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TECHNICAL MEMORANDUM

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From:	Zane Pulver Maris Fry, P.E. Erwin Andres	
Date:	May 3, 2019	
Subject:	Market Terminal Building A2 Stage 2 PUD Comprehensive Transportation Review	

Introduction

This memorandum presents the findings of a Comprehensive Transportation Review (CTR) conducted for Building A2 of the overall Market Terminal Development in support of its Stage 2 Planned Unit Development (PUD) application (ZC Case Number 15-27A). The overall Market Terminal development is located within the Florida Avenue Market, also known as the Union Market District in the Northeast quadrant of DC, as shown in Figure 1. Building A2 is located in the northwest portion of the site.

Building A2 includes 260 residential units, approximately 6,700 square feet of retail space, 165 vehicular parking spaces, and 135 long-term bicycle parking spaces. Access to the buildings parking and loading facilities are from a single curb cut along 3rd Street NE. This curb cut will also be used to access parking and loading facilities for Building A1. Short-term bicycle parking will be provided along the perimeter of the site and in addition to the new sidewalks installed as part of the development's new roadway network, Building A2 will include a park, further enhancing the public realm.

Project Background

Building A2 is part of Phase 2 of the overall Market Terminal development, which was approved in March of 2017 (ZC Case No. 15-27) as a Stage 1 PUD. The Stage 1 PUD also includes Buildings C2 and D, which will be included under separate Stage 2 PUD applications. Phase 1 of the overall development includes Buildings A1, B, and C1 and was approved as a Consolidated PUD as part of the same zoning case. It should be noted that Buildings A1 and A2 are a single building for zoning purposes. The Stage 1 PUD was evaluated and approved under the 1958 zoning regulations and Building A2 is vested under the 1958 Zoning Regulations.

It should also be noted that the division between Building A1 and A2 has shifted since completion of the CTR for the Consolidated/Stage 1 PUD. A map showing the location and extents of Building A2 in the context of the overall development is shown on Figure 2. This map shows the extents of Building A2 as studied during the Stage 1 PUD as well as the extents as it is currently proposed. As shown, in addition to the division line changing, a portion of Building A2 was included as part of

Phase 1 in the original CTR. This resulted in a more conservative analysis of the impacts of Phase 1. Ultimately, the inclusion of part of Building A2 under Phase 1 was eliminated from the plan, resulting in a slightly different approved development program, as compared to what was analyzed. For this reason, the transportation demand comparisons included in this CTR are based on Building A in its entirety to provide a more direct comparison. As discussed in further detail in this study, although the development program for Building A2 is increasing as compared to what was approved during the Stage 1 PUD, the overall development program for Building A is similar to what was analyzed as part of the original CTR.

Contents of Study

The CTR includes the following four sections to address the Stage 2 PUD Application for Building A2 of the overall Market Terminal Development:

- Review of Stage 1 PUD Conditions: This section reviews the PUD conditions outlined in the Zoning Commission Order that relate specifically to Building A2 or all buildings in the overall development and outlines the compliance of these conditions as part of the Stage 2 PUD. This section also discusses Zoning Conditions tied to other buildings within the overall development that impact Building A2.
- Project Update: This section outlines how the development program of Building A2 has changed over the progression of the project in the context of Building A in its entirety. This section also provides an update to the trip generation projections for Building A.
- Design Review: This section reviews the transportation components of Building A2, including the proposed site plan. It includes descriptions of the site's vehicular access, loading, parking, pedestrian facilities, and bicycle accommodations.
- Transportation Demand Management: This section outlines the proposed TDM plan for Building A2 based on what was approved during the Stage 1 PUD and the specific needs of the site.

Of note, no supplementary capacity analysis is included as part of this memorandum as there is no significant change to the projected trip generation of the site.

Summary and Conclusions

This CTR concludes that:

- The Applicant complies with all Stage 1 PUD Zoning Commission conditions relating to Building A2.
- The overall development program of Building A is generally consistent with what was analyzed as part of the CTR for the Consolidated/Stage 1 PUD application, resulting in insignificant change to the projected trip generation.
- The access and circulation plan for Building A2 is consistent with what was approved during the Stage 1 PUD.
- The proposed loading facilities will sufficiently meet the loading demands of the site.
- The amount of proposed long-term and short-term bicycle parking exceeds ZR16 requirements.
- The pedestrian environment will be greatly improved as a result of the Building A2 development, which includes the Neal Place Park, café seating, and other public seating.
- The proposed Transportation Demand Management Plan adequately promotes non-auto modes of travel that are consistent with the specific needs of the site.

Figure 1: Site Location

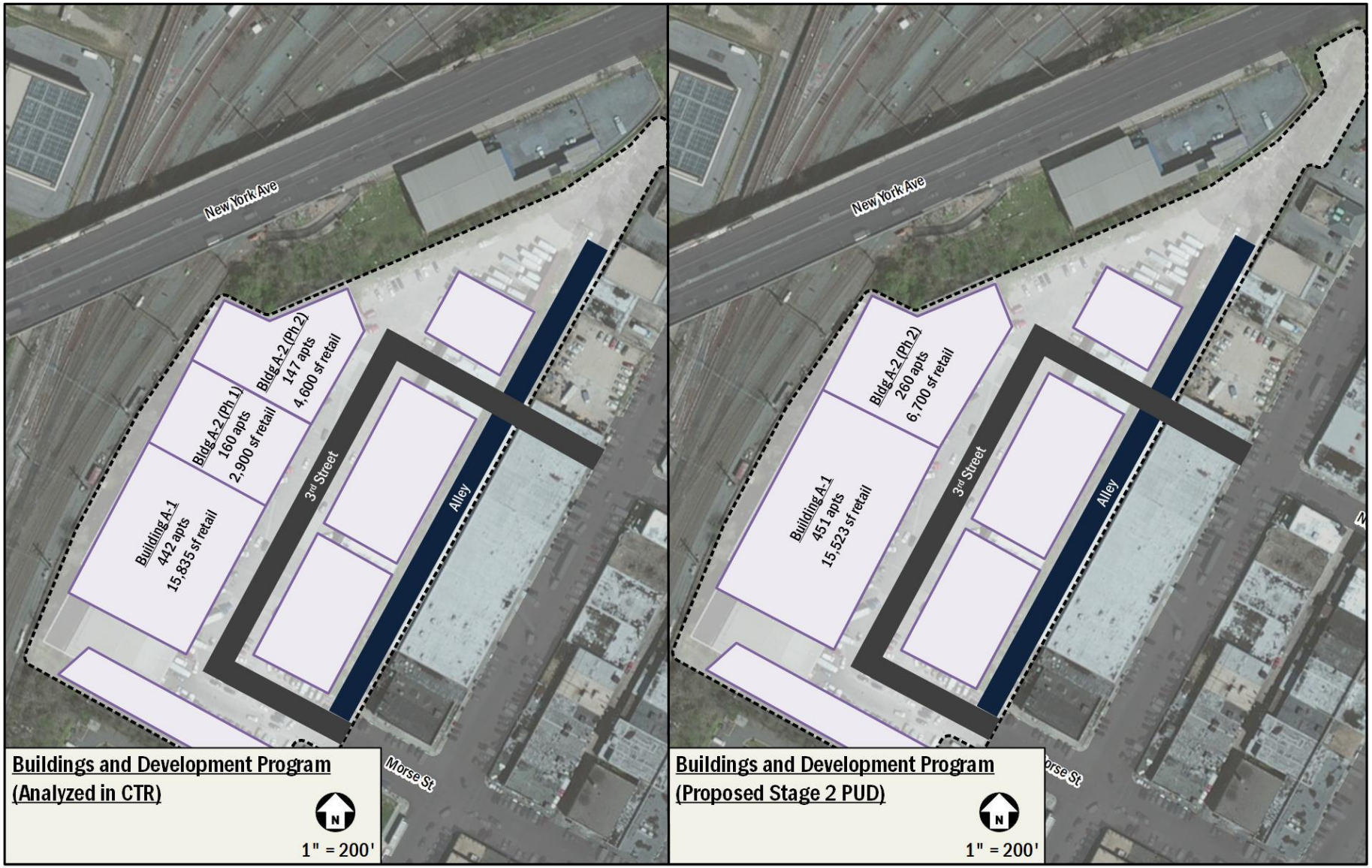


Figure 2: Comparison of Building A Development Program and Building Extents

Review of Stage 1 PUD Conditions

As part of ZC Case Number 15-27, Phase 1 of the overall Market Terminal development (consisting of Building A1, Building B, and Building C1) was approved as a Consolidated PUD and Phase 2 (consisting of Building A2, Building C2, and Building D) was approved as a First Stage PUD. During the approval process, the District Department of Transportation (DDOT) submitted two reports in support of the application on October 11, 2016 and January 3, 2017, a public hearing was held on January 12, 2017, and the Zoning Commission took final action to approve the Application on March 27, 2017.

Building A2 PUD Conditions

The transportation-related conditions outlined in the Zoning Commission Order in direct relation to Building A2 or the development in its entirety are outlined in **Error! Reference source not found.** along with the action in compliance as part of the Building A2 Stage 2 Application.

