3 | 3 | 5 | 2 |

Notes: LOS = Level-of-Service; v/c = volume-to-capacity ratio.

Table 4
2017 Existing Conditions Level of Service Analysis

| Intersection | Weekday AM | | | | Weekday Midday | | | | Weekday PM | | | | Saturday | | | |
|--|--------------|-----------|-------------|-----|----------------|-----------|-------------|-----|--------------|-----------|-------------|-----|--------------|-----------|-------------|-----|
| | Lane Group | v/c Ratio | Delay (sec) | LOS | Lane Group | v/c Ratio | Delay (sec) | LOS | Lane Group | v/c Ratio | Delay (sec) | LOS | Lane Group | v/c Ratio | Delay (sec) | LOS |
| East 18th Street Extension and Avenue C | | | | | | | | | | | | | | | | |
| EB | LTR | 0.25 | 38.0 | D | LTR | 0.16 | 22.4 | C | LTR | 0.15 | 22.2 | C | LTR | 0.17 | 22.5 | C |
| WB | R | 0.40 | 22.0 | C | R | 0.48 | 25.0 | C | R | 0.70 | 29.8 | C | R | 0.52 | 25.6 | C |
| NB | T | 0.79 | 65.9 | E | T | 0.75 | 50.2 | D | T | 0.77 | 51.7 | D | T | 0.65 | 44.2 | D |
| SB | R | 0.48 | 58.4 | E | R | 0.61 | 50.5 | D | R | 1.04 | 145.7 | F | R | 0.46 | 41.5 | D |
| | L | 0.60 | 27.4 | C | L | 0.73 | 34.3 | C | L | 0.92 | 52.0 | D | L | 0.72 | 33.2 | C |
| | T | 0.51 | 24.6 | C | T | 0.68 | 31.2 | C | T | 0.68 | 31.3 | C | T | 0.61 | 28.7 | C |
| | Intersection | | 32.6 | C | Intersection | | 33.8 | C | Intersection | | 43.4 | D | Intersection | | 31.1 | C |
| East 20th Street and Avenue C | | | | | | | | | | | | | | | | |
| EB (Mainline) | LTR | 1.05 | 90.9 | F | LTR | 1.05 | 88.9 | F | LTR | 1.05 | 90.0 | F | LTR | 1.04 | 86.9 | F |
| WB | LTR | 0.04 | 21.7 | C | LTR | 0.03 | 21.7 | C | LTR | 0.04 | 21.8 | C | LTR | 0.03 | 21.7 | C |
| NB | L | 0.63 | 24.3 | C | L | 0.50 | 19.6 | B | L | 0.59 | 22.7 | C | L | 0.58 | 21.1 | C |
| | TR | 0.38 | 14.5 | B | TR | 0.33 | 14.0 | B | TR | 0.46 | 15.5 | B | TR | 0.32 | 13.9 | B |
| SB | LTR | 0.63 | 27.5 | C | LTR | 0.62 | 27.3 | C | LTR | 0.68 | 28.8 | C | LTR | 0.55 | 25.8 | C |
| EB (Service Road) | R | 0.24 | 42.4 | D | R | 0.20 | 41.0 | D | R | 0.27 | 43.0 | D | R | 0.19 | 40.8 | D |
| | Intersection | | 37.0 | D | Intersection | | 38.3 | D | Intersection | | 36.0 | D | Intersection | | 36.3 | D |
| East 23rd Street and Avenue C | | | | | | | | | | | | | | | | |
| EB (Mainline) | LTR | 1.05 | 81.9 | F | LTR | 1.01 | 70.7 | E | LTR | 1.02 | 72.3 | E | LTR | 0.89 | 47.6 | D |
| WB | LTR | 0.09 | 14.1 | B | LTR | 0.08 | 14.1 | B | LTR | 0.12 | 14.4 | B | LTR | 0.02 | 13.5 | B |
| NB | LTR | 0.77 | 26.9 | C | LTR | 0.70 | 24.3 | C | LTR | 0.87 | 31.7 | C | LTR | 0.60 | 21.8 | C |
| SB | LTR | 1.05 | 85.1 | F | LTR | 1.05 | 89.2 | F | LTR | 1.05 | 87.1 | F | LTR | 1.05 | 86.7 | F |
| EB (Service Road) | R | 0.44 | 45.0 | D | R | 0.33 | 40.5 | D | R | 0.39 | 42.9 | D | R | 0.24 | 37.8 | D |
| | Intersection | | 60.0 | E | Intersection | | 56.2 | E | Intersection | | 56.1 | E | Intersection | | 49.8 | D |

Notes: L = Left Turn, T = Through, R = Right Turn, LOS = Level of Service, EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound.

East 18th Street Extension and Avenue C

- Northbound through (LOS E with a v/c ratio of 0.79 and a delay of 65.9 seconds per vehicle [spv] during the weekday AM peak hour; LOS D with a v/c ratio of 0.75 and a delay of 50.2 spv during the weekday midday peak hour; and LOS D with a v/c ratio of 0.77 and a delay of 51.7 spv during the weekday PM peak hour);
- Northbound right-turn (LOS E with a v/c ratio of 0.48 and a delay of 58.4 spv during the weekday AM peak hour; LOS D with a v/c ratio of 0.61 and a delay of 50.5 spv during the weekday midday peak hour; and LOS F with a v/c ratio of 1.04 and a delay of 145.7 spv during the weekday PM peak hour); and
- Southbound left-turn (LOS D with a v/c ratio of 0.92 and a delay of 52.0 spv during the weekday PM peak hour).

East 20th Street and Avenue C

- Eastbound mainline approach (LOS F with a v/c ratio of 1.05 and a delay of 90.9 spv during the weekday AM peak hour; LOS F with a v/c ratio of 1.05 and a delay of 88.9 spv during the weekday midday peak hour; LOS F with a v/c ratio of 1.05 and a delay of 90.0 spv during the weekday PM peak hour; and LOS F with a v/c ratio of 1.04 and a delay of 86.9 spv during the Saturday peak hour).

East 23rd Street and Avenue C

- Eastbound mainline approach (LOS F with a v/c ratio of 1.05 and a delay of 81.9 spv during the weekday AM peak hour; LOS E with a v/c ratio of 1.01 and a delay of 70.7 spv during the weekday midday peak hour; LOS E with a v/c ratio of 1.02 and a delay of 72.3 spv during the weekday PM peak hour; and LOS D with a v/c ratio of 0.89 and a delay of 47.6 spv during the Saturday peak hour); and
- Southbound approach (LOS F with a v/c ratio of 1.05 and a delay of 85.1 spv during the weekday AM peak hour; LOS F with a v/c ratio of 1.05 and a delay of 89.2 spv during the weekday midday peak hour; LOS F with a v/c ratio of 1.05 and a delay of 87.1 spv during the weekday PM peak hour; and LOS F with a v/c ratio of 1.05 and a delay of 86.7 spv during the Saturday peak hour).

As discussed above, the projects preferred design would not affect the traffic operations along Avenue C, at East 18th Street Extension, East 20th Street, and East 23rd Street and the proposed project would not generate any incremental vehicle trips under the 2024 or 2044 With Action conditions. As part of the design, the parking lot entrance/exit underneath the FDR Drive at East 20th Street would be reconfigured; however, the geometry and operation of the intersection would not change from the No Action to With Action conditions. As described above, the service road in front of the BP Gas Station east of East 23rd Street and Avenue C would be closed to vehicular traffic, however, similarly, the geometry and operation of the intersection would not change from the No Action to With Action conditions. Therefore, future No Action and With Action analyses were not prepared and significant adverse traffic impacts are not anticipated in the 2024 and 2044 With Action conditions.

H. DETAILED PEDESTRIAN ANALYSIS

2017 EXISTING CONDITIONS

As described above, pedestrian data were collected in June 2017. **Figures 13 through 16** show the 2017 existing pedestrian volumes for the weekday AM, midday, PM, and Saturday peak hours, respectively.

As shown in **Table 5**, all crosswalk analysis locations would operate at acceptable LOS C or better (minimum of 24.0 SFP), except for the east crosswalk of East 23rd Street and Avenue C in the weekday PM peak hour (LOS D with 21.81 SFP).

The projects preferred design would not affect the operations of the crosswalks at any of the three analysis locations. Therefore, future No Action and With Action analyses were not prepared and significant adverse pedestrian impacts are not anticipated in the 2024 and 2044 With Action conditions.

**Table 5
2017 Existing Conditions: Crosswalk Analysis**

| Location | Crosswalk | Crosswalk Length (ft) | Crosswalk Width (ft) | 2-way Peak Hour Volume | SFP | LOS |
|---|-----------|-----------------------|----------------------|------------------------|---------|-----|
| Weekday AM Peak Hour | | | | | | |
| East 18th Street Extension and Avenue C | North | 34.0 | 14.0 | 42 | 160.10 | A |
| | East | 31.0 | 12.0 | 137 | 189.42 | A |
| | South | 40.0 | 13.0 | 13 | 383.55 | A |
| | West | 29.0 | 14.0 | 72 | 688.58 | A |
| East 20th Street and Avenue C | North | 46.0 | 13.0 | 40 | 454.96 | A |
| | South | 57.0 | 15.0 | 43 | 418.11 | A |
| | West | 95.0 | 13.0 | 68 | 147.72 | A |
| East 23rd Street and Avenue C | North | 41.0 | 15.0 | 173 | 340.49 | A |
| | East | 54.0 | 12.0 | 397 | 24.73 | C |
| | South | 27.0 | 15.0 | 226 | 48.20 | B |
| | West | 96.0 | 15.0 | 151 | 97.41 | A |
| Weekday Midday Peak Hour | | | | | | |
| East 18th Street Extension and Avenue C | North | 34.0 | 14.0 | 33 | 268.00 | A |
| | East | 31.0 | 12.0 | 77 | 336.20 | A |
| | South | 40.0 | 13.0 | 8 | 794.26 | A |
| | West | 29.0 | 14.0 | 58 | 737.77 | A |
| East 20th Street and Avenue C | North | 46.0 | 13.0 | 23 | 635.45 | A |
| | South | 57.0 | 15.0 | 25 | 639.08 | A |
| | West | 95.0 | 13.0 | 53 | 205.28 | A |
| East 23rd Street and Avenue C | North | 41.0 | 15.0 | 165 | 300.66 | A |
| | East | 54.0 | 12.0 | 201 | 59.58 | B |
| | South | 27.0 | 15.0 | 130 | 99.50 | A |
| | West | 96.0 | 15.0 | 107 | 139.11 | A |
| Weekday PM Peak Hour | | | | | | |
| East 18th Street Extension and Avenue C | North | 34.0 | 14.0 | 92 | 123.33 | A |
| | East | 31.0 | 12.0 | 263 | 113.27 | A |
| | South | 40.0 | 13.0 | 19 | 454.13 | A |
| | West | 29.0 | 14.0 | 124 | 442.32 | A |
| East 20th Street and Avenue C | North | 46.0 | 13.0 | 77 | 277.66 | A |
| | South | 57.0 | 15.0 | 72 | 261.57 | A |
| | West | 95.0 | 13.0 | 68 | 182.24 | A |
| East 23rd Street and Avenue C | North | 41.0 | 15.0 | 174 | 374.55 | A |
| | East | 54.0 | 12.0 | 544 | 21.81 | D |
| | South | 27.0 | 15.0 | 152 | 83.29 | A |
| | West | 96.0 | 15.0 | 96 | 156.93 | A |
| Saturday Peak Hour | | | | | | |
| East 18th Street Extension and Avenue C | North | 34.0 | 14.0 | 65 | 156.62 | A |
| | East | 31.0 | 12.0 | 39 | 703.22 | A |
| | South | 40.0 | 13.0 | 7 | 1040.35 | A |
| | West | 29.0 | 14.0 | 76 | 639.70 | A |
| East 20th Street and Avenue C | North | 46.0 | 13.0 | 52 | 356.35 | A |
| | South | 57.0 | 15.0 | 60 | 395.31 | A |
| | West | 95.0 | 13.0 | 29 | 444.60 | A |
| East 23rd Street and Avenue C | North | 41.0 | 15.0 | 112 | 417.69 | A |
| | East | 54.0 | 12.0 | 201 | 57.60 | B |
| | South | 27.0 | 15.0 | 79 | 170.66 | A |
| | West | 96.0 | 15.0 | 46 | 371.77 | A |

Note: SFP = square feet per pedestrian.

I. CONCLUSION

This technical memorandum evaluated the feasibility of converting the easternmost segment of East 10th Street between a traffic circle and the FDR Drive service road from two-way to one-way eastbound in association with the relocation of the East 10th Street pedestrian/bicycle bridge; and closing the service road in front of the BP Gas Station east of East 23rd Street and Avenue C to vehicular traffic.

The existing hourly background traffic volumes traveling westbound along the East 10th Street segment are low, with an average of 15 vehicles per hour between 6:00 AM and 8:00 PM and a maximum of 35 vehicles in an hour within that same period that would need to be diverted to surrounding intersections. Since the

number of diverted vehicles in any hour would be fewer than 50 vehicle trips, which is the *CEQR Technical Manual* minimum threshold for further traffic analysis, it is anticipated that the conversion of East 10th Street between the traffic circle and the FDR Drive service road from two-way to one-way eastbound would not result in any significant adverse traffic impacts.