Table 1: Summary of Stage 1 PUD Conditions and Stage 2 PUD Compliance for Building A2

Stage 1 PUD Condition	Stage 2 Compliance
Prior to the issuance of COO for each building, each building owner shall have the individual obligation to demonstrate to the Zoning Administrator that it has constructed the interior bicycle parking within the relevant building, as shown on Sheets 37-39, 44, 69, and 82 of the Plans. (Ex. 61A, 75A).	This CTR addresses the proposed number of long-term bicycle parking spaces. A total of 135 long-term bicycle parking spaces are proposed as part of the Stage 2 PUD Application for Building A2. Although this is less than what was included in the referenced Plans, this significantly exceeds both the 1958 and ZR16 zoning requirements.
Prior to the issuance of COO for the first building completed within the second-stage PUD, the Applicant shall demonstrate to the Zoning Administrator that it has paid DDOT for the installation and first year's operation expenses of a new Capital Bikeshare station to be located on Morse Street, south of Building C1.	The Applicant is complying with this condition as discussed in the TDM section of this CTR.
For the life of the project each building owner shall have the individual obligation to: ▪ Provide TDM materials to new residents as part of the Residential Welcome Package for Buildings A, B, C2, and D; ▪ Price all on-site vehicle parking at market rate at minimum, defined as the average cost for parking within a 0.25-mile radius of the PUD Site; and ▪ Unbundle the cost of residential parking from the cost of lease or purchase of residential units for Buildings A, B, C2, and D.	The Applicant is complying with this condition as discussed in the TDM section of this CTR.
Prior to the issuance of a COO for each building, the Applicant shall demonstrate to the Zoning Administrator	This CTR addresses the proposed number of long-term and short-term bicycle parking spaces. The project is proposing to supply 135 long-term bicycle parking spaces and 16

that it has exceeded the zoning requirements for bicycle parking for the applicable building.	short-term bicycle parking spaces, which exceeds both the 1958 and ZR16 zoning requirements.
Prior to the issuance of a COO for each building, each building owner shall have the individual obligation to demonstrate to the Zoning Administrator that it has installed a transit information screen in each of the residential and office lobbies.	The Applicant is complying with this condition as discussed in the TDM section of this CTR.
Prior to the issuance of COO for each residential building completed within the consolidated PUD and second-stage PUD, respectively, each building owner shall have the individual obligation to demonstrate to the Zoning Administrator that it has dedicated $200 per residential unit in alternative transportation incentives that can be used as an annual Capital Bikeshare membership, an annual carshare membership, a carshare driving credit, or for bicycle repair/maintenance. These funds shall be pooled during each phase of the Project into a fund that would make incentives available to residents until the fund is exhausted. This benefit shall be included in rental or condominium documents for all of the residential units planned within the project, both in Phase 1 and Phase 2. If the fund is not exhausted within five years of a COO for the first building within each phase of the project, it shall be disbursed to a TDM-related entity or organization at DDOT direction.	The Applicant is complying with this condition as discussed in the TDM section of this CTR.
Prior to the issuance of a COO for each residential building, each building owner shall have the individual obligation to demonstrate to the Zoning Administrator that it has: ▪ Purchased and placed two cargo bicycles within each residential building; and ▪ Purchased and placed three rolling shopping carts within each residential building.	The Applicant is complying with this condition as discussed in the TDM section of this CTR.

Phase 1 PUD Conditions

In addition to the Building A2 PUD conditions outlined above, Phase 1 of the overall development includes several PUD conditions that will improve the overall transportation conditions within and surrounding the site. As such, a large portion of the roadway additions and improvements, public space improvements, and public benefits associated with the overall development will be completed as part of Phase 1. The primary transportation-related conditions as part of Phase 1 are as follows:

- Prior to the issuance of a Certificate of Occupancy (COO) for the first building completed within the consolidated PUD, the Applicant shall demonstrate to the Zoning Administrator that it has completed construction of the street grid, landscaping, sidewalks, streetscape improvements, street trees, energy and water efficient systems, construction waste management elements, stormwater runoff materials, and bicycle parking facilities consistent with the Landscape Plans included in the Plans dated December 23, 2016 (Exhibit 61A1-61A15), and the Plans dated January 26, 2017 (Exhibit 72A1-72A2), showing such improvements for each relevant building delivery.
- Prior to the issuance of a COO for Building C1, the Applicant shall demonstrate to the Zoning Administrator that it has installed the improvements in the western 13 feet of the Alley, labeled from west to east as a 7-foot circulation zone, a one-foot paving band, and half of the 10-foot bicycle lane, and as shown on Sheet L1.32 of the Plans. (Ex. 61A.)
- Prior to the issuance of a COO for Building C1, the owner of Building C1 shall demonstrate to the Zoning Administrator that it has installed a bicycle lane in the Alley, as shown on Sheet L1.32 of the Plans. (*Id.*) In the event that the owner of Building C1 is unable to complete installation of the bicycle lane in the Alley prior to the issuance of a COO for Building C1, due to the resultant timing of completion of Alley improvements that are part of the Fourth Street PUD, then the owner of Building C1 shall have flexibility to complete the installation of the bicycle lane no less than six months following the issuance of the COO for the South Parcel building of the Fourth Street PUD.
- Prior to issuance of COO for the first building completed within the consolidated PUD, the Applicant shall demonstrate to the Zoning Administrator that it has installed a bicycle lane on Morse Street, between the Alley and 4th Street.
- Prior to the issuance of a COO for the first building completed within the consolidated PUD, the Applicant shall demonstrate to the Zoning Administrator that it has: (a) installed a new traffic signal, subject to DDOT approval, at the intersection of 4th and Morse Streets, NE, and (b) installed traffic management cameras at the intersections of New York Avenue and 4th Street and Florida Avenue and 5th Street for integration into the DDOT traffic management program. If DDOT is not ready to incorporate these improvements at the time that the Applicant is submitting for COO for the first building, then prior to issuance of a COO for the first building completed within the consolidated PUD, the Applicant shall put into an escrow account: (a) $250,000 necessary to install a new traffic signal at 4th and Morse Streets, NE, and (b) $12,000 necessary to install a traffic management camera at the intersections of New York Avenue and 4th Street and Florida Avenue and 5th Street.
- Prior to the issuance of a COO for the first building completed within the consolidated PUD, the Applicant shall demonstrate to the Zoning Administrator that it has designated two curbside parking spaces for carsharing within the PUD Site. If no carshare providers are willing to operate in those spaces, the dedicates spaces may be returned to the general on-street parking supply.

Project Update

This section outlines the progression of the development program for Building A2 in the context of Building A in its entirety. As noted previously, the division between Building A1 and A2 has shifted over time. As such, it is difficult to provide a direct comparison of Building A2 between the Stage 1 PUD and the Stage 2 PUD. Additionally, Buildings A1 and A2 share a garage with a single access point along 3rd Street and are considered a single building for zoning purposes. For these reasons, the subsequent update to the projected vehicular trip generation is also shown for Building A in its entirety.

Development Program Modifications

Table 2 illustrates the progression of Building A1 and A2 individually, over the course of the project timeline, as well as Building A in its entirety. As summarized in the table, the overall Building A development program that was approved as part of the Stage 1 PUD included 651 residential units, 21,065 square feet of retail space, 371 vehicular parking spaces, and 490 long-term bicycle parking spaces. However, the CTR for the Consolidated/Stage 1 PUD for Building A assumed an overall development program of 749 residential units, 23,335 square feet of retail space, 421 vehicular parking spaces, and 410 long-term bicycle parking spaces. Currently, the overall Building A development program includes 711 residential units, 22,223 square feet of retail space, 451 parking spaces, and 465 bicycle parking spaces.

That said, although the development program for Building A2 is increasing as compared to what was approved during the Stage 1 PUD, the overall development program for Building A is similar to what was analyzed as part of the original CTR.

Table 2: Summary of Building A Development Program

Building A Development Program	Consolidated/Stage 1 PUD (As approved by ZC Case No. 15-27)	Consolidated/Stage 1 PUD (As analyzed in the CTR)	Proposed Stage 2 PUD (ZC Case No. 15-27A)
Building A1 (Phase 1)			
Residential	453 units	602 units**	451 units
Retail	16,495 sf	15,835 sf	15,523 sf
Vehicle Parking	308 spaces*	364 spaces*	286 spaces*
Long-Term Bicycle Parking	330 spaces	330 spaces	330 spaces***
Building A2 (Phase 2)			
Residential	198 units	147 units	260 units
Retail	4,570 sf	7,500 sf	6,700 sf
Vehicle Parking	63 spaces	57 spaces	165 spaces
Long-Term Bicycle Parking	160 spaces	80 spaces	135 spaces
Building A Combined			
Residential	651 units	749 units	711 units
Retail	21,065 sf	23,335 sf	22,223 sf
Vehicle Parking	371 spaces	421 spaces	451 spaces
Long-Term Bicycle Parking	490 spaces	410 spaces	465 spaces

**Parking within Building A1 also serves Building B*

***As analyzed in the CTR, a portion of Building A2 was included as part of the first phase, although still part of the Stage 1 PUD. For comparison purposes we are showing all Phase 1 elements of Building A in this tabulation. The remaining Building A2 elements are included below.*

****An updated number of long-term bike parking spaces for Building A1 was not available so 330 spaces was assumed.*

Trip Generation Update

In order to provide a direct comparison, the updated trip generation projections for Building A were calculated using the same methodology that was used in the CTR for the Consolidated/Stage 1 PUD, in which the Institute of Transportation Engineers' (ITE) Trip Generation, 9th Edition was supplemented to account for the urban nature of the site. Trips were split into four modes: transit (consisting of both Metrorail and Metrobus), walking, biking, and vehicle. The mode split estimates were developed using survey information contained within several sources, including WMATA's 2005 *Development-Related Ridership Survey*, Commuter Connections' 2010 *State of the Commute Survey* Report, and U.S. Census Data (using Census Transportation Planning Products software).

Table 3: Mode Split Assumptions

Land Use	Mode			
	Drive	*Transit*	*Bike*	*Walk*
Residential	39%	40%	4%	17%
Retail	35%	35%	5%	25%

All residential trip generation was calculated based on ITE land use 220, Apartment and all retail trip generation was calculated using ITE land use 820, Shopping Center.

Based on the above methodology, the development program analyzed as part of the Stage 1 PUD, and the proposed Stage 2 PUD plans, the following changes to Building A trip generation were determined:

- AM trip generation decreases by 9 vehicular trips (from 155 to 146 trips)
- PM trip generation decreases by 18 vehicular trips (from 214 to 196 trips)

Table 4 summarizes the Building A trip generation analyzed as part of the Stage 1 PUD Application, the current Stage 2 PUD Application, and the difference between the two trip generation projections. Detailed trip generation calculations are included in the Technical Attachments.

Table 4: Summary of Trip Generation Comparison

	Land Use	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Proposed	Residential	711 du	28 veh/hr	111 veh/hr	139 veh/hr	108 veh/hr	59 veh/hr	167 veh/hr
	Retail	22223 sf	4 veh/hr	3 veh/hr	7 veh/hr	14 veh/hr	15 veh/hr	29 veh/hr
Analyzed	*Residential*	*749 du*	*30 veh/hr*	*118 veh/hr*	*148 veh/hr*	*118 veh/hr*	*65 veh/hr*	*183 veh/hr*
	Retail	*23335 sf*	*5 veh/hr*	*2 veh/hr*	*7 veh/hr*	*15 veh/hr*	*16 veh/hr*	*31 veh/hr*
		Net Trips	**-3 veh/hr**	**-6 veh/hr**	**-9 veh/hr**	**-11 veh/hr**	**-7 veh/hr**	**-18 veh/hr**

Design Review

This section provides an overview of the on-site transportation features for Building A2. This section reviews updates to the proposed site facilities discussed during the Stage 1 PUD process and provides detailed site design information that has been refined since approval of the Stage 1 PUD. The Stage 2 plans for Building A2 consist of 260 dwelling units, approximately 6,700 square feet of retail, and 165 parking spaces. A detailed ground-floor site plan is shown on Figure 3.

Vehicular Access and Circulation

Consistent with the Stage 1 PUD, the site will be significantly modified as part of the overall redevelopment such that porosity through the site and the overall Union Market District will be improved. Phase 1 of the site is currently under construction, under previous conditions the site primarily included wholesale warehouse facilities served by a large surface parking lot with one access point from Morse Street. The overall development, in coordination with the Fourth Street PUD[1] will create an improved street grid consisting of Morse Street, 3rd Street (a new roadway), Neal Place (an extension of an existing roadway), and an improved alley. 3rd Street NE adjacent to Building A2 will consist of two (2) 10' travel lanes with 8' parking lanes on both sides of the street.

The vehicular access and circulation specific to Building A2 has not changed as part of the Stage 2 PUD Application. Consistent with the Stage 1 PUD, the plan for Building A2 includes vehicular access to the residential and retail parking from the same entrance as Building A1, located south of Building A2 along 3rd Street NE and shown on Figure 3. Vehicular circulation to/from the site is presented in Figure 4.

Parking

Building A2 is proposed to include 165 vehicular parking spaces. 160 spaces are expected to be allocated to residential uses and 5 spaces are expected to be allocated to retail uses. This results in a residential parking ratio of 0.62 parking spaces per unit. The residential parking ratio for Building A overall has increased slightly from 0.47 parking spaces per unit to 0.54 parking spaces per unit. The increase in the residential parking ratio over that which was analyzed as part of the Stage 1 PUD is primarily a result of the change from rental units to for-sale units within Building A2, which was always anticipated as an option for Building A2.

Loading

Building A2 will provide two (2) 30' loading berths and one (1) 20' delivery space, consistent with what was approved as part of the Stage 1 PUD. Truck routing to and from these loading areas will be focused on designated truck routes. The nearest designated truck routes to the site are Brentwood Parkway/6th Street, New York Avenue, and Florida Avenue, therefore it is assumed that all trucks will access and egress the loading areas from these routes. AutoTURN software was used to test 30 foot single-unit (SU-30) trucks in and out of the loading area via 3rd Street NE. The turning maneuvering diagrams, included in the Technical Attachments, show that the design of the loading area will appropriately accommodate the anticipated truck activity.

The amount of loading expected at Building A2 is estimated as follows:

[1] The Fourth Street PUD is a two-building, mixed-use development that was approved under ZC Order 14-07 and is generally bounded Morse Street NE to the south, Neal Place NE to the north, 4th Street NE to the east, and an alley to the west.

- As a baseline, it is expected that there will be three (3) daily truck deliveries (covering trash, general delivery, and mail).
- Residential loading activity is estimated assuming an expected condo turnover of 18 months, with two (2) trucks per move – one move-in and one move-out.
- Although the exact nature of the retail space is unknown at this time, it is expected that in general each retail store will generate an additional two (2) deliveries per day in addition to the baseline deliveries. It is estimated that there will be two (2) individual retail spaces therefore it is expected that the retail use will generate a total of four (4) deliveries per day.

Using these estimates, and assuming 260 residential units and 6,700 sf of retail, Building A2 is expected to generate a loading demand of 7 to 8 trucks per day, of which 4 to 5 are expected to be a single-unit trucks of 24 to 30 feet in length and 3 are expected to be 20' service vehicles. Based on these projections, the proposed amount of loading facilities will be sufficient to accommodate the demand generated by the development.

Bicycle Facilities

Building A2 will include both short- and long-term bicycle parking. As shown on Figure 3, long-term bicycle parking will be located on the ground-floor and will be accessible from Neal Place NE. Although the development is not required to meet the ZR 2016 requirements, the Applicant is providing 135 long-term bicycle parking spaces which exceeds the ZR16 requirements of 87 long-term bicycle parking spaces.

Building A2 will also include 16 short-term bicycle parking spaces along the perimeter of the site, in the form of eight (8) inverted U-racks, or similar racks, placed in high-visibility areas. The Applicant intends to place these short-term bicycle parking spaces along the private 3rd Street NE, as shown on Figure 6. Again, although the project is not required to meet ZR16 requirements, it is exceeding the ZR16 requirements of 15 short-term bicycle parking spaces. Bicycle routes to/from the site are provided in Figure 5 and Figure 6.

Pedestrian Facilities

As determined during the Consolidated/Stage 1 PUD process, the new street grid as part of the overall development will provide significant pedestrian facilities and amenities, particularly in accordance with the Union Market Streetscape Guidelines. In direct relation to Building A2, pedestrian and streetscape improvements are proposed including the Neal Place Park, café seating, and other public seating areas. The proposed sidewalk space is designed to allow for integration between the public realm and ground-floor retail. Proposed pedestrian circulation surrounding the site is provided in Figure 5 and Figure 6.