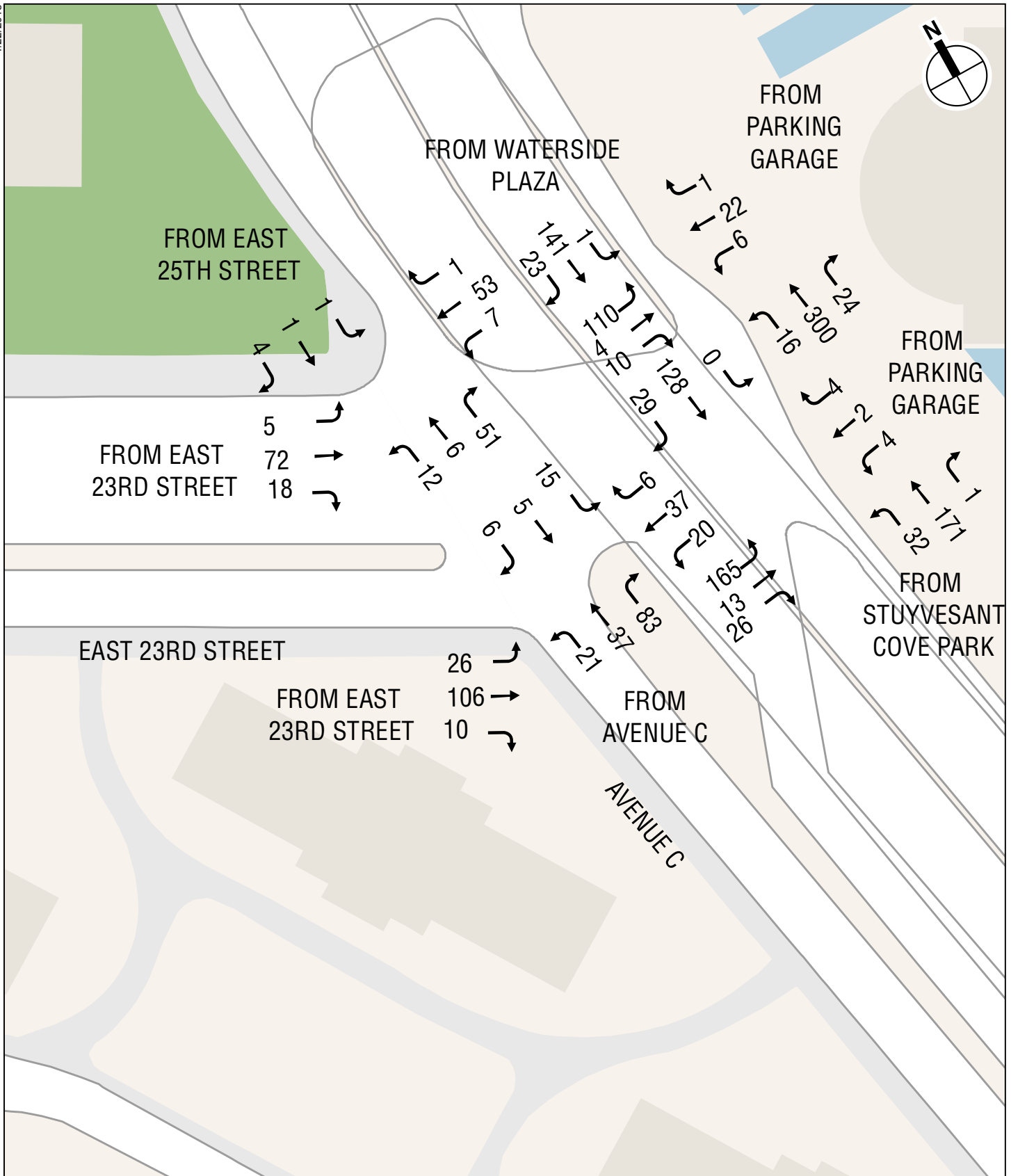
The existing hourly traffic volumes traveling southbound along the service road at East 23rd Street are low, with an average of 10 vehicles per hour between 6:00 AM and 8:00 PM and a maximum of 22 vehicles in an hour within that same period that would need to be diverted to surrounding intersections. Since the number of diverted vehicles in a peak hour would be fewer than 50 vehicle trips, it is anticipated that closing the service road to vehicular traffic would not result in any significant adverse traffic impacts.

*

APPENDIX

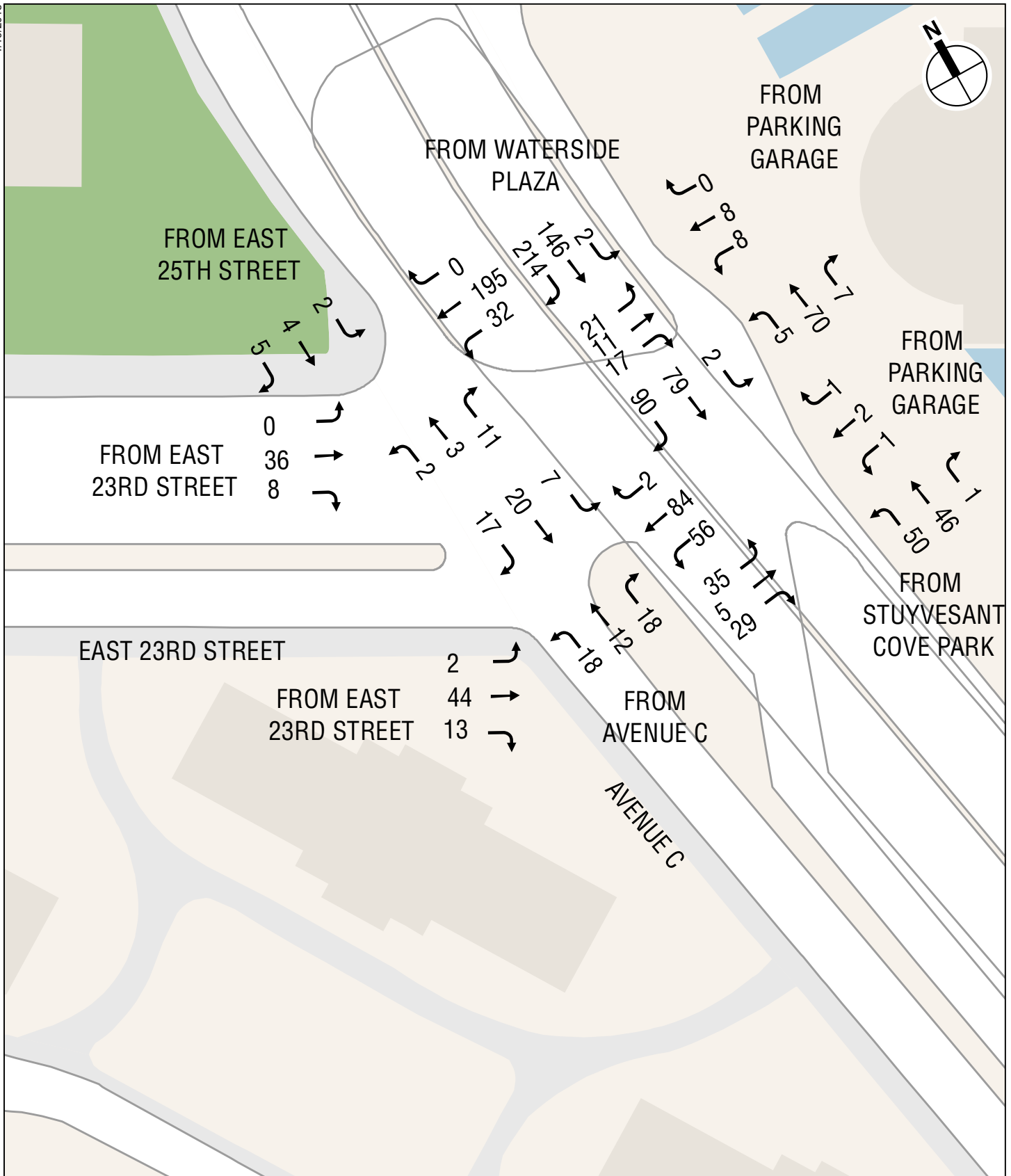
- Figure 1 – East 23rd Street Existing Pedestrian Volumes – Weekday AM Peak Hour
- Figure 2 – East 23rd Street Existing Pedestrian Volumes – Weekday Midday Peak Hour
- Figure 3 – East 23rd Street Existing Pedestrian Volumes – Weekday PM Peak Hour
- Figure 4 – East 23rd Street Existing Pedestrian Volumes – Saturday Peak Hour
- Figure 5a – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner – Weekday AM Peak Hour
- Figure 5b – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner – Weekday AM Peak Hour
- Figure 5c – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northwest Corner – Weekday AM Peak Hour
- Figure 5d – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner – Weekday AM Peak Hour
- Figure 6a – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner – Weekday Midday Peak Hour
- Figure 6b – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner – Weekday Midday Peak Hour
- Figure 6c – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northwest Corner – Weekday Midday Peak Hour
- Figure 6d – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner – Weekday Midday Peak Hour
- Figure 7a – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner – Weekday PM Peak Hour
- Figure 7b – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner – Weekday PM Peak Hour
- Figure 7c – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northwest Corner – Weekday PM Peak Hour
- Figure 7d – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner – Weekday PM Peak Hour

- Figure 8a – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner – Saturday Peak Hour
- Figure 8b – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner – Saturday Peak Hour
- Figure 8c – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northwest Corner – Saturday Peak Hour
- Figure 8d – East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner – Saturday Peak Hour
- Figure 9 – 2017 Existing Traffic Volumes – Weekday AM Peak Hour
- Figure 10 – 2017 Existing Traffic Volumes – Weekday Midday Peak Hour
- Figure 11 – 2017 Existing Traffic Volumes – Weekday PM Peak Hour
- Figure 12 – 2017 Existing Traffic Volumes – Saturday Peak Hour
- Figure 13 – 2017 Existing Pedestrian Volumes – Weekday AM Peak Hour
- Figure 14 – 2017 Existing Pedestrian Volumes – Weekday Midday Peak Hour
- Figure 15 – 2017 Existing Pedestrian Volumes – Weekday PM Peak Hour
- Figure 16 – 2017 Existing Pedestrian Volumes – Saturday Peak Hour



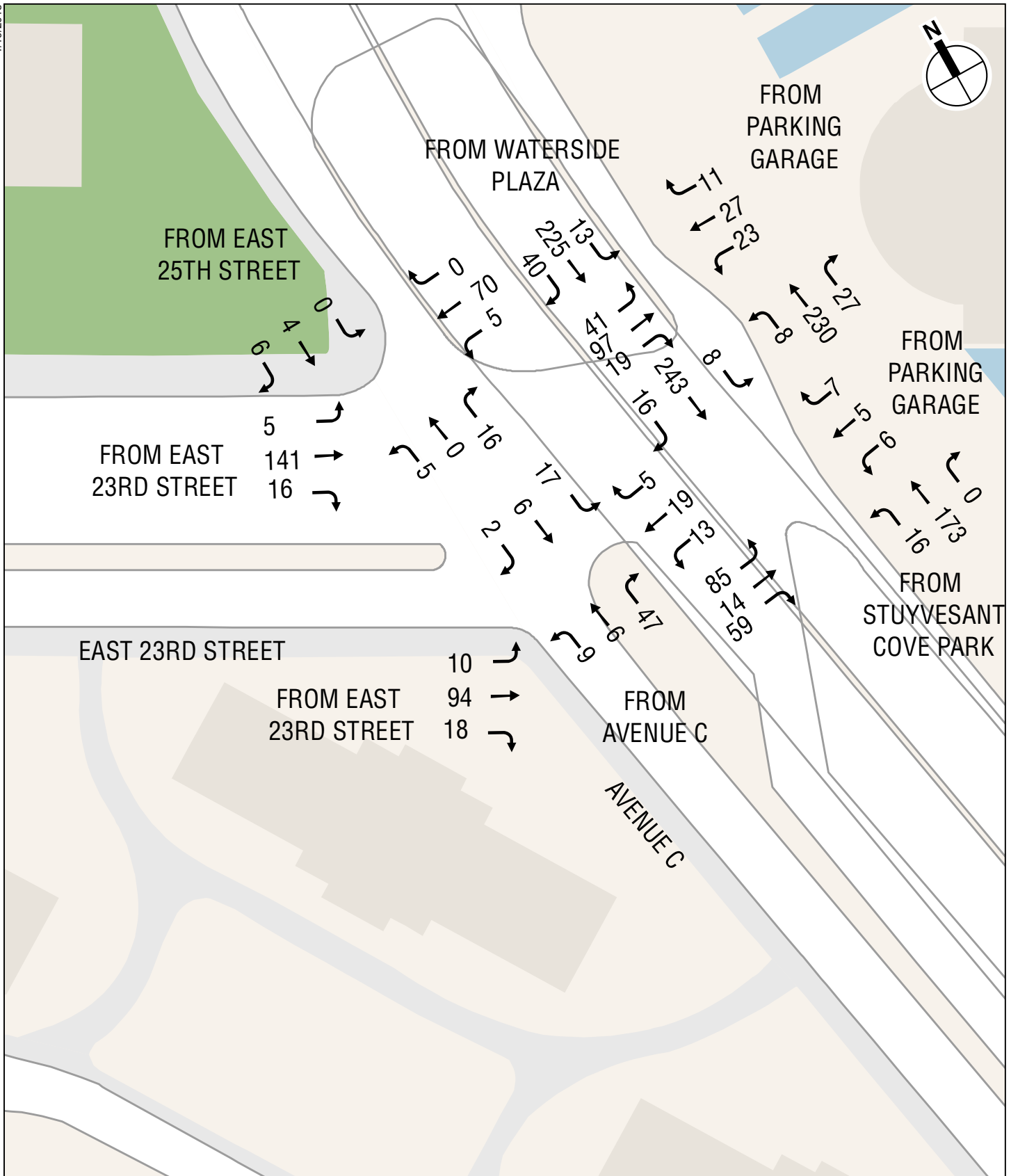
East 23rd Street Existing Pedestrian Volumes
Weekday AM Peak Hour