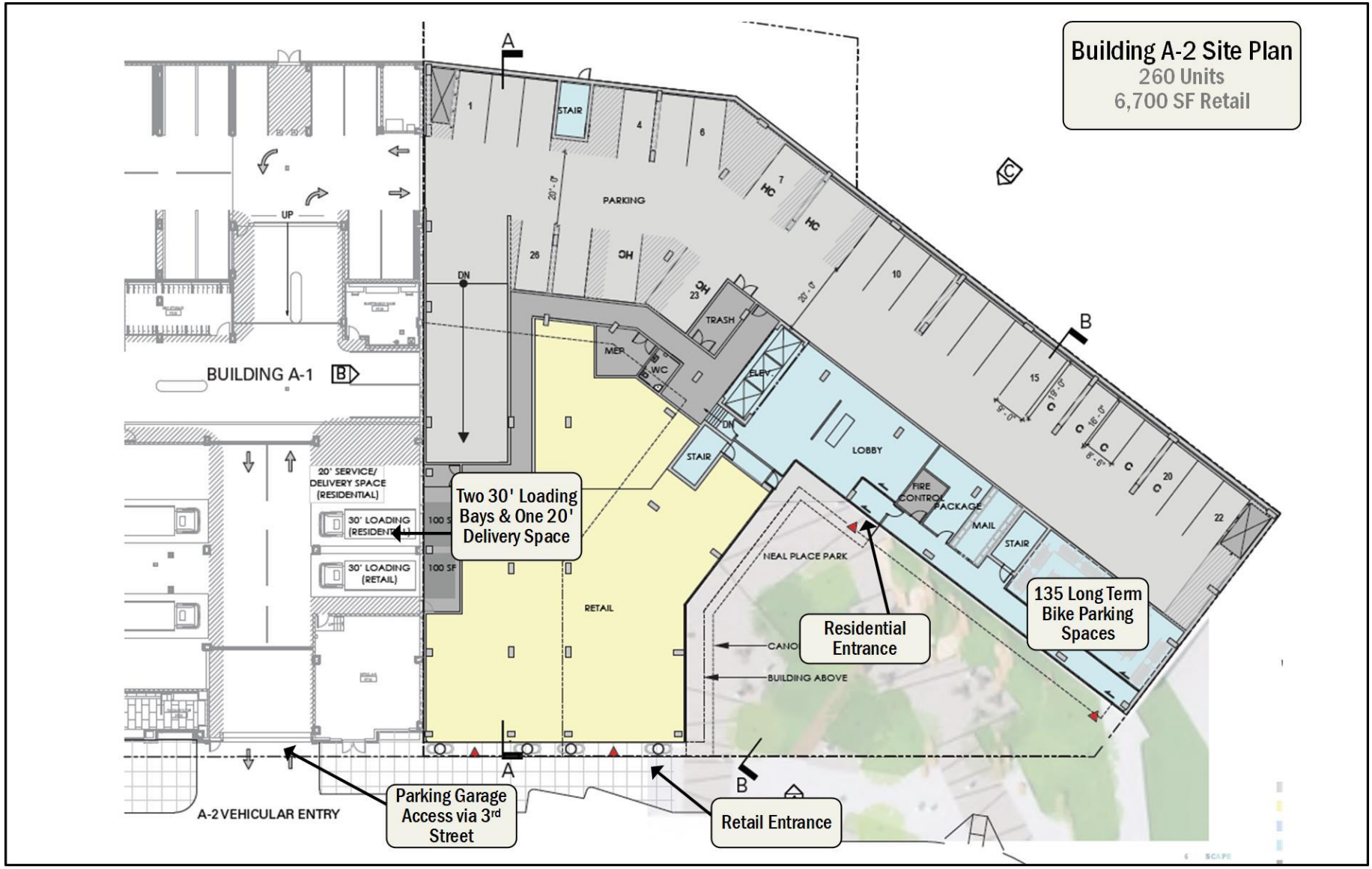


Figure 3: Site Plan

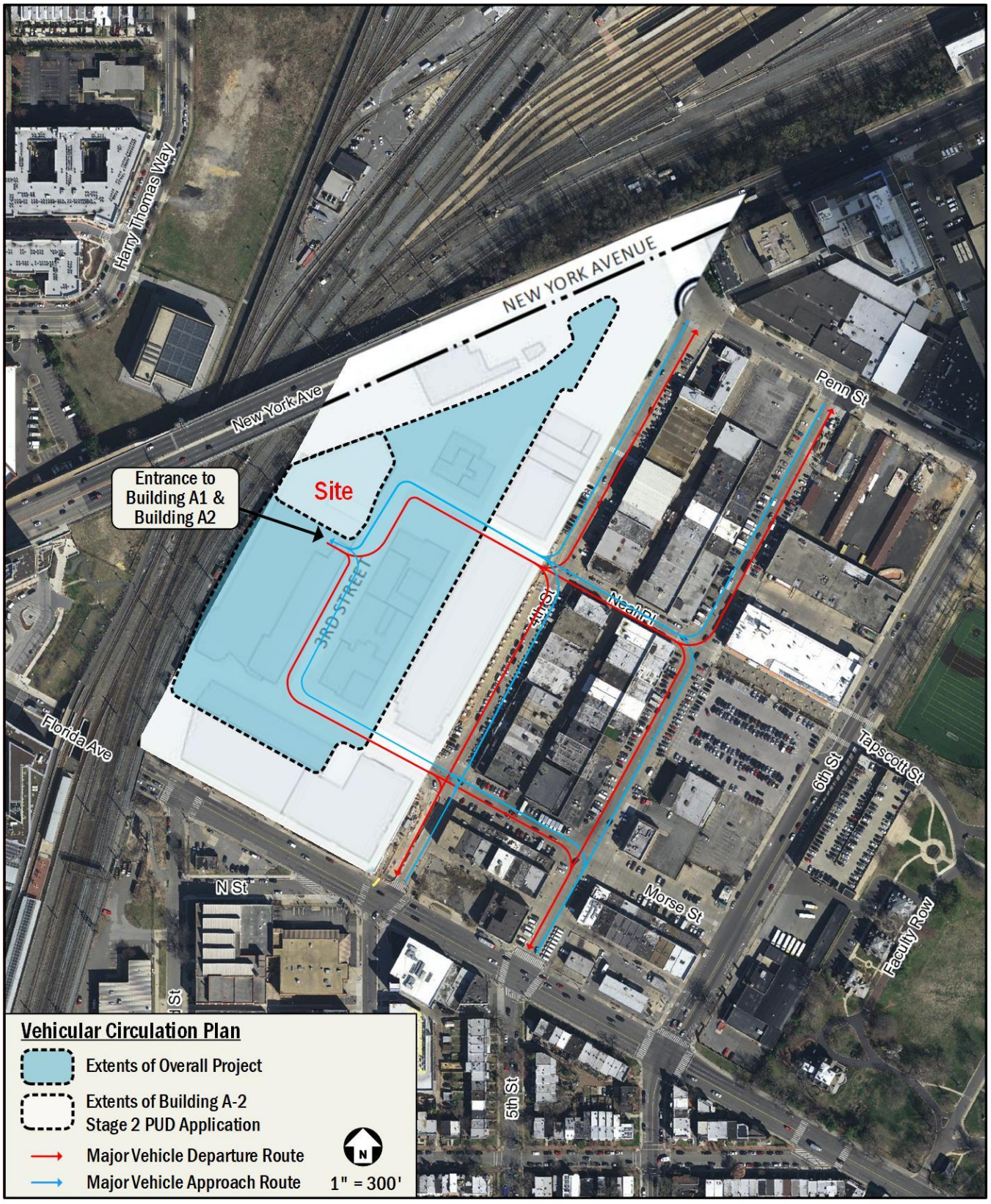


Figure 4: Vehicular Circulation

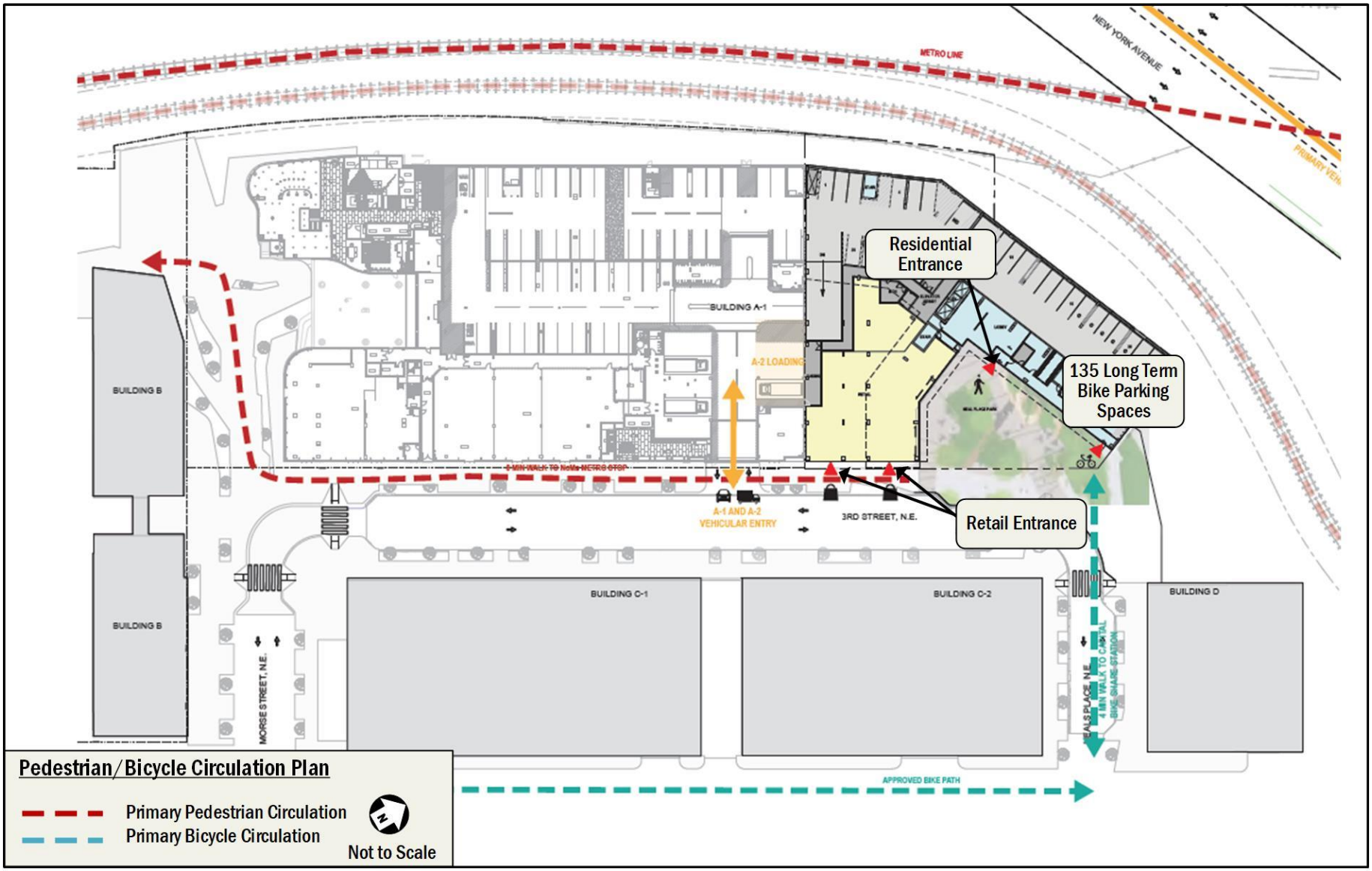


Figure 5: Bicycle and Pedestrian Circulation (Overall Development)

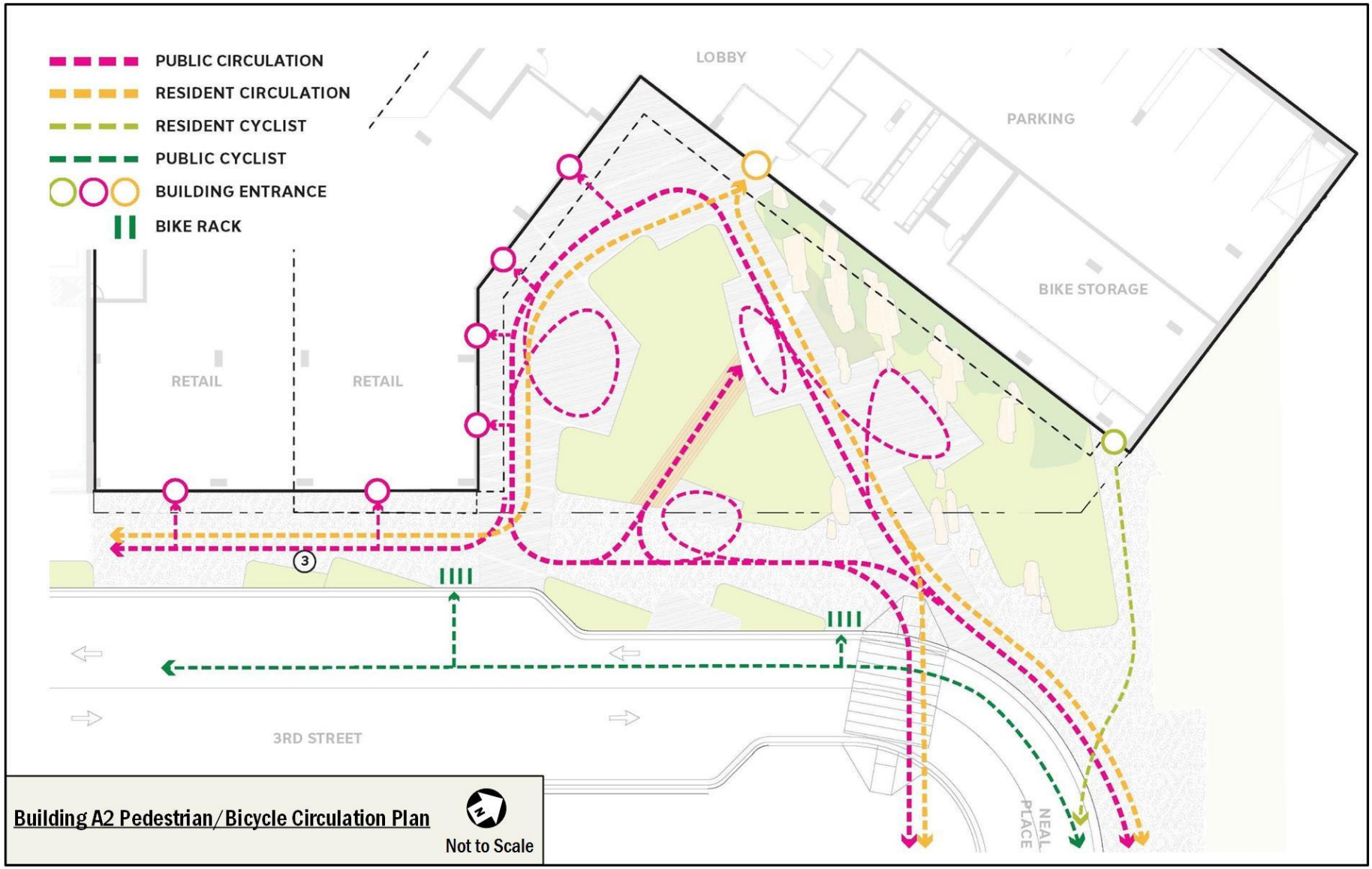


Figure 6: Pedestrian and Bicycle Circulation (Building A2)

Transportation Demand Management (TDM)

TDM is the application of policies and strategies used to reduce travel demand or to redistribute demand to other times or spaces. TDM typically focuses on reducing the demand of single-occupancy, private vehicles during peak period travel times or on shifting single-occupancy vehicular demand to off-peak periods.

Building A2 will include a TDM plan in order to help minimize its potential traffic impacts to the surrounding neighborhood. As outlined in the CTR for the Consolidated/Stage 1 PUD 1 and the Zoning Commission Order conditions, and consistent with the specific needs of Building A2, the TDM plan will include the following measures:

- The Applicant shall designate a TDM Coordinator, who is responsible for organizing and marketing the TDM plan and who will act as a point of contact with DDOT.
- All parking on site will be priced at market rates at minimum, defined as the average cost for parking in a 0.25-mile radius from the site.
- All residential parking will be unbundled from the cost of purchase.
- The Applicant will install a Transportation Information Screen (electronic screen) within Building A2's residential lobby containing information related to local transportation alternatives.
- The Applicant will provide TDM materials to new residents in the Residential Welcome Package materials.
- The Applicant will exceed Zoning requirements for short-term and long-term bicycle parking, including 135 long-term bicycle parking spaces located in a secure room on the ground floor of the development and 16 short-term bicycle parking spaces in the form of 8 bicycle racks along the perimeter of the site.
- The Applicant will provide a bicycle repair station within the long-term bicycle storage room.
- The Applicant will dedicate $200 per residential unit in alternative transportation incentives that can be used as an annual Capital Bikeshare membership, an annual carshare membership, a carshare driving credit, or for bicycle repair/maintenance. These funds will be pooled during each phase of the Project into a fund that would make incentives available to residents until the fund is exhausted.
- The Applicant will purchase two cargo bicycles which will be kept within the building and made available to residents for use.
- The Applicant will purchase three rolling shopping carts which will be kept within the building and made available to residents for use.
- The Phase 2 PUD building owners will fund the installation and one year of maintenance for a new Capital Bikeshare by Certificate of Occupancy of the first Phase 2 building completed.

Summary and Conclusions

The findings of this CTR conclude the following:

- The Applicant complies with all Stage 1 PUD Zoning Commission conditions relating to Building A2.
- The overall development program of Building A is generally consistent with what was analyzed as part of the CTR for the Consolidated/Stage 1 PUD application, resulting in insignificant change to the projected trip generation.
- The access and circulation plan for Building A2 is consistent with what was approved during the Stage 1 PUD.
- The proposed loading facilities will sufficiently meet the loading demands of the site.
- The amount of proposed long-term and short-term bicycle parking exceeds ZR16 requirements.
- The pedestrian environment will be greatly improved as a result of the Building A2 development, which includes the Neal Place Park, café seating, and other public seating.
- The proposed Transportation Demand Management Plan adequately promotes non-auto modes of travel that are consistent with the specific needs of the site.

TECHNICAL ATTACHMENTS

Mode Split Assumptions

Residential Component

Pertinent Mode Split data from other sources:

Information Source	Mode						
	SOV	Carpool	Transit	Bike	Walk	Telecommute	Other
Census Data - Census Tract (106)	25%	5%	34%	4%	19%	2%	1%
CTPP - TAZ Residents (20282)	30%	5%	45%	1%	18%	1%	0%
CTPP - TAZ Residents (10273)	5%	7%	4%	0%	56%	27%	0%
CTPP - TAZ Residents (10281)	25%	3%	41%	1%	27%	2%	0%
CTPP - TAZ Residents (aggregate)	26%	5%	39%	1%	25%	4%	0%
State of the Commute (of District residents)	41%	7%	41%	11%		---	
WMATA Ridership Survey (residential sites in CBD)	18%		56%	26%		---	

Ratio of parking provided vs. suburban parking rates:

Parking provided	Max. suburban parking demand (per ITE Parking Generation, 4th Ed)	Percentage of suburban demand proposed
486 spaces (0.46 per dwelling unit)	1,234 spaces (LU 222, using rates)	39%

Mode Split assumed in TIS:

Land Use	Mode				
	Drive	Transit	Bike	Walk	Telecommute/Other
Residential Mode Split	39%	40%	4%	17%	---

Notes: -Census data (CTPP) used as basis for assumptions
-Drive adjusted up from census data to reflect parking ratio influence

Retail Component

Pertinent Mode Split data from other sources:

Information Source	Mode						
	SOV	Carpool	Transit	Bike	Walk	Telecommute	Other
WMATA Ridership Survey (U Street Main Street Retail)	19%		57%	25%		---	
WMATA Ridership Survey (Crystal City - Crystal Plaza Shops)	24%		41%	35%		---	
WMATA Ridership Survey (Crystal City - The Underground)	27%		37%	36%		---	

Mode Split assumed in TIS:

Land Use	Mode				
	Drive	Transit	Bike	Walk	Telecommute/Other
Retail Mode Split	35%	35%	5%	25%	---

Notes: -The three WMATA survey sites listed are applicable to the travel patterns of ground-floor neighborhood-serving retail

Trip Generation - Residential (Building A-1) Approved

442 residential units

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	220	442 du	44 veh/hr	176 veh/hr	220 veh/hr	170 veh/hr	91 veh/hr	261 veh/hr
		Calculation Details:	*20%*	*80%*	*=0.49(x)+3.73*	*65%*	*35%*	*=0.55(x)+17.65*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	50 ppl/hr	199 ppl/hr	249 ppl/hr	192 ppl/hr	103 ppl/hr	295 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	Auto	39%	20 ppl/hr	77 ppl/hr	97 ppl/hr	75 ppl/hr	40 ppl/hr	115 ppl/hr
Apartments	Transit	40%	20 ppl/hr	80 ppl/hr	100 ppl/hr	77 ppl/hr	41 ppl/hr	118 ppl/hr
Apartments	Bike	4%	2 ppl/hr	8 ppl/hr	10 ppl/hr	8 ppl/hr	4 ppl/hr	12 ppl/hr
Apartments	Walk	17%	9 ppl/hr	33 ppl/hr	42 ppl/hr	33 ppl/hr	17 ppl/hr	50 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	18 veh/hr	68 veh/hr	86 veh/hr	66 veh/hr	36 veh/hr	102 veh/hr

Trip Gen Summary for Residential

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	18 veh/hr	68 veh/hr	86 veh/hr	66 veh/hr	36 veh/hr	102 veh/hr
Transit	20 ppl/hr	80 ppl/hr	100 ppl/hr	77 ppl/hr	41 ppl/hr	118 ppl/hr
Bike	2 ppl/hr	8 ppl/hr	10 ppl/hr	8 ppl/hr	4 ppl/hr	12 ppl/hr
Walk	9 ppl/hr	33 ppl/hr	42 ppl/hr	33 ppl/hr	17 ppl/hr	50 ppl/hr

Trip Generation - Retail (Building A-1) Approved

15,835 square feet of retail

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	820	15,835 sf	9 veh/hr	6 veh/hr	15 veh/hr	28 veh/hr	31 veh/hr	59 veh/hr
		Calculation Details:	*62%*	*38%*	*=0.96(x/1000)*	*48%*	*52%*	*=3.71(x/1000)*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	16 ppl/hr	11 ppl/hr	27 ppl/hr	50 ppl/hr	55 ppl/hr	105 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	Auto	35%	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	19 ppl/hr	37 ppl/hr
Retail	Transit	35%	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	19 ppl/hr	37 ppl/hr
Retail	Bike	5%	1 ppl/hr	0 ppl/hr	1 ppl/hr	3 ppl/hr	2 ppl/hr	5 ppl/hr
Retail	Walk	25%	4 ppl/hr	3 ppl/hr	7 ppl/hr	13 ppl/hr	13 ppl/hr	26 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	3 veh/hr	2 veh/hr	5 veh/hr	10 veh/hr	11 veh/hr	21 veh/hr

Trip Gen Summary for Retail

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	3 veh/hr	2 veh/hr	5 veh/hr	10 veh/hr	11 veh/hr	21 veh/hr
Transit	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	19 ppl/hr	37 ppl/hr
Bike	1 ppl/hr	0 ppl/hr	1 ppl/hr	3 ppl/hr	2 ppl/hr	5 ppl/hr
Walk	4 ppl/hr	3 ppl/hr	7 ppl/hr	13 ppl/hr	13 ppl/hr	26 ppl/hr