Figure 1



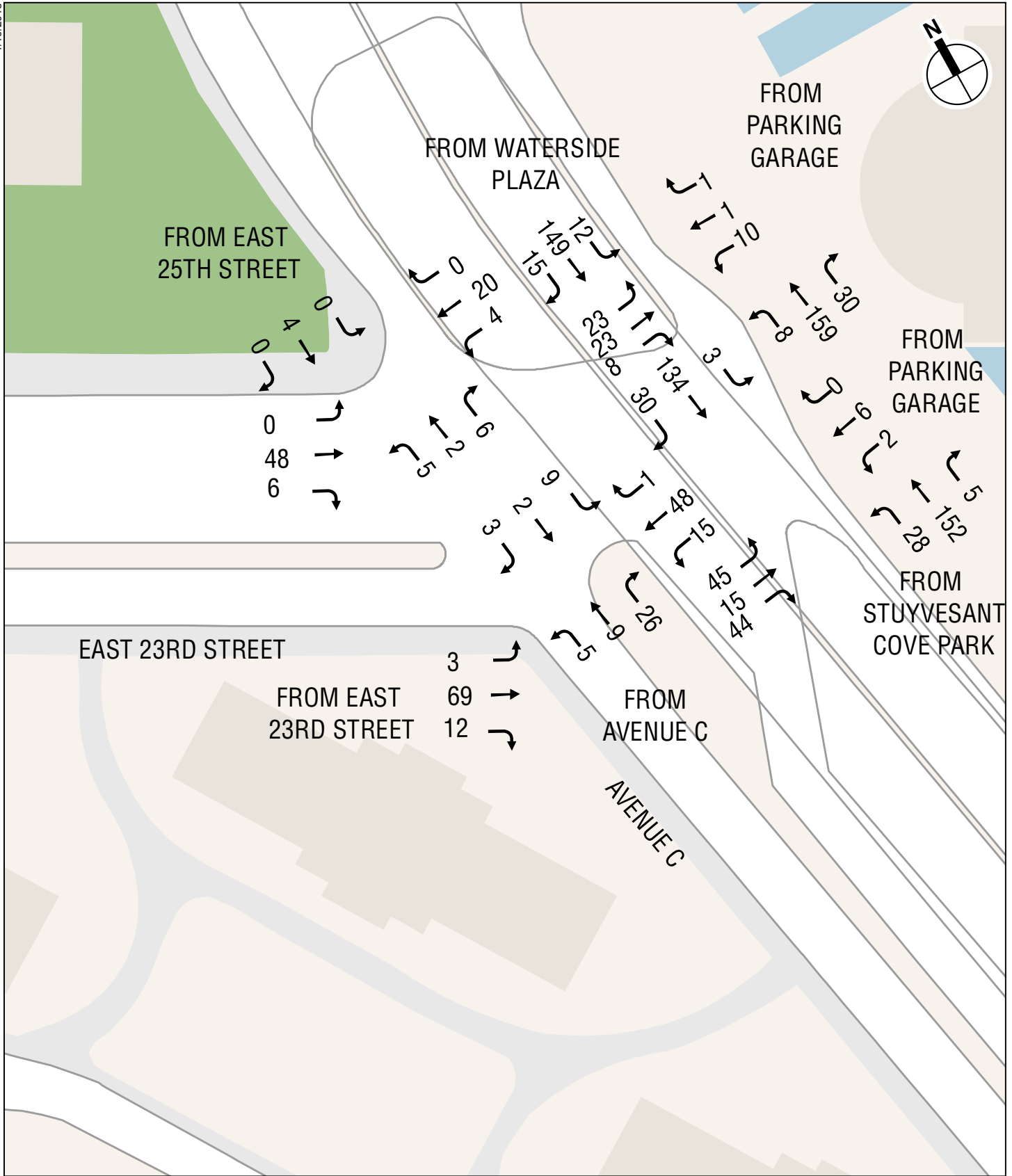
East 23rd Street Existing Pedestrian Volumes
Weekday Midday Peak Hour

Figure 2



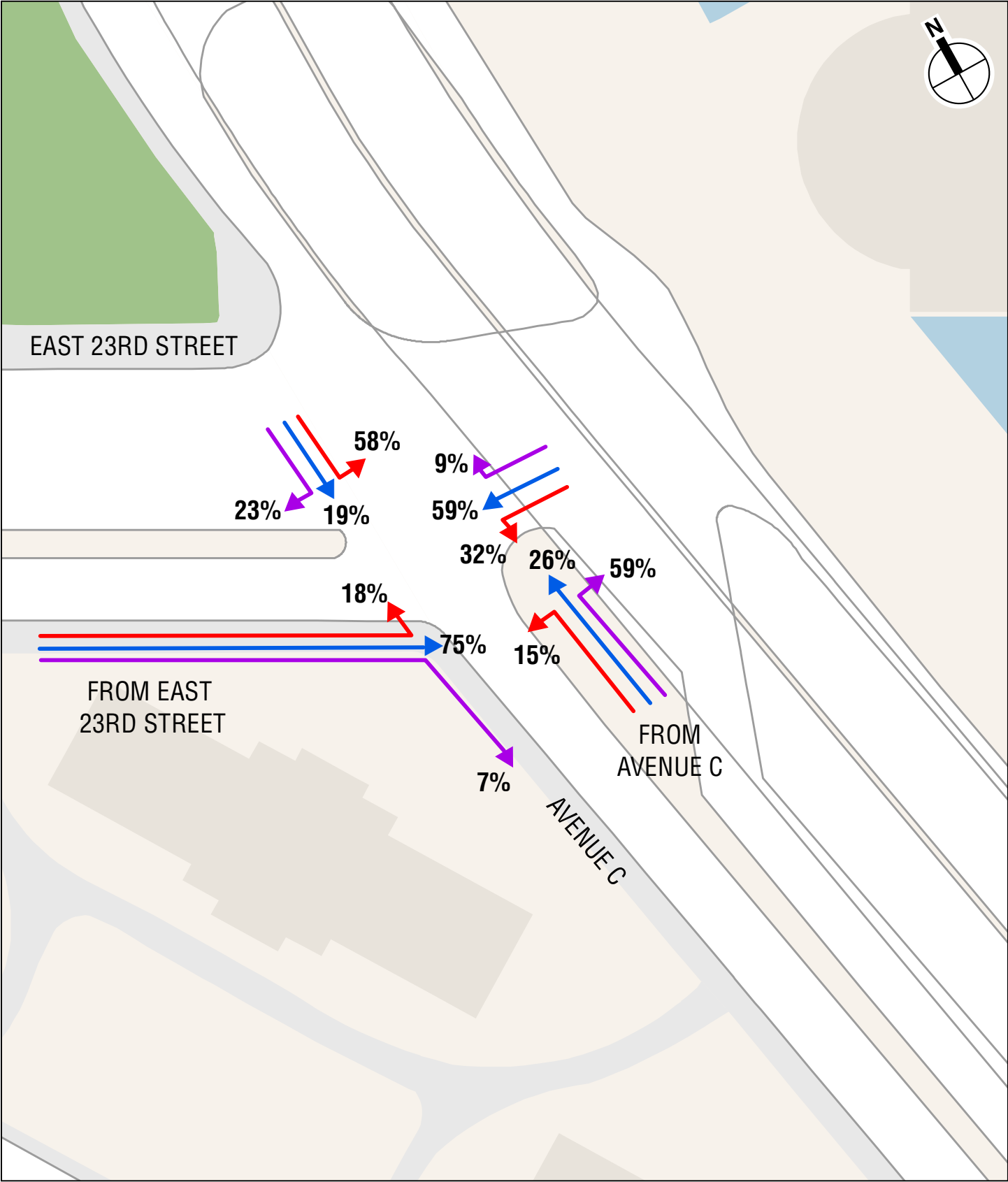
East 23rd Street Existing Pedestrian Volumes
Weekday PM Peak Hour

Figure 3

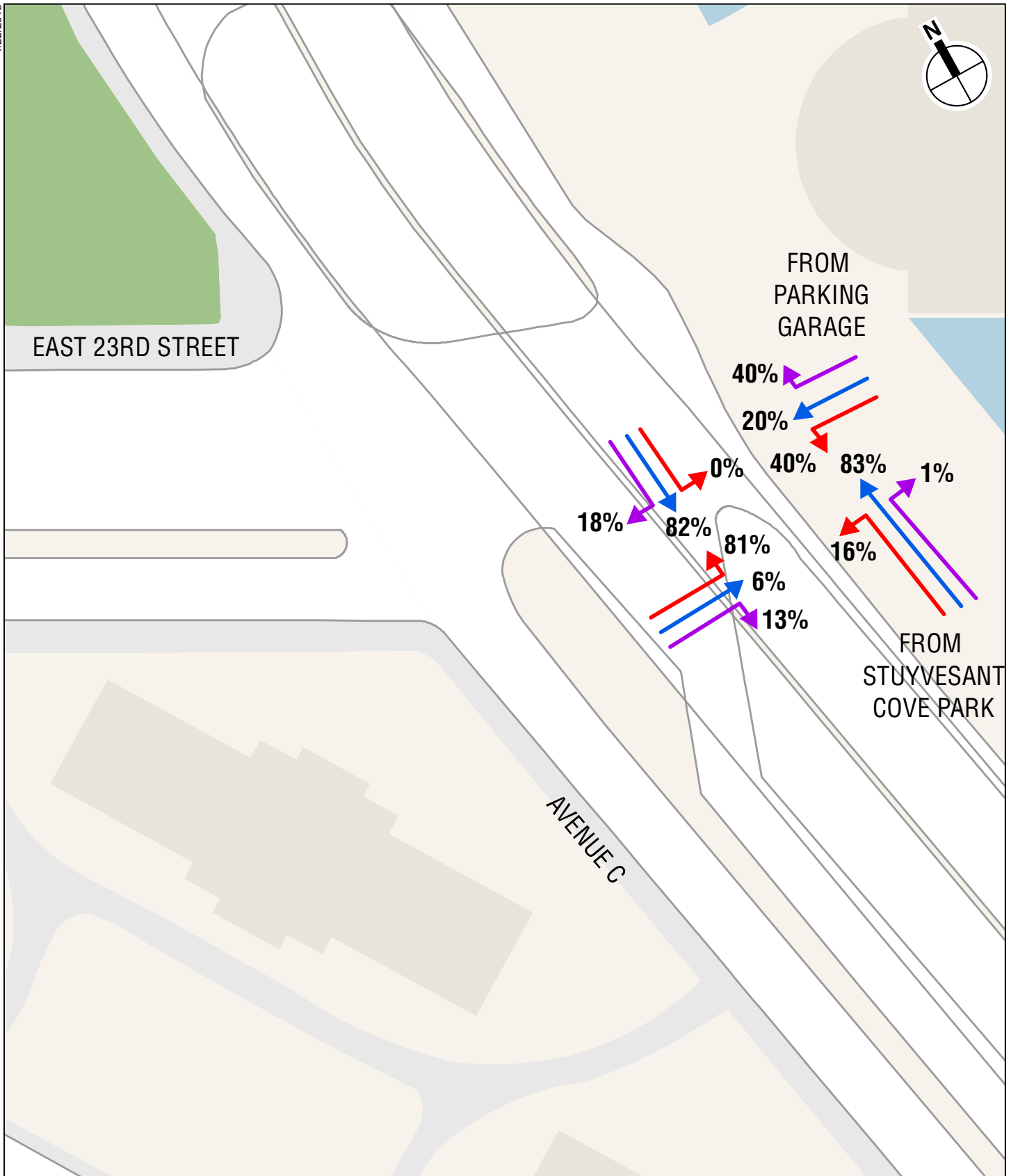


East 23rd Street Existing Pedestrian Volumes
Saturday Peak Hour

Figure 4

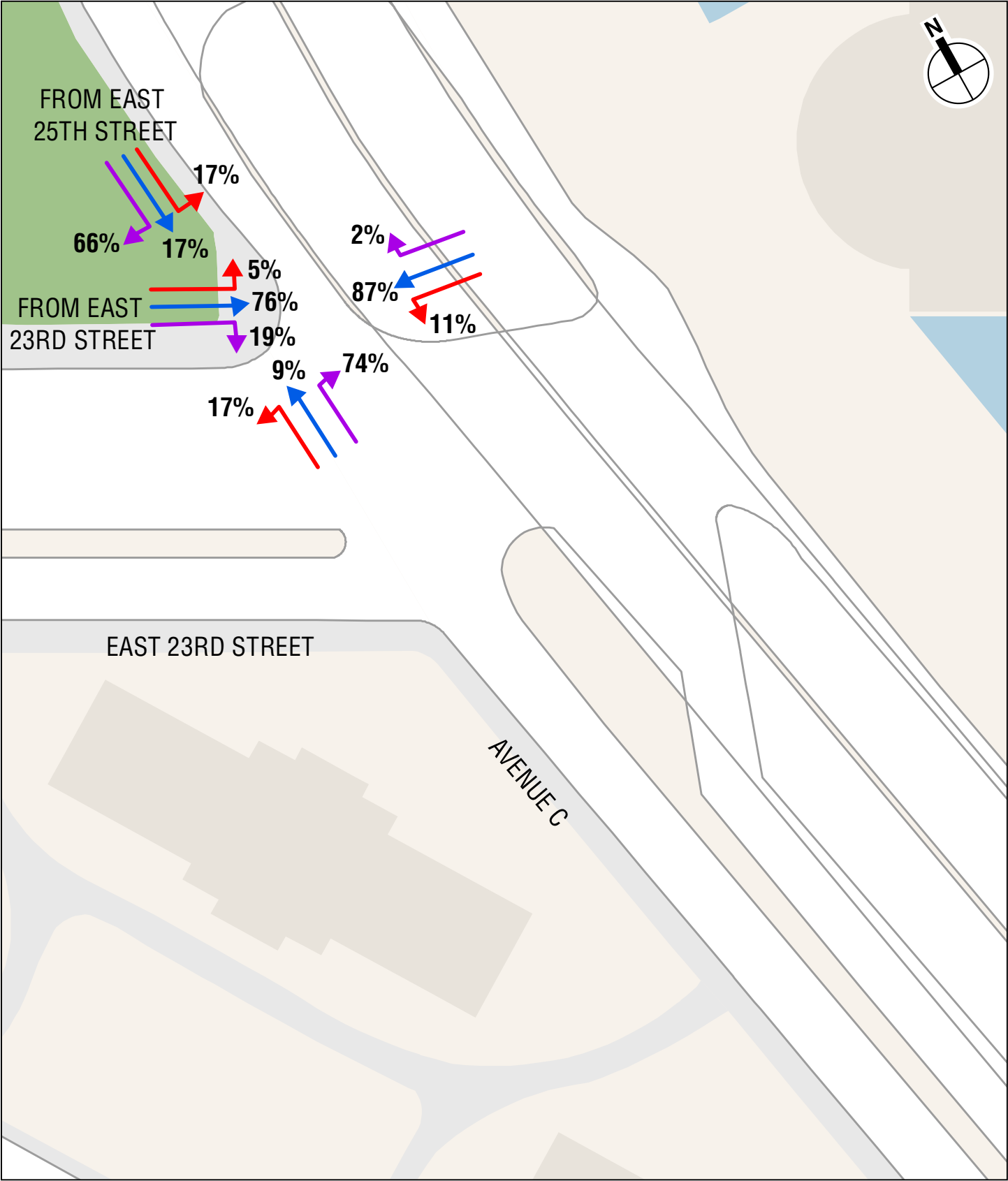


East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner
Weekday AM Peak Hour

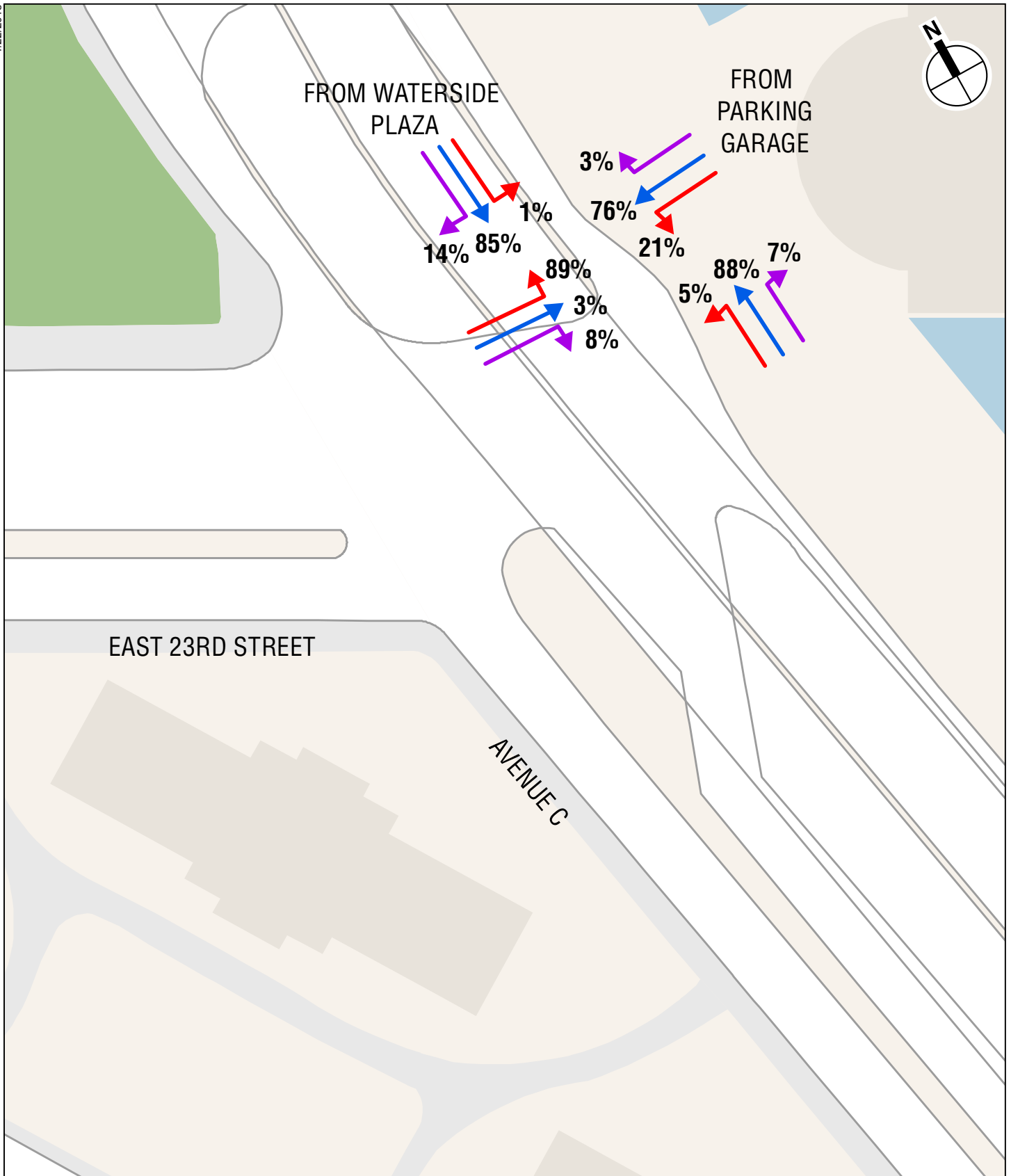


East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner Weekday AM Peak Hour

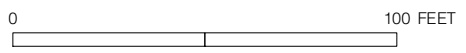
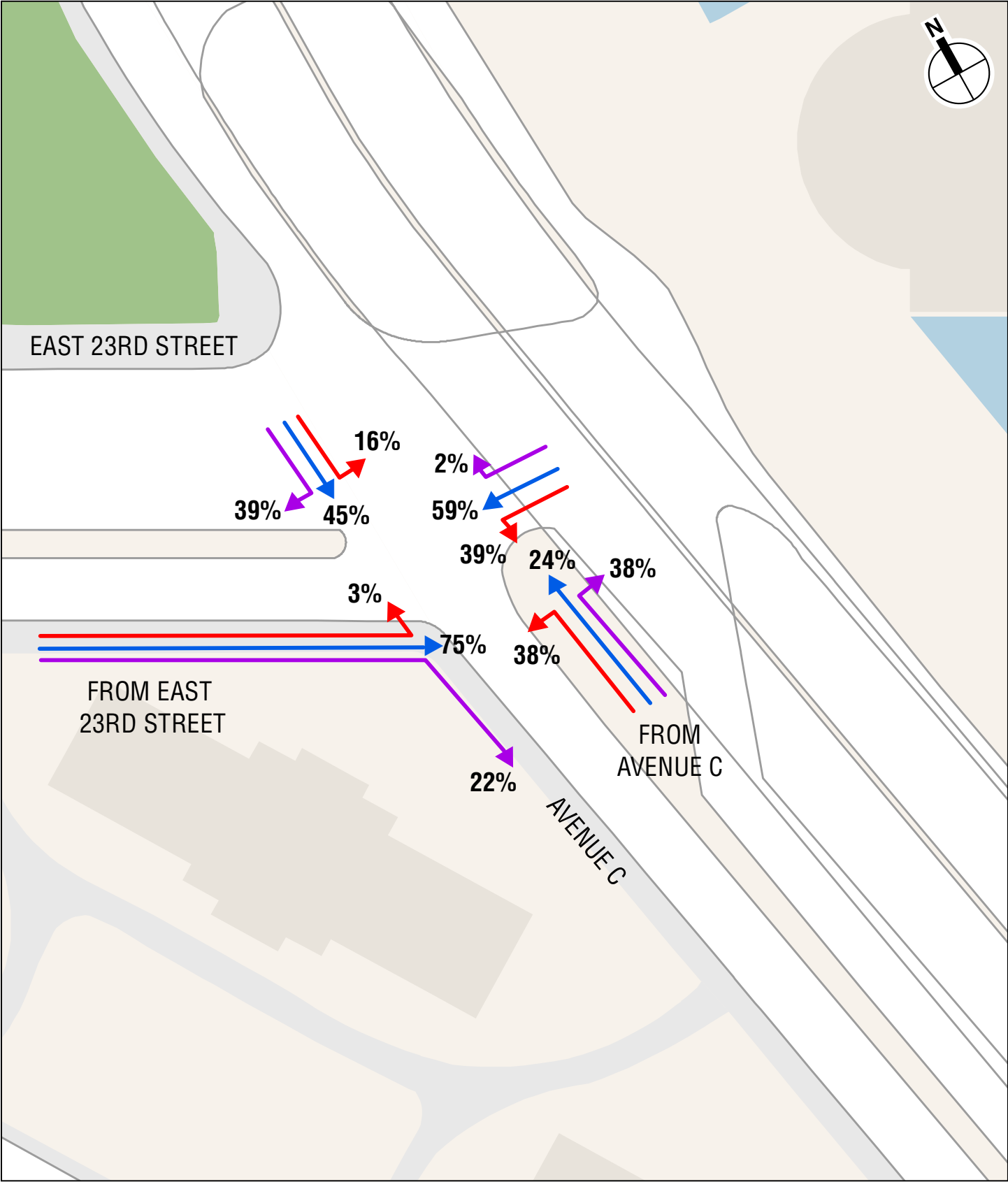
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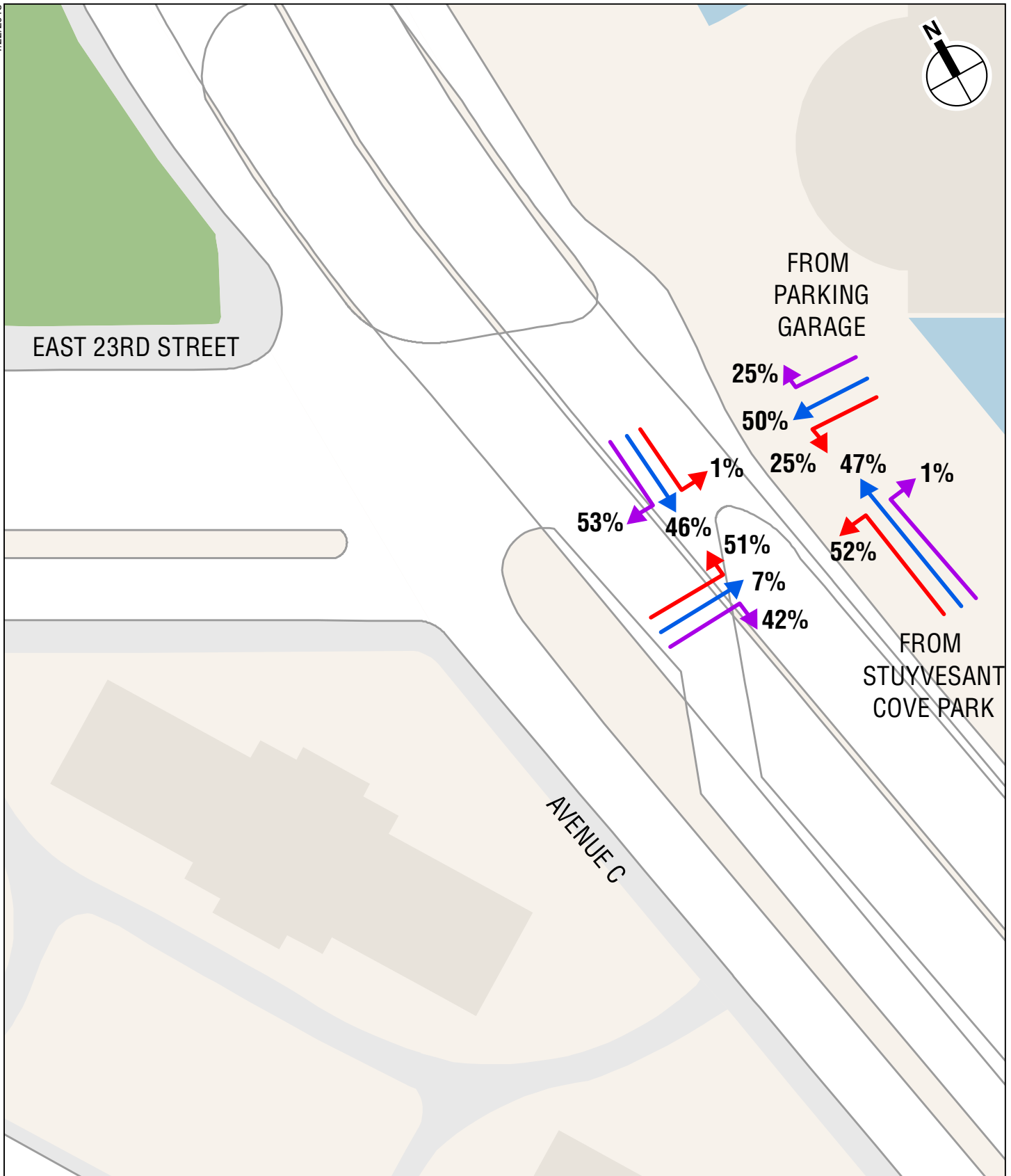
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northwest Corner
Weekday AM Peak Hour