Trip Generation - Residential (Building A-2 Phase 1) Approved

160 residential units

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	220	160 du	16 veh/hr	66 veh/hr	82 veh/hr	69 veh/hr	37 veh/hr	106 veh/hr
		Calculation Details:	*20%*	*80%*	*=0.49(x)+3.73*	*65%*	*35%*	*=0.55(x)+17.65*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	18 ppl/hr	75 ppl/hr	93 ppl/hr	78 ppl/hr	42 ppl/hr	120 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	Auto	39%	7 ppl/hr	29 ppl/hr	36 ppl/hr	30 ppl/hr	17 ppl/hr	47 ppl/hr
Apartments	Transit	40%	7 ppl/hr	30 ppl/hr	37 ppl/hr	31 ppl/hr	17 ppl/hr	48 ppl/hr
Apartments	Bike	4%	1 ppl/hr	3 ppl/hr	4 ppl/hr	3 ppl/hr	2 ppl/hr	5 ppl/hr
Apartments	Walk	17%	3 ppl/hr	13 ppl/hr	16 ppl/hr	13 ppl/hr	7 ppl/hr	20 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	6 veh/hr	26 veh/hr	32 veh/hr	27 veh/hr	15 veh/hr	42 veh/hr

Trip Gen Summary for Residential

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	6 veh/hr	26 veh/hr	32 veh/hr	27 veh/hr	15 veh/hr	42 veh/hr
Transit	7 ppl/hr	30 ppl/hr	37 ppl/hr	31 ppl/hr	17 ppl/hr	48 ppl/hr
Bike	1 ppl/hr	3 ppl/hr	4 ppl/hr	3 ppl/hr	2 ppl/hr	5 ppl/hr
Walk	3 ppl/hr	13 ppl/hr	16 ppl/hr	13 ppl/hr	7 ppl/hr	20 ppl/hr

Trip Generation - Retail (Building A-2 Phase 1) Approved

2,900 square feet of retail space

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	820	2,900 sf	2 veh/hr	1 veh/hr	3 veh/hr	5 veh/hr	6 veh/hr	11 veh/hr
		Calculation Details:	*62%*	*38%*	*=0.96(x/1000)*	*48%*	*52%*	*=3.71(x/1000)*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	4 ppl/hr	1 ppl/hr	5 ppl/hr	9 ppl/hr	11 ppl/hr	20 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	Auto	35%	1 ppl/hr	1 ppl/hr	2 ppl/hr	3 ppl/hr	4 ppl/hr	7 ppl/hr
Retail	Transit	35%	1 ppl/hr	1 ppl/hr	2 ppl/hr	3 ppl/hr	4 ppl/hr	7 ppl/hr
Retail	Bike	5%	0 ppl/hr	0 ppl/hr	0 ppl/hr	0 ppl/hr	1 ppl/hr	1 ppl/hr
Retail	Walk	25%	1 ppl/hr	0 ppl/hr	1 ppl/hr	2 ppl/hr	3 ppl/hr	5 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	1 veh/hr	0 veh/hr	1 veh/hr	2 veh/hr	2 veh/hr	4 veh/hr

Trip Gen Summary for Retail

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	1 veh/hr	0 veh/hr	1 veh/hr	2 veh/hr	2 veh/hr	4 veh/hr
Transit	1 ppl/hr	1 ppl/hr	2 ppl/hr	3 ppl/hr	4 ppl/hr	7 ppl/hr
Bike	0 ppl/hr	0 ppl/hr	0 ppl/hr	0 ppl/hr	1 ppl/hr	1 ppl/hr
Walk	1 ppl/hr	0 ppl/hr	1 ppl/hr	2 ppl/hr	3 ppl/hr	5 ppl/hr

Trip Generation - Residential (Building A-2 Phase 2) Approved

147 residential units

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	220	147 du	15 veh/hr	61 veh/hr	76 veh/hr	64 veh/hr	35 veh/hr	99 veh/hr
		Calculation Details:	*20%*	*80%*	*=0.49(x)+3.73*	*65%*	*35%*	*=0.55(x)+17.65*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	17 ppl/hr	69 ppl/hr	86 ppl/hr	72 ppl/hr	40 ppl/hr	112 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	Auto	39%	7 ppl/hr	27 ppl/hr	34 ppl/hr	28 ppl/hr	16 ppl/hr	44 ppl/hr
Apartments	Transit	40%	7 ppl/hr	27 ppl/hr	34 ppl/hr	29 ppl/hr	16 ppl/hr	45 ppl/hr
Apartments	Bike	4%	1 ppl/hr	2 ppl/hr	3 ppl/hr	3 ppl/hr	1 ppl/hr	4 ppl/hr
Apartments	Walk	17%	3 ppl/hr	12 ppl/hr	15 ppl/hr	12 ppl/hr	7 ppl/hr	19 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	6 veh/hr	24 veh/hr	30 veh/hr	25 veh/hr	14 veh/hr	39 veh/hr

Trip Gen Summary for Residential

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	6 veh/hr	24 veh/hr	30 veh/hr	25 veh/hr	14 veh/hr	39 veh/hr
Transit	7 ppl/hr	27 ppl/hr	34 ppl/hr	29 ppl/hr	16 ppl/hr	45 ppl/hr
Bike	1 ppl/hr	2 ppl/hr	3 ppl/hr	3 ppl/hr	1 ppl/hr	4 ppl/hr
Walk	3 ppl/hr	12 ppl/hr	15 ppl/hr	12 ppl/hr	7 ppl/hr	19 ppl/hr

Trip Generation - Retail (Building A-2 Phase 2) Approved

4,600 square feet of retail space

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	820	4,600 sf	2 veh/hr	2 veh/hr	4 veh/hr	8 veh/hr	9 veh/hr	17 veh/hr
		Calculation Details:	*62%*	*38%*	*=0.96(x/1000)*	*48%*	*52%*	*=3.71(x/1000)*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	4 ppl/hr	3 ppl/hr	7 ppl/hr	14 ppl/hr	16 ppl/hr	30 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	Auto	35%	1 ppl/hr	1 ppl/hr	2 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr
Retail	Transit	35%	1 ppl/hr	1 ppl/hr	2 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr
Retail	Bike	5%	0 ppl/hr	0 ppl/hr	0 ppl/hr	1 ppl/hr	1 ppl/hr	2 ppl/hr
Retail	Walk	25%	1 ppl/hr	1 ppl/hr	2 ppl/hr	4 ppl/hr	4 ppl/hr	8 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	1 veh/hr	0 veh/hr	1 veh/hr	3 veh/hr	3 veh/hr	6 veh/hr

Trip Gen Summary for Retail

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	1 veh/hr	0 veh/hr	1 veh/hr	3 veh/hr	3 veh/hr	6 veh/hr
Transit	1 ppl/hr	1 ppl/hr	2 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr
Bike	0 ppl/hr	0 ppl/hr	0 ppl/hr	1 ppl/hr	1 ppl/hr	2 ppl/hr
Walk	1 ppl/hr	1 ppl/hr	2 ppl/hr	4 ppl/hr	4 ppl/hr	8 ppl/hr

Trip Generation - Residential (Building A-1) Proposed

451 residential units

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	220	451 du	45 veh/hr	180 veh/hr	225 veh/hr	173 veh/hr	93 veh/hr	266 veh/hr
		Calculation Details:	*20%*	*80%*	*=0.49(x)+3.73*	*65%*	*35%*	*=0.55(x)+17.65*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	51 ppl/hr	203 ppl/hr	254 ppl/hr	195 ppl/hr	106 ppl/hr	301 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	Auto	39%	20 ppl/hr	79 ppl/hr	99 ppl/hr	76 ppl/hr	41 ppl/hr	117 ppl/hr
Apartments	Transit	40%	20 ppl/hr	82 ppl/hr	102 ppl/hr	78 ppl/hr	42 ppl/hr	120 ppl/hr
Apartments	Bike	4%	2 ppl/hr	8 ppl/hr	10 ppl/hr	8 ppl/hr	4 ppl/hr	12 ppl/hr
Apartments	Walk	17%	9 ppl/hr	34 ppl/hr	43 ppl/hr	33 ppl/hr	18 ppl/hr	51 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	18 veh/hr	70 veh/hr	88 veh/hr	67 veh/hr	37 veh/hr	104 veh/hr

Trip Gen Summary for Residential

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	18 veh/hr	70 veh/hr	88 veh/hr	67 veh/hr	37 veh/hr	104 veh/hr
Transit	20 ppl/hr	82 ppl/hr	102 ppl/hr	78 ppl/hr	42 ppl/hr	120 ppl/hr
Bike	2 ppl/hr	8 ppl/hr	10 ppl/hr	8 ppl/hr	4 ppl/hr	12 ppl/hr
Walk	9 ppl/hr	34 ppl/hr	43 ppl/hr	33 ppl/hr	18 ppl/hr	51 ppl/hr

Trip Generation - Retail (Building A-1) Proposed

15,523 square feet of retail space

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	820	15,523 sf	9 veh/hr	6 veh/hr	15 veh/hr	28 veh/hr	30 veh/hr	58 veh/hr
		Calculation Details:	*62%*	*38%*	*=0.96(x/1000)*	*48%*	*52%*	*=3.71(x/1000)*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	16 ppl/hr	11 ppl/hr	27 ppl/hr	50 ppl/hr	53 ppl/hr	103 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	Auto	35%	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	18 ppl/hr	36 ppl/hr
Retail	Transit	35%	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	18 ppl/hr	36 ppl/hr
Retail	Bike	5%	1 ppl/hr	0 ppl/hr	1 ppl/hr	3 ppl/hr	2 ppl/hr	5 ppl/hr
Retail	Walk	25%	4 ppl/hr	3 ppl/hr	7 ppl/hr	13 ppl/hr	13 ppl/hr	26 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	3 veh/hr	2 veh/hr	5 veh/hr	10 veh/hr	10 veh/hr	20 veh/hr

Trip Gen Summary for Retail

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	3 veh/hr	2 veh/hr	5 veh/hr	10 veh/hr	10 veh/hr	20 veh/hr
Transit	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	18 ppl/hr	36 ppl/hr
Bike	1 ppl/hr	0 ppl/hr	1 ppl/hr	3 ppl/hr	2 ppl/hr	5 ppl/hr
Walk	4 ppl/hr	3 ppl/hr	7 ppl/hr	13 ppl/hr	13 ppl/hr	26 ppl/hr