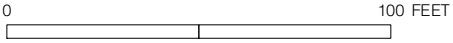
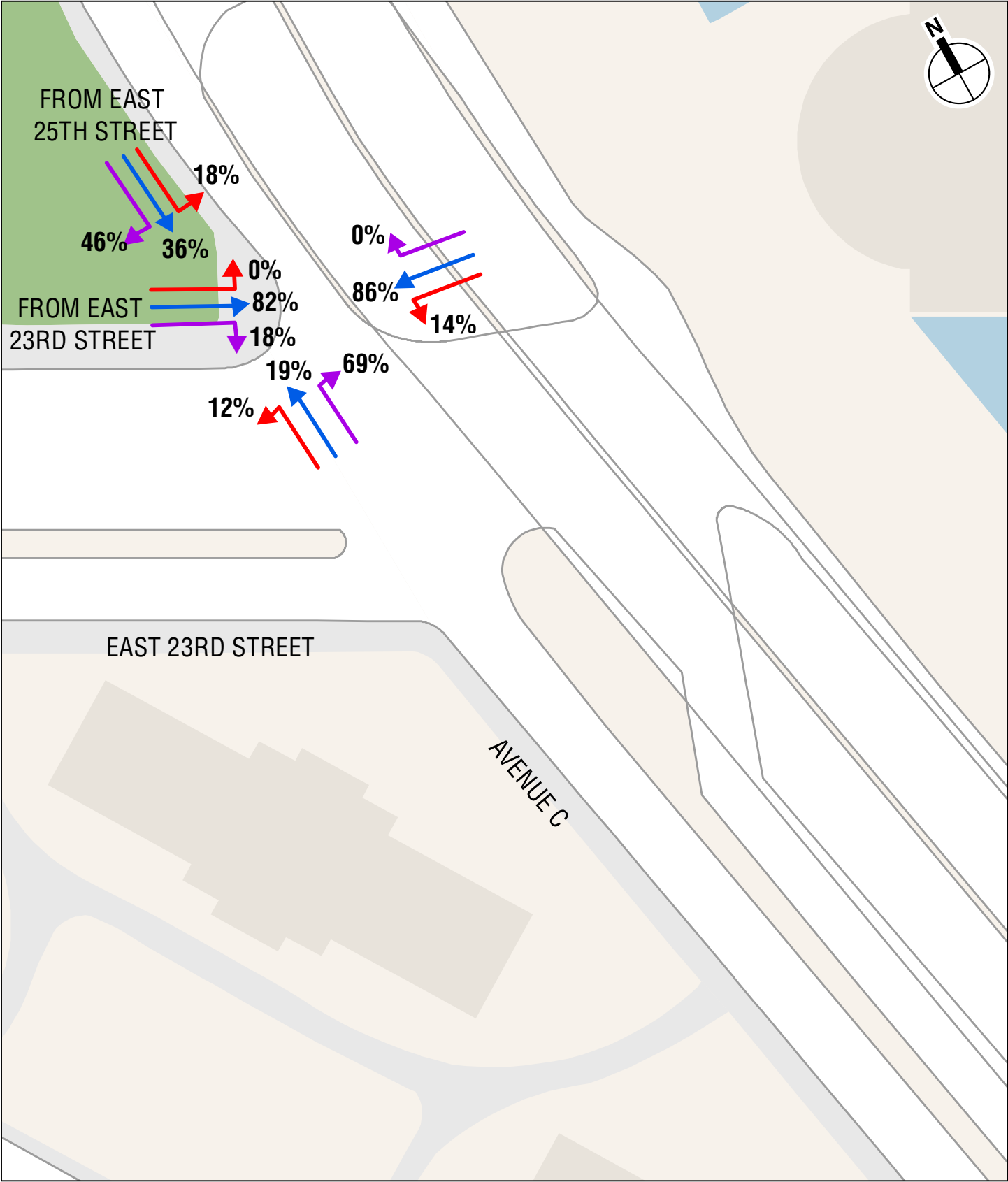
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner
Weekday AM Peak Hour



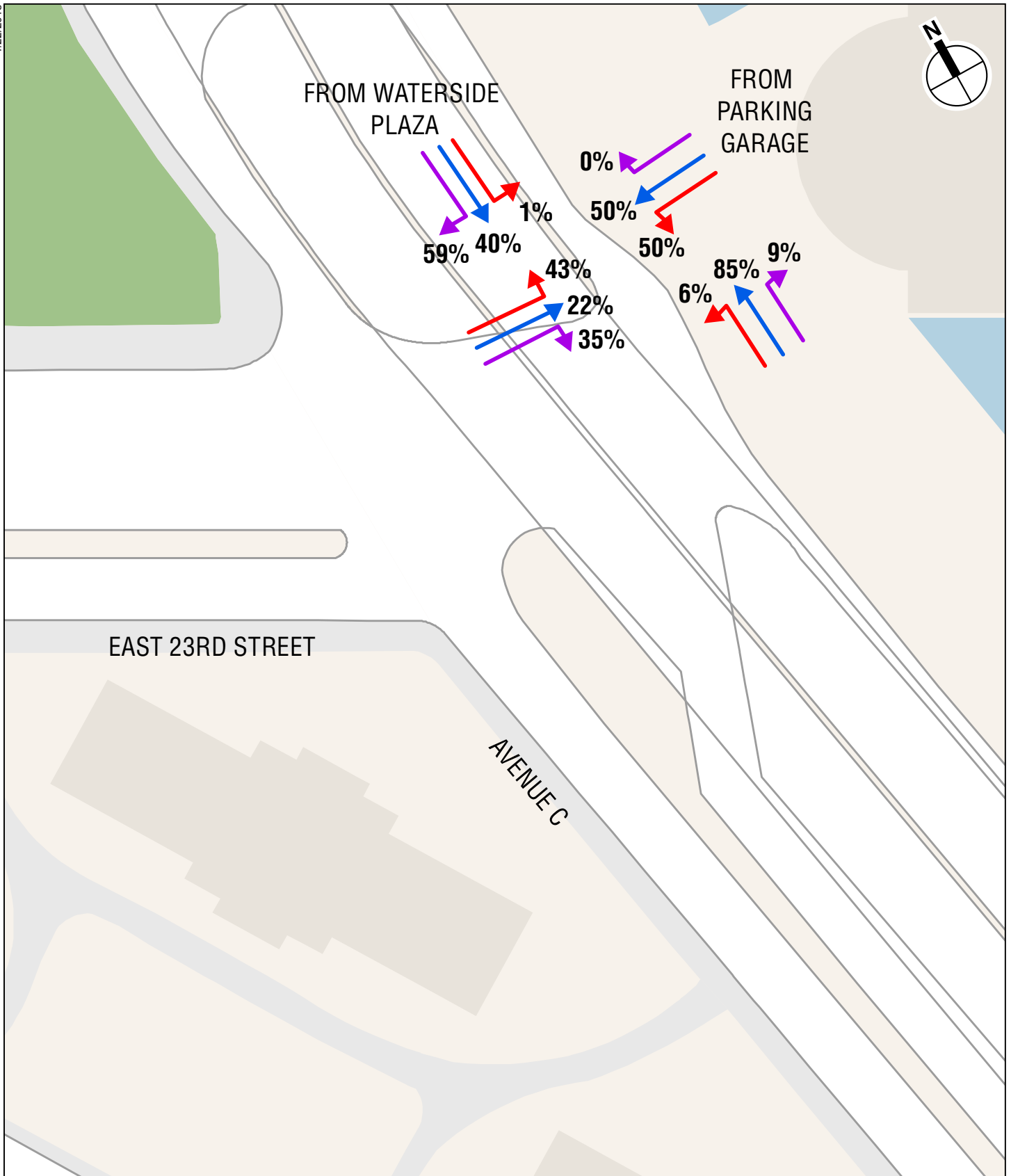
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner
Weekday Midday Peak Hour



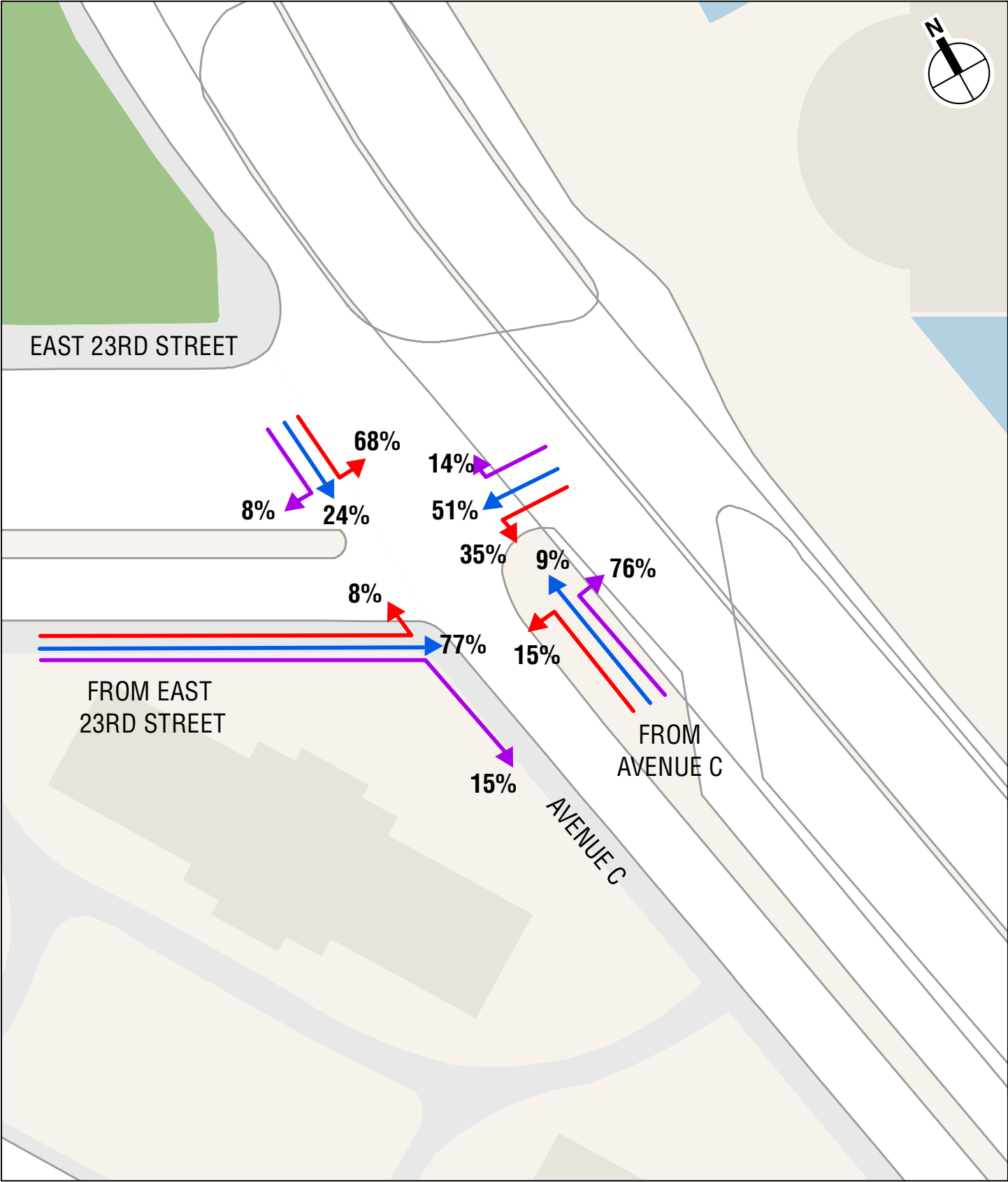
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner
Weekday Midday Peak Hour



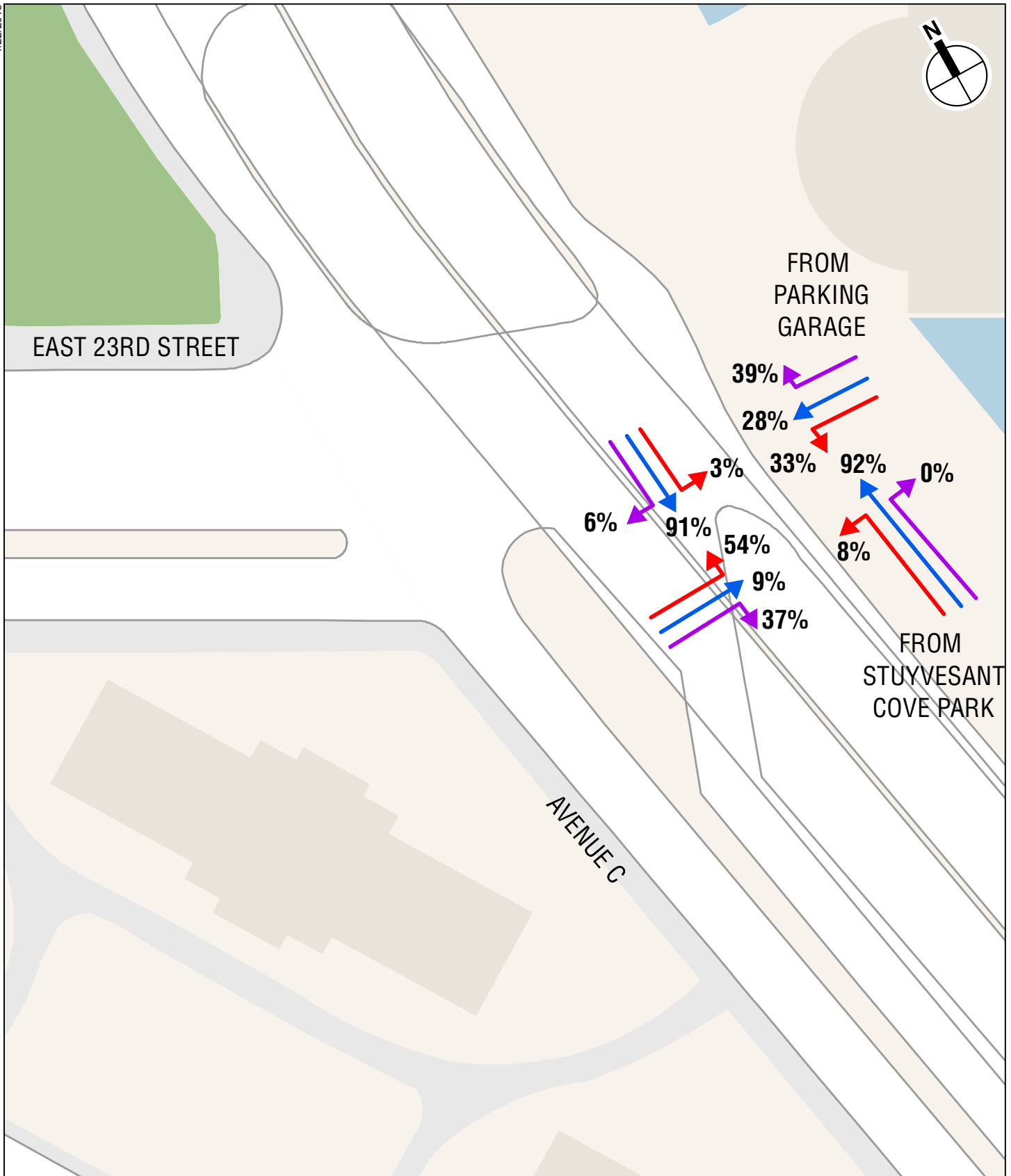
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Weekday Midday Peak Hour



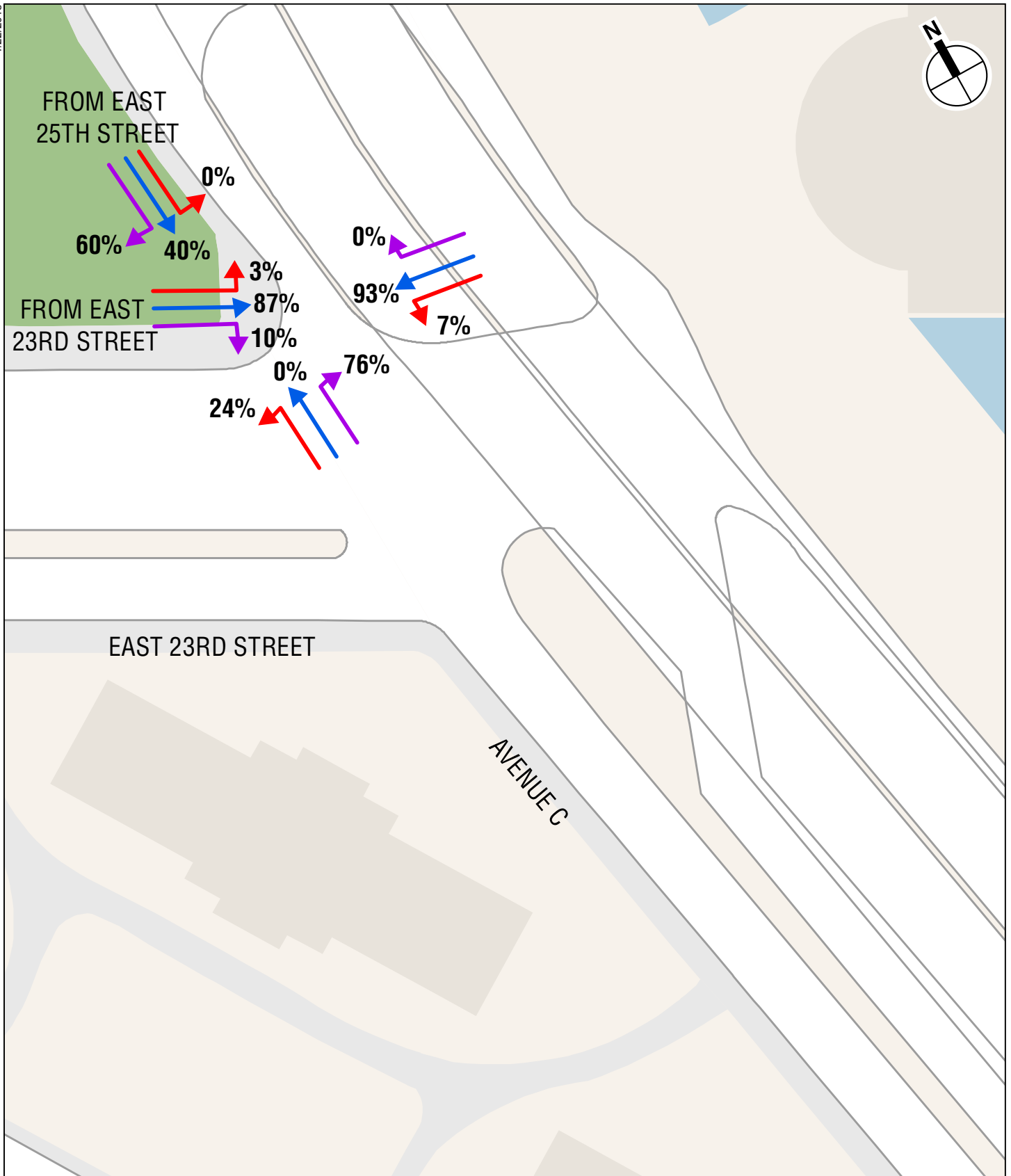
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner
Weekday Midday Peak Hour



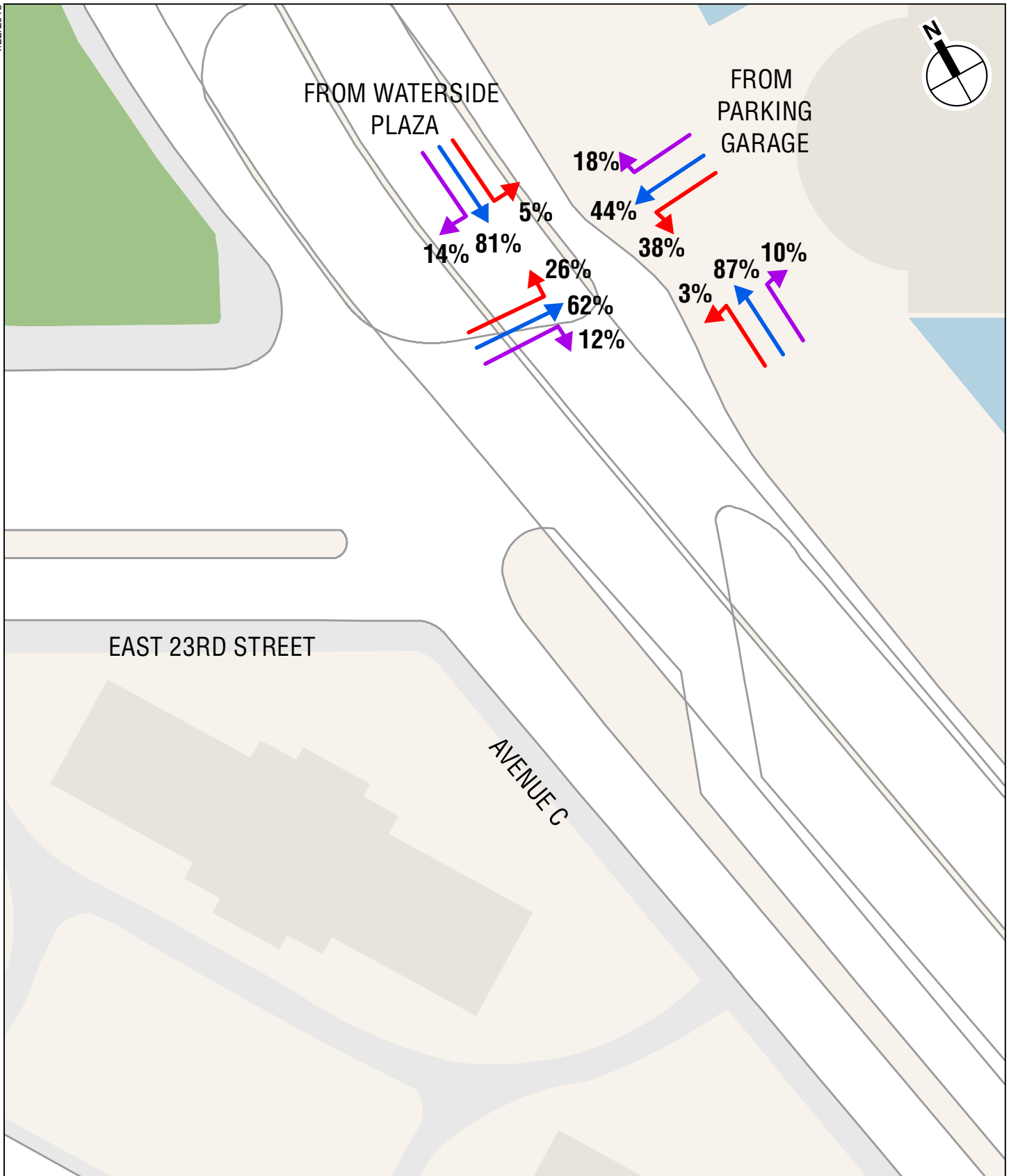
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner Weekday PM Peak Hour



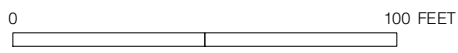
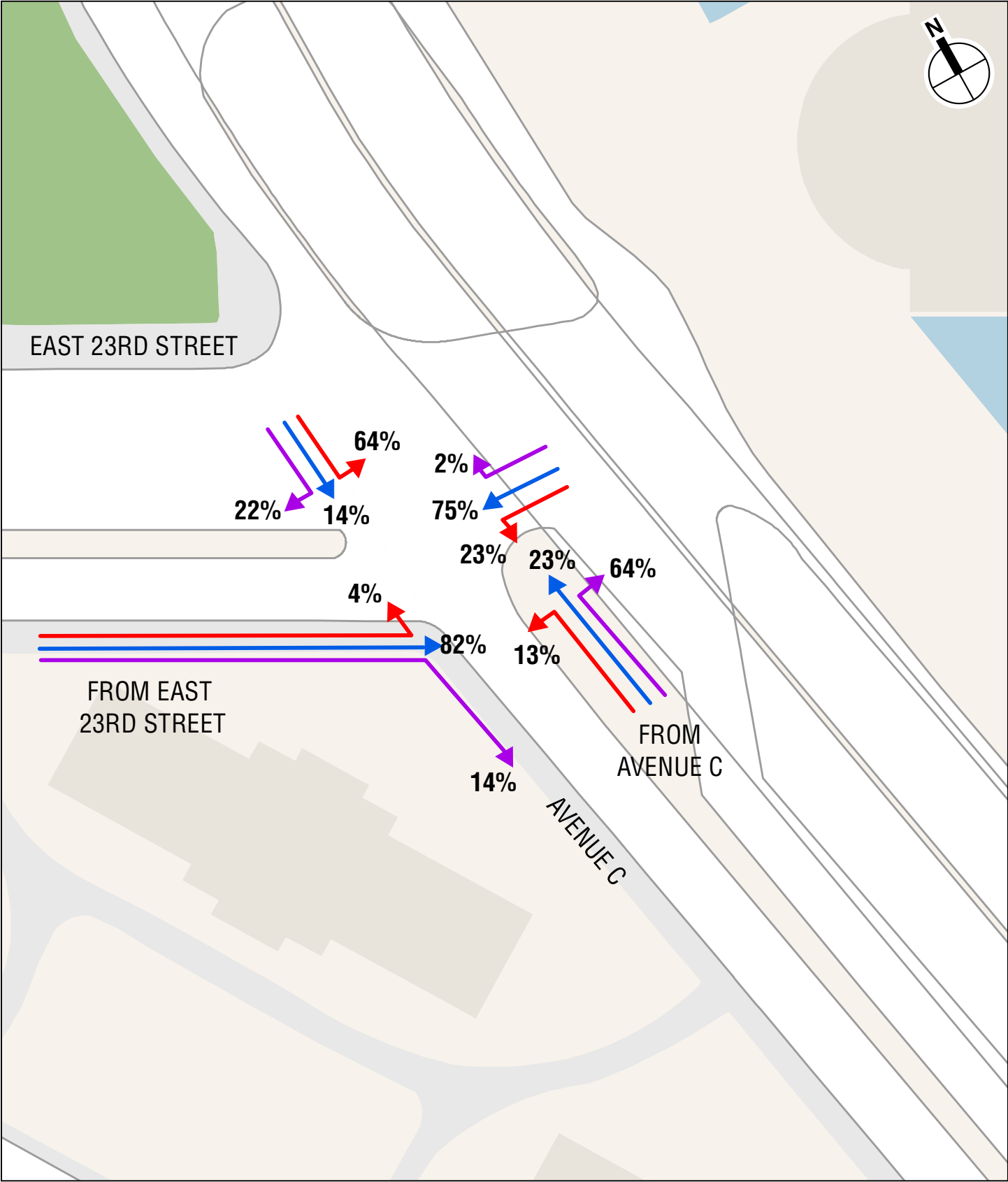
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner Weekday PM Peak Hour