Trip Generation - Residential (Building A-2) Proposed

260 residential units

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	220	260 du	26 veh/hr	105 veh/hr	131 veh/hr	105 veh/hr	56 veh/hr	161 veh/hr
		Calculation Details:	*20%*	*80%*	*=0.49(x)+3.73*	*65%*	*35%*	*=0.55(x)+17.65*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	29 ppl/hr	119 ppl/hr	148 ppl/hr	119 ppl/hr	63 ppl/hr	182 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartments	Auto	39%	11 ppl/hr	47 ppl/hr	58 ppl/hr	46 ppl/hr	25 ppl/hr	71 ppl/hr
Apartments	Transit	40%	12 ppl/hr	47 ppl/hr	59 ppl/hr	48 ppl/hr	25 ppl/hr	73 ppl/hr
Apartments	Bike	4%	1 ppl/hr	5 ppl/hr	6 ppl/hr	5 ppl/hr	2 ppl/hr	7 ppl/hr
Apartments	Walk	17%	5 ppl/hr	20 ppl/hr	25 ppl/hr	20 ppl/hr	11 ppl/hr	31 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments	1.13 ppl/veh	10 veh/hr	41 veh/hr	51 veh/hr	41 veh/hr	22 veh/hr	63 veh/hr

Trip Gen Summary for Residential

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	10 veh/hr	41 veh/hr	51 veh/hr	41 veh/hr	22 veh/hr	63 veh/hr
Transit	12 ppl/hr	47 ppl/hr	59 ppl/hr	48 ppl/hr	25 ppl/hr	73 ppl/hr
Bike	1 ppl/hr	5 ppl/hr	6 ppl/hr	5 ppl/hr	2 ppl/hr	7 ppl/hr
Walk	5 ppl/hr	20 ppl/hr	25 ppl/hr	20 ppl/hr	11 ppl/hr	31 ppl/hr

Trip Generation - Retail (Building A-2) Proposed

6,700 square feet of retail space

Step 1: Base trip generation using ITEs' *Trip Generation*

Land Use	Land Use Code	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	820	6,700 sf	4 veh/hr	2 veh/hr	6 veh/hr	12 veh/hr	13 veh/hr	25 veh/hr
		Calculation Details:	*62%*	*38%*	*=0.96(x/1000)*	*48%*	*52%*	*=3.71(x/1000)*

Step 2: Convert to people per hour, before applying mode splits

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	7 ppl/hr	4 ppl/hr	11 ppl/hr	21 ppl/hr	24 ppl/hr	45 ppl/hr

Step 3: Split between modes, per assumed Mode Splits

Land Use	Mode	Split	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Retail	Auto	35%	2 ppl/hr	2 ppl/hr	4 ppl/hr	7 ppl/hr	9 ppl/hr	16 ppl/hr
Retail	Transit	35%	2 ppl/hr	2 ppl/hr	4 ppl/hr	7 ppl/hr	9 ppl/hr	16 ppl/hr
Retail	Bike	5%	0 ppl/hr	1 ppl/hr	1 ppl/hr	1 ppl/hr	1 ppl/hr	2 ppl/hr
Retail	Walk	25%	2 ppl/hr	1 ppl/hr	3 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr

Step 4: Convert auto trips back to vehicles/hour

Land Use	People/Car (from 2009 NHTS, Table 16)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail	1.78 ppl/veh	1 veh/hr	1 veh/hr	2 veh/hr	4 veh/hr	5 veh/hr	9 veh/hr

Trip Gen Summary for Retail

Mode	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Auto	1 veh/hr	1 veh/hr	2 veh/hr	4 veh/hr	5 veh/hr	9 veh/hr
Transit	2 ppl/hr	2 ppl/hr	4 ppl/hr	7 ppl/hr	9 ppl/hr	16 ppl/hr
Bike	0 ppl/hr	1 ppl/hr	1 ppl/hr	1 ppl/hr	1 ppl/hr	2 ppl/hr
Walk	2 ppl/hr	1 ppl/hr	3 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr