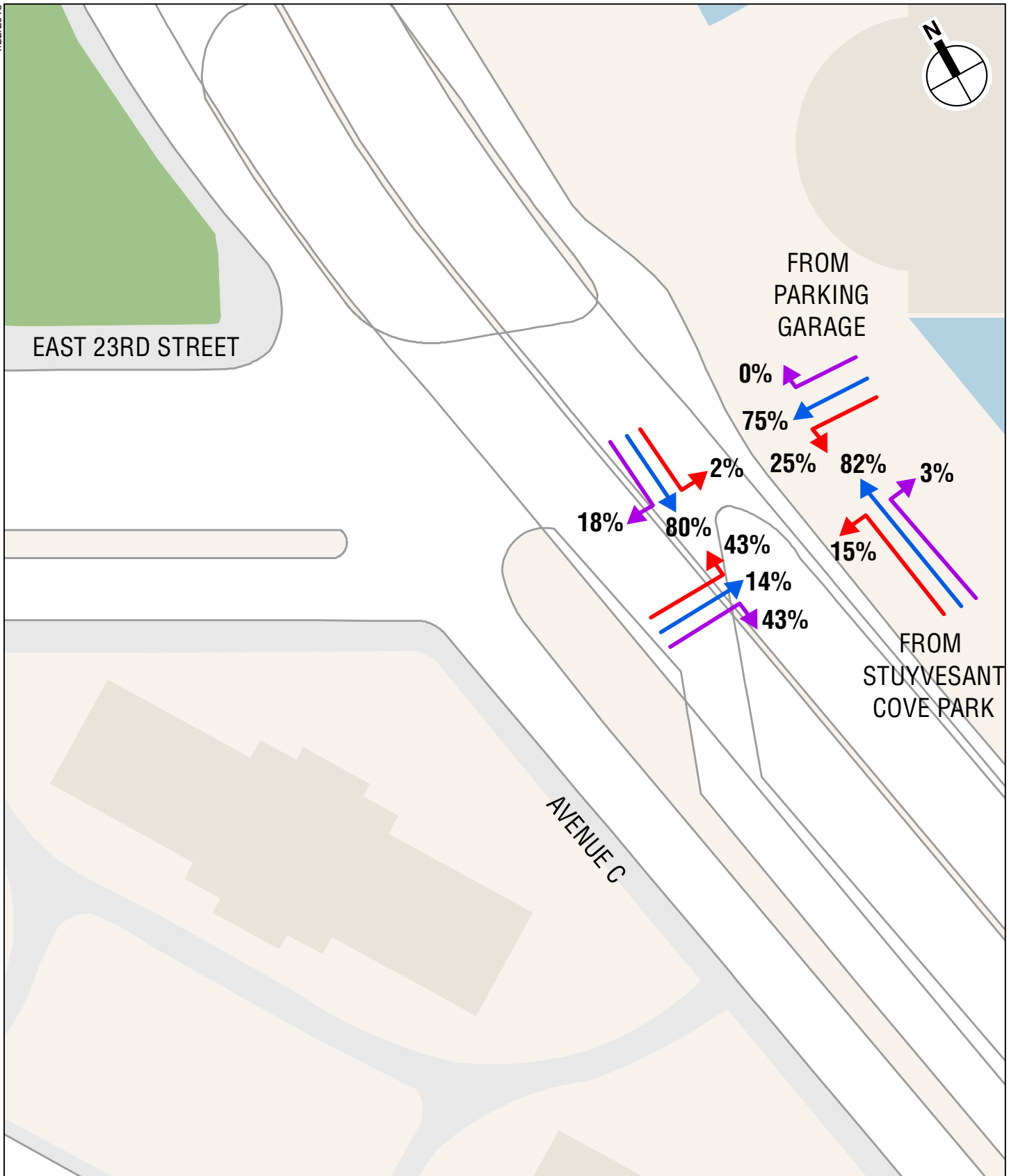
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northwest Corner
Weekday PM Peak Hour



East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner
Weekday PM Peak Hour

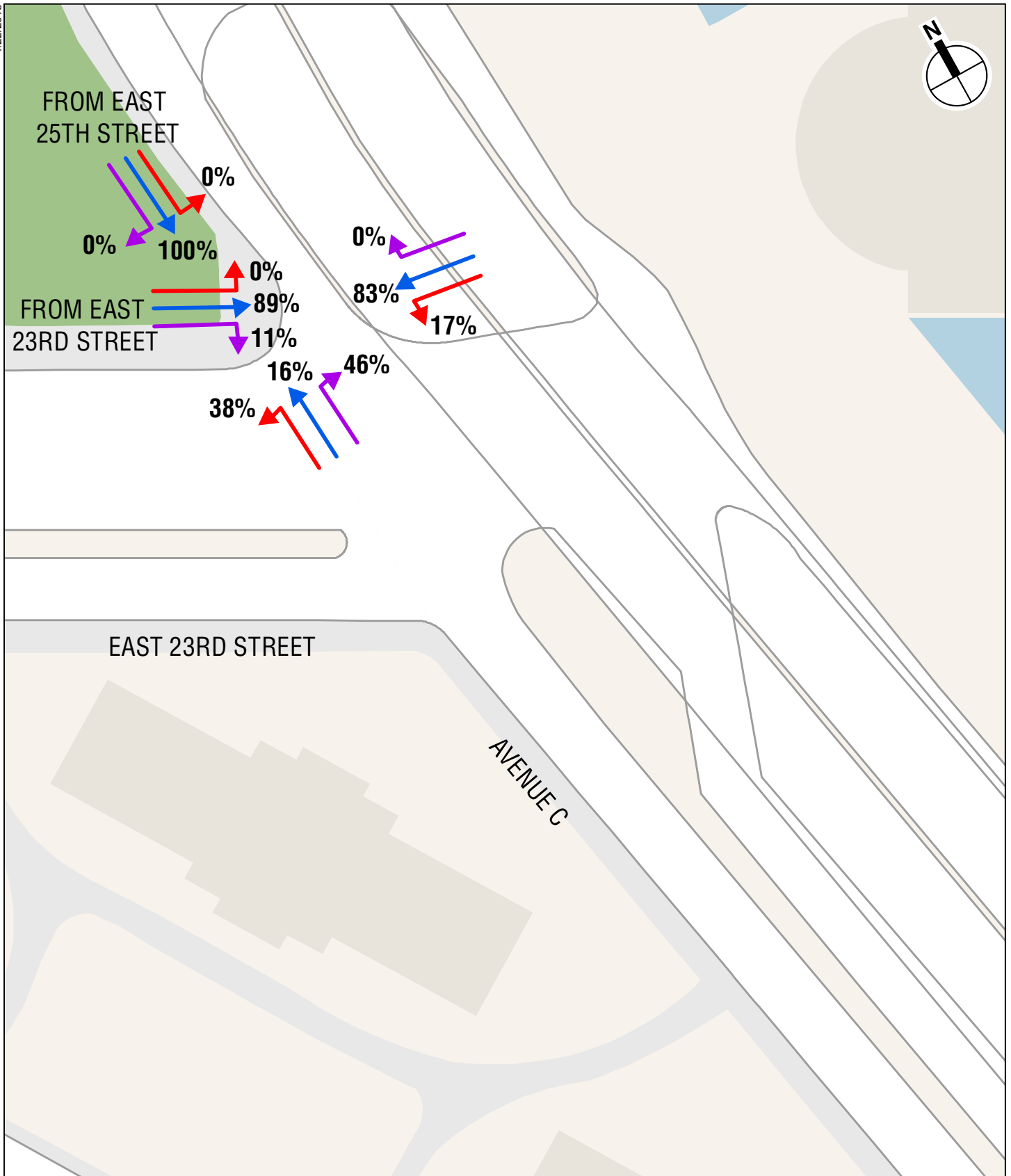


East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southwest Corner Saturday Peak Hour

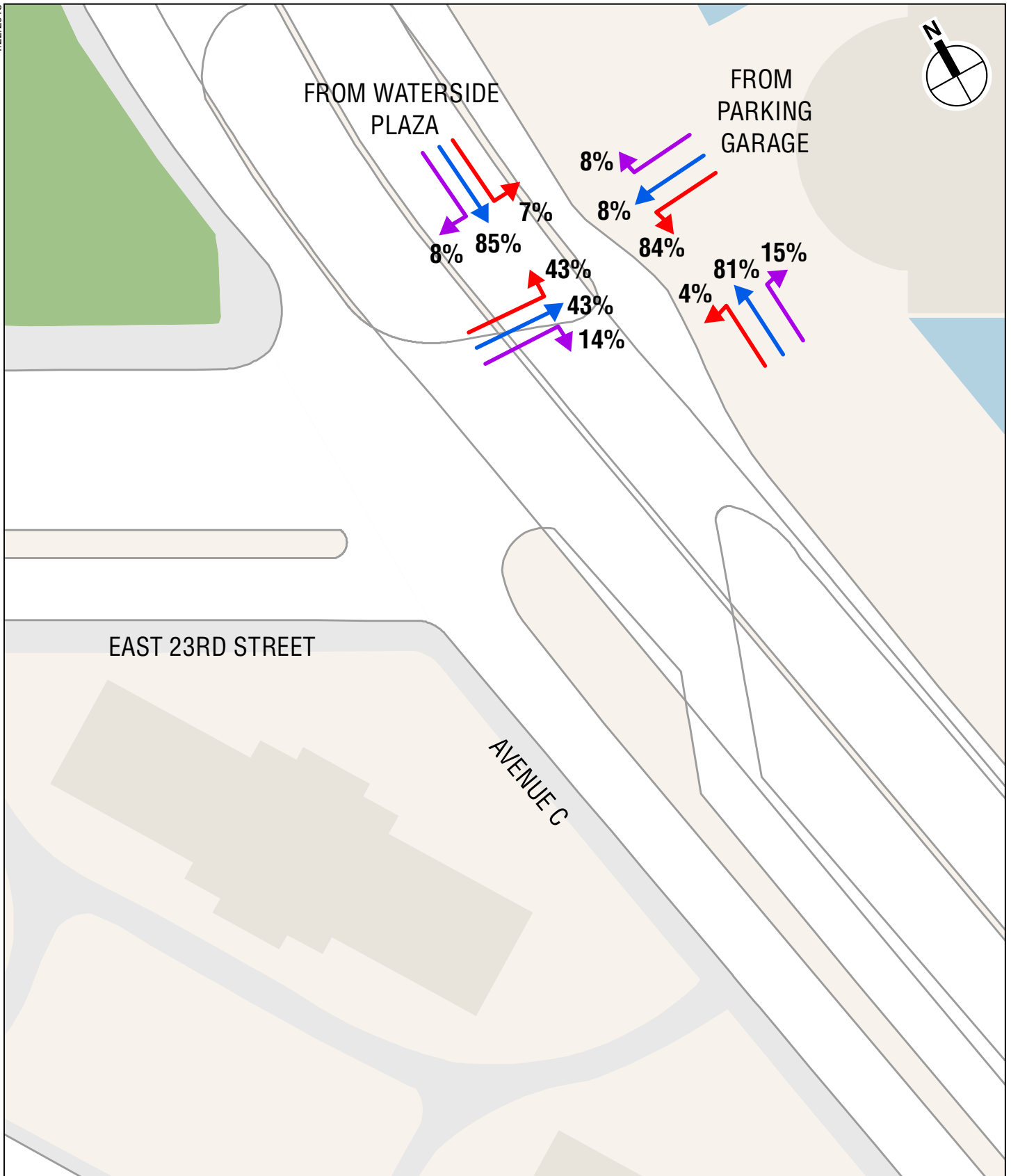


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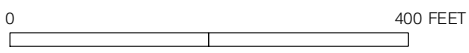
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Southeast Corner Saturday Peak Hour



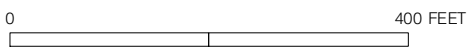
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northwest Corner
Saturday Peak Hour



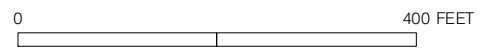
East 23rd Street Existing Pedestrian Volume Percent Distribution To/From Northeast Corner
Saturday Peak Hour



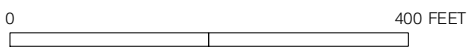
2017 Existing Traffic Volumes
 Weekday AM Peak Hour
Figure 9



2017 Existing Traffic Volumes
 Weekday Midday Peak Hour
Figure 10

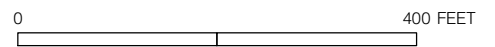


2017 Existing Traffic Volumes
 Weekday PM Peak Hour
Figure 11

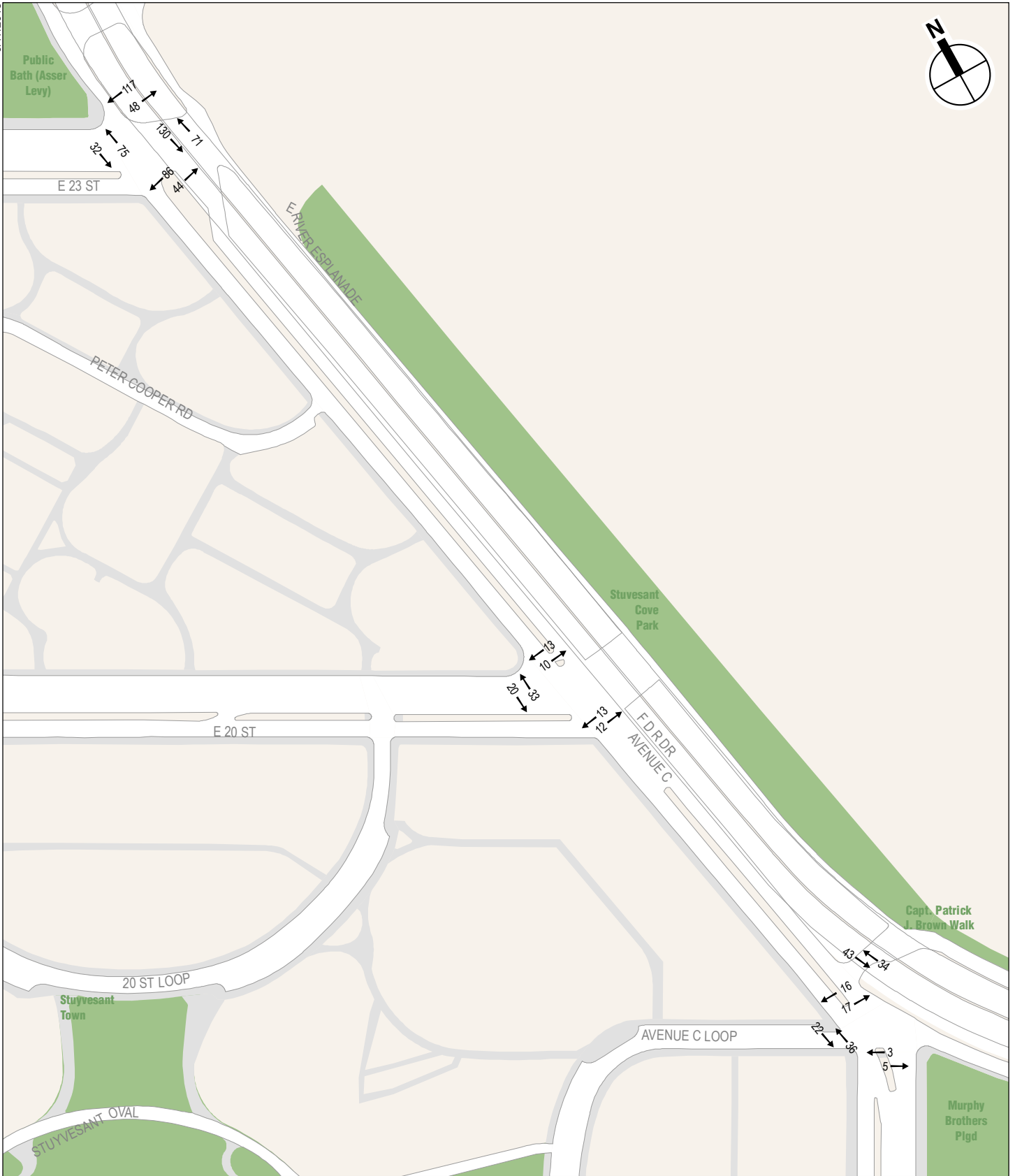


2017 Existing Traffic Volumes
 Saturday Peak Hour
Figure 12

9/17/2018

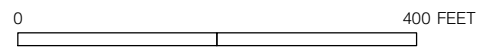
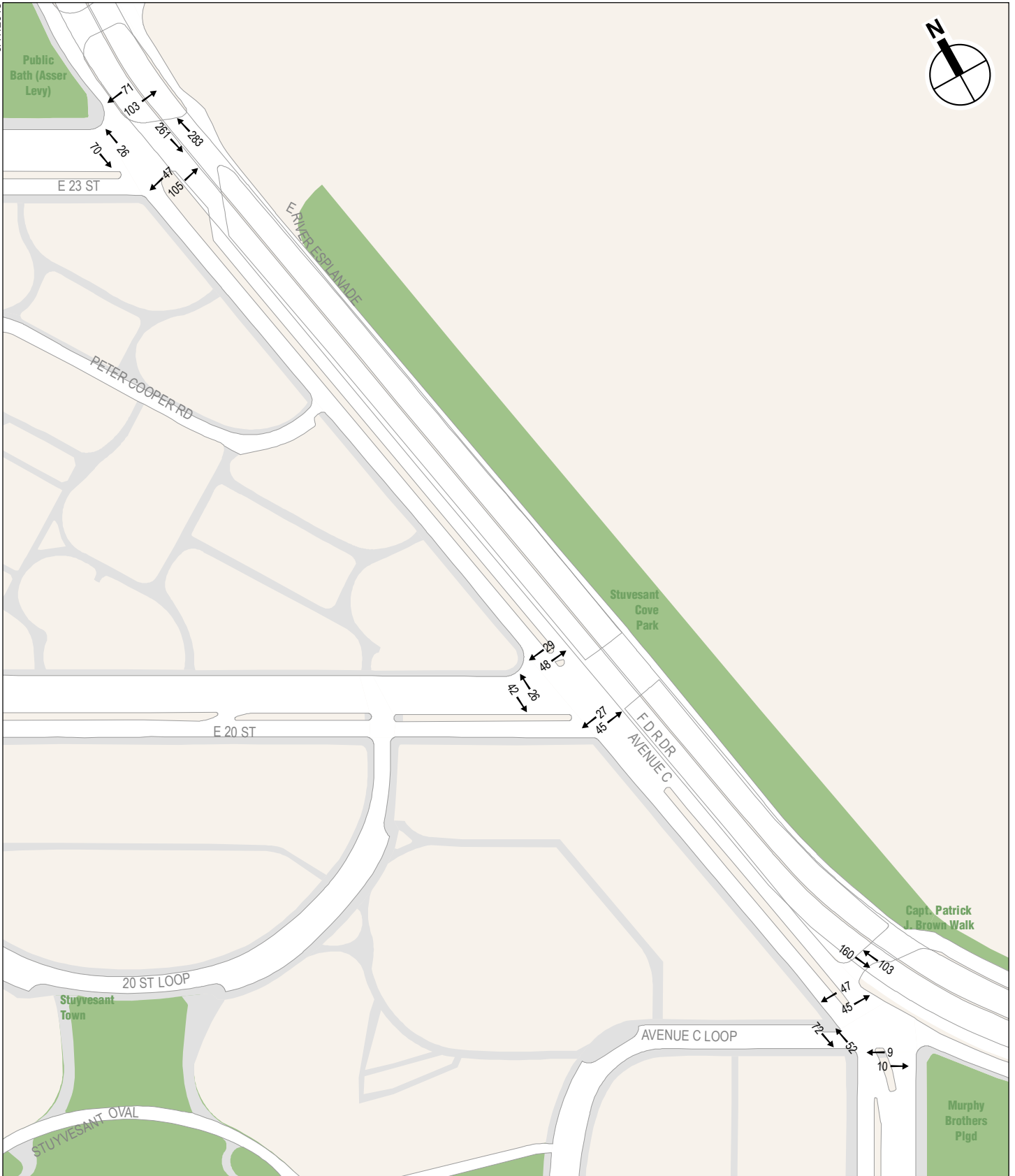


2017 Existing Pedestrian Volumes
 Weekday AM Peak Hour
Figure 13



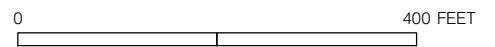
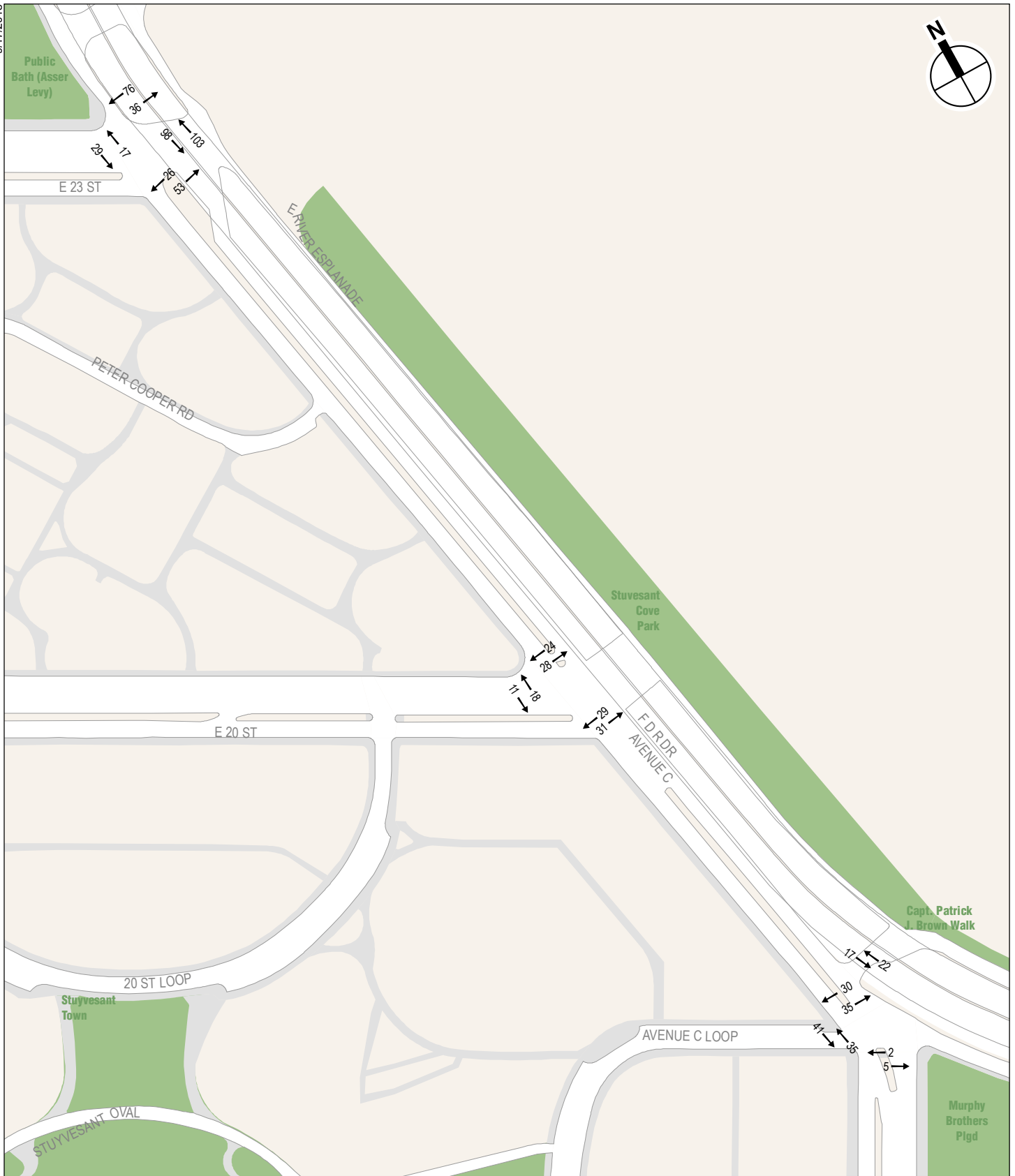
2017 Existing Pedestrian Volumes
 Weekday Midday Peak Hour
Figure 14

9/17/2018



2017 Existing Pedestrian Volumes
 Weekday PM Peak Hour
Figure 15

9/17/2018



2017 Existing Pedestrian Volumes
 Saturday Peak Hour
Figure 16