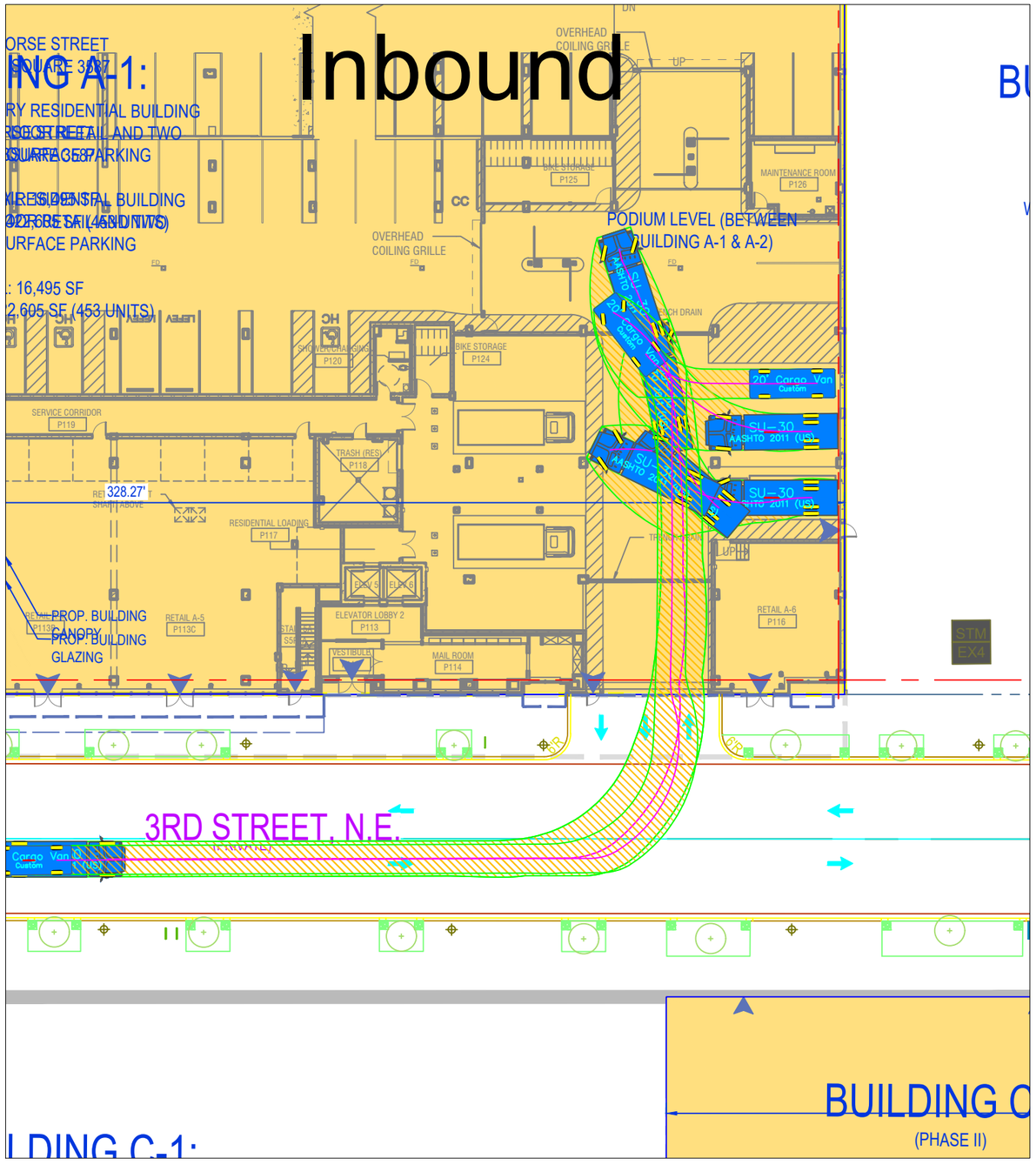
Trip Gen Summary by Land Use/Mode

Mode	Building	Land Use	AM Peak Hour			PM Peak Hour		
			In	*Out*	*Total*	*In*	*Out*	*Total*
Auto	Building A-1 Approved	*Residential*	18 veh/hr	68 veh/hr	86 veh/hr	66 veh/hr	36 veh/hr	102 veh/hr
		Retail	3 veh/hr	2 veh/hr	5 veh/hr	10 veh/hr	11 veh/hr	21 veh/hr
	Building A-2 Phase 1 Approved	*Residential*	6 veh/hr	26 veh/hr	32 veh/hr	27 veh/hr	15 veh/hr	42 veh/hr
		Retail	1 veh/hr	0 veh/hr	1 veh/hr	2 veh/hr	2 veh/hr	4 veh/hr
	Building A-2 Phase 2 Approved	*Residential*	6 veh/hr	24 veh/hr	30 veh/hr	25 veh/hr	14 veh/hr	39 veh/hr
		Retail	1 veh/hr	0 veh/hr	1 veh/hr	3 veh/hr	3 veh/hr	6 veh/hr
	Building A-1 Proposed	*Residential*	18 veh/hr	70 veh/hr	88 veh/hr	67 veh/hr	37 veh/hr	104 veh/hr
		Retail	3 veh/hr	2 veh/hr	5 veh/hr	10 veh/hr	10 veh/hr	20 veh/hr
	Building A-2 Proposed	*Residential*	10 veh/hr	41 veh/hr	51 veh/hr	41 veh/hr	22 veh/hr	63 veh/hr
		Retail	1 veh/hr	1 veh/hr	2 veh/hr	4 veh/hr	5 veh/hr	9 veh/hr
	Net Trips		**-3 veh/hr**	**-6 veh/hr**	**-9 veh/hr**	**-11 veh/hr**	**-7 veh/hr**	**-18 veh/hr**
Transit	Building A-1 Approved	*Residential*	20 ppl/hr	80 ppl/hr	100 ppl/hr	77 ppl/hr	41 ppl/hr	118 ppl/hr
		Retail	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	19 ppl/hr	37 ppl/hr
	Building A-2 Phase 1 Approved	*Residential*	7 ppl/hr	30 ppl/hr	37 ppl/hr	31 ppl/hr	17 ppl/hr	48 ppl/hr
		Retail	1 ppl/hr	1 ppl/hr	2 ppl/hr	3 ppl/hr	4 ppl/hr	7 ppl/hr
	Building A-2 Phase 2 Approved	*Residential*	7 ppl/hr	27 ppl/hr	34 ppl/hr	29 ppl/hr	16 ppl/hr	45 ppl/hr
		Retail	1 ppl/hr	1 ppl/hr	2 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr
	Building A-1 Proposed	*Residential*	20 ppl/hr	82 ppl/hr	102 ppl/hr	78 ppl/hr	42 ppl/hr	120 ppl/hr
		Retail	6 ppl/hr	3 ppl/hr	9 ppl/hr	18 ppl/hr	18 ppl/hr	36 ppl/hr
	Building A-2 Proposed	*Residential*	12 ppl/hr	47 ppl/hr	59 ppl/hr	48 ppl/hr	25 ppl/hr	73 ppl/hr
		Retail	2 ppl/hr	2 ppl/hr	4 ppl/hr	7 ppl/hr	9 ppl/hr	16 ppl/hr
	Total		**-2 ppl/hr**	**-8 ppl/hr**	**-10 ppl/hr**	**-12 ppl/hr**	**-9 ppl/hr**	**-21 ppl/hr**
Bike	Building A-1 Approved	*Residential*	2 veh/hr	8 veh/hr	10 veh/hr	8 veh/hr	4 veh/hr	12 veh/hr
		Retail	1 veh/hr	0 veh/hr	1 veh/hr	3 veh/hr	2 veh/hr	5 veh/hr
	Building A-2 Phase 1 Approved	*Residential*	1 veh/hr	3 veh/hr	4 veh/hr	3 veh/hr	2 veh/hr	5 veh/hr
		Retail	0 veh/hr	0 veh/hr	0 veh/hr	0 veh/hr	1 veh/hr	1 veh/hr
	Building A-2 Phase 2 Approved	*Residential*	1 veh/hr	2 veh/hr	3 veh/hr	3 veh/hr	1 veh/hr	4 veh/hr
		Retail	0 veh/hr	0 veh/hr	0 veh/hr	1 veh/hr	1 veh/hr	2 veh/hr
	Building A-1 Proposed	*Residential*	2 veh/hr	8 veh/hr	10 veh/hr	8 veh/hr	4 veh/hr	12 veh/hr
		Retail	1 veh/hr	0 veh/hr	1 veh/hr	3 veh/hr	2 veh/hr	5 veh/hr
	Building A-2 Proposed	*Residential*	1 veh/hr	5 veh/hr	6 veh/hr	5 veh/hr	2 veh/hr	7 veh/hr
		Retail	0 veh/hr	1 veh/hr	1 veh/hr	1 veh/hr	1 veh/hr	2 veh/hr
	Total		**-1 veh/hr**	**1 veh/hr**	**0 veh/hr**	**-1 veh/hr**	**-2 veh/hr**	**-3 veh/hr**
Walk	Building A-1 Approved	*Residential*	9 ppl/hr	33 ppl/hr	42 ppl/hr	33 ppl/hr	17 ppl/hr	50 ppl/hr
		Retail	4 ppl/hr	3 ppl/hr	7 ppl/hr	13 ppl/hr	13 ppl/hr	26 ppl/hr
	Building A-2 Phase 1 Approved	*Residential*	3 ppl/hr	13 ppl/hr	16 ppl/hr	13 ppl/hr	7 ppl/hr	20 ppl/hr
		Retail	1 ppl/hr	0 ppl/hr	1 ppl/hr	2 ppl/hr	3 ppl/hr	5 ppl/hr
	Building A-2 Phase 2 Approved	*Residential*	3 ppl/hr	12 ppl/hr	15 ppl/hr	12 ppl/hr	7 ppl/hr	19 ppl/hr
		Retail	1 ppl/hr	1 ppl/hr	2 ppl/hr	4 ppl/hr	4 ppl/hr	8 ppl/hr
	Building A-1 Proposed	*Residential*	9 ppl/hr	34 ppl/hr	43 ppl/hr	33 ppl/hr	18 ppl/hr	51 ppl/hr
		Retail	4 ppl/hr	3 ppl/hr	7 ppl/hr	13 ppl/hr	13 ppl/hr	26 ppl/hr
	Building A-2 Proposed	*Residential*	2 ppl/hr	1 ppl/hr	3 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr
		Retail	2 ppl/hr	1 ppl/hr	3 ppl/hr	5 ppl/hr	6 ppl/hr	11 ppl/hr
	Total		**-4 ppl/hr**	**-23 ppl/hr**	**-27 ppl/hr**	**-21 ppl/hr**	**-8 ppl/hr**	**-29 ppl/hr**

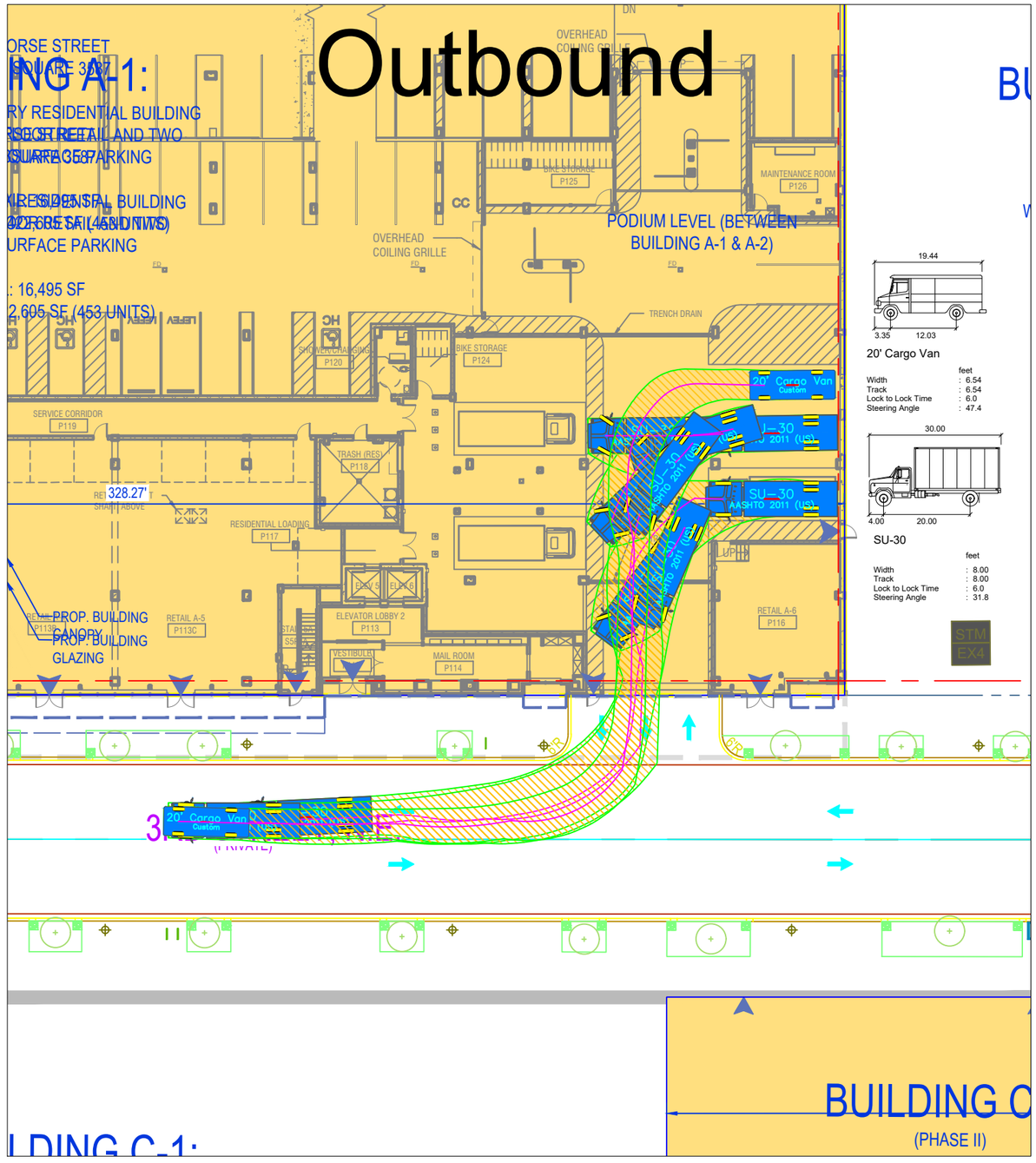
Trip Gen Summary by Building/Mode

	Land Use	Quantity (x)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Proposed	Residential	711 du	28 veh/hr	111 veh/hr	139 veh/hr	108 veh/hr	59 veh/hr	167 veh/hr
	Retail	22223 sf	4 veh/hr	3 veh/hr	7 veh/hr	14 veh/hr	15 veh/hr	29 veh/hr
Approved	*Residential*	*749 du*	*30 veh/hr*	*118 veh/hr*	*148 veh/hr*	*118 veh/hr*	*65 veh/hr*	*183 veh/hr*
	Retail	*23335 sf*	*5 veh/hr*	*2 veh/hr*	*7 veh/hr*	*15 veh/hr*	*16 veh/hr*	*31 veh/hr*
		Net Trips	**-3 veh/hr**	**-6 veh/hr**	**-9 veh/hr**	**-11 veh/hr**	**-7 veh/hr**	**-18 veh/hr**

Inbound



Outbound



20' Cargo Van

	feet
Width	: 6.54
Track	: 6.54
Lock to Lock Time	: 6.0
Steering Angle	: 47.4

SU-30

	feet
Width	: 8.00
Track	: 8.00
Lock to Lock Time	: 6.0
Steering Angle	: 31.8

STM EX4

GOROVE / SLADE
Transportation Planners and Engineers

Market Terminal Building A2: Turning Maneuver Analysis

Grosvenor

Union Market, Washington, DC

P:\1569-006 Market Terminal Bldg A-2 (7301-2532)\CAD\Market Terminal AutoTURN 5.3.19.dwg - 5/3/2019 1:08 PM

N

1" = 30'