

MEMORANDUM

TO: Andrew McIntyre
Via email: amcintyre@penzco.com

FROM: Karina Ricks

DATE: May 13, 2015

RE: **Transportation Review of Alternatives**

Nelson\Nygaard was retained to examine the preliminary multimodal transportation operations and impacts of several proposed site development concepts for the West Rosslyn project. This memo captures our initial analysis of the proposed concepts and their operational performance and impacts.

OVERVIEW

Site Context

The project is located at 1550 Wilson Boulevard in the Rosslyn Sector Plan area of Arlington County. The site is imbedded within a long block located between Wilson Boulevard and 18th Street. The block is bounded by North Oak Street to the east and North Quinn Street to the west.

Significant uses surrounding the site include a major grocer and office development adjacent to the east, the high density development spine of the Wilson/Clarendon Boulevard corridor to the south, a school and cultural resource adjacent to the west, and high density residential development across 18th Street to the north.

Transportation Context

The site is proximate to a rich diversity of quality transportation amenities and services.

- **Metrorail:** The site is approximately 1,200 feet (a five minute walk) from the Rosslyn Metro Station and 2,700 feet (a 10-minute walk) from the Courthouse Metro Station.
- **Surface transit:** County (ART) and regional (WMATA) bus service is provided on both the Wilson/Clarendon corridor as well as Key Boulevard one block to the north.
- **Pedestrian network:** Rosslyn is an intensive walk environment with some of the highest pedestrian concentrations in Arlington County.
 - Sidewalks are generally complete in the area with the exception of the western segment of 18th Street between the subject site and N. Quinn Street.
 - Pedestrian volumes are very high along Wilson Boulevard with a greater proportion utilizing the north side of the street. In the AM peak hour, 142 pedestrians traveled along Wilson Boulevard across N. Quinn Street. That number more than quadrupled as over 650 pedestrians traversed Wilson Boulevard at N. Oak Street – over 500 of them on the north side. PM peak hour pedestrian volumes were slightly higher yet.

(see Appendix A). Pedestrians account for up to 20 to 30% of multimodal traffic on area streets. (Figure 1)

- The area is projected to have a 34% increase in residents and a 51% increase in jobs.¹ This is anticipated to further increase the proportion of walk trips and density of pedestrian activity along with other non-auto modes.
- Existing sidewalks are narrow along the north side of 18th Street along the site frontage.
- **Bicycle network and services:** Bicycle lanes are located on the Wilson/Clarendon corridor and N. Quinn Street. 18th Street is a comfortable bicycling environment. Two Capital Bikeshare stations are located within a short block of the site with two more available within easy walk distance. Bicycle volumes are modest in the area with bicycle volumes hovering around 14 bicycles in the peak hour utilizing Wilson Boulevard (See Appendix A). Bicycles account for less than 1% of multimodal traffic on area streets (Figure 1).
- **Shared vehicles:** Three car share locations are available within one-block of the site while a fourth is available a short distance further. Two taxi stands are located just one block to the east.
- **Street network:** Immediately adjacent to the site is Wilson Boulevard, which is the one-way westbound urban arterial paired with the eastbound urban arterial of Clarendon Boulevard. These two roadways serve as both regional and local connections through Arlington County and the Rosslyn corridor. To the south and west N. Pierce Street and N. Quinn Street are local collector facilities that provide access between the Wilson Blvd/Clarendon Blvd pairing and to Lee Highway respectively. To the north and east 18th Street and N. Oak Street are local roadways.
- **Traffic volumes:** Wilson and Clarendon Boulevards garner the greatest amount of vehicle traffic volumes followed by N. Quinn and Oak Streets (Figure 1).

Figure 1 Multimodal traffic volumes

Corridor	Distribution	Vehicles	Bicycles ²	Pedestrians ³
Wilson Boulevard	2 lanes westbound only, bike lane, on-street parking, sidewalk	14,000	155	7,250
Clarendon Boulevard	2 lanes westbound only, bike lane, on-street parking, sidewalk	13,600	n/a	n/a
N. Quinn Street	2 lanes (bi-directional), bike lane, on street parking, sidewalk	3,300	25	825
18 th Street	2 lanes (bi-directional), on-street parking (partial), sidewalk (partial)	1,500 ⁴	n/a	n/a
N. Oak Street	2 lanes (bi-directional), on-street parking, sidewalk	3,100	20	1,320

¹ Final Draft *Rossllyn Multi-Modal Transportation Study*. Arlington County DES – Transportation Planning. September 2012. Pg.3

² Daily average derived from peak hour counts conducted April 1, 2015 consistent with VDOT “K Factor” methodology.

³ Daily average derived from peak hour counts conducted April 1, 2015 consistent with VDOT “K Factor” methodology.

⁴ Estimated

Proposed Development Program

Proposed program elements of the development site include:

- 700 to 750 residential units
- Up to 50,000 s.f. of retail space (including approximately 37,000 s.f. grocer)
- Approximately 415,000 s.f. of office space
- A significant public amenity (park and open space), and
- A fire station.

EXISTING MULTIMODAL VOLUMES

In order to document existing traffic patterns and levels, vehicle, pedestrian, and bicycle turning movement counts (TMCs) were conducted on Wednesday April 1, 2015 during the peak weekday hours of 7:00 to 9:00am and 4:00 to 6:00pm. Counts were collected at the intersections of:

- N. Oak Street at Wilson Boulevard
- N. Pierce Street at Wilson Boulevard
- N. Quinn Street at Wilson Boulevard

The existing conditions network was then used as a baseline to analyze the proposed site access conditions for the development site.

Existing Traffic Capacity

To assess the quality of existing traffic flow at intersections, turning movement counts and volumes were compiled and evaluated utilizing the procedures outlined by the 2010 Highway Capacity Manual (HCM). Each intersection within the study area was analyzed for vehicle level-of-service (LOS), reporting the quality of traffic with a letter grade A to F, volume to capacity ratio (V/C), the stop time delay in seconds and the 95th percentile queue lengths. A summary chart of the results of this analysis is shown below. Traffic operations in the existing conditions at all study area intersections operate overall at LOS B or better, with minimal delay and queue lengths. (Figure 2)

Figure 2 Existing Level of Service Summary

Intersection	AM Peak Hour				PM Peak Hour				Saturday Peak Hour			
	LOS	Delay	V/C	95 th % Queue	LOS	Delay	V/C	95 th % Queue	LOS	Delay	V/C	95 th % Queue
Wilson Boulevard/N. Oak Street (Signalized)												
WB Wilson Blvd (T/R)	B	19	0.45	128	B	19	0.43	136	B	16.0	0.26	82
NB N. Oak St. (L/T)	A	6	0.35	18	A	7	0.25	13	D	42.0	0.22	68
SB N. Oak St. (T/R)	C	27	0.44	85	C	30	0.40	96	C	20.0	0.21	52
Wilson Boulevard/N. Pierce Street (Signalized)												
WB Wilson Blvd (L/T)	A	5	0.36	46	A	6	0.49	65	A	7	0.31	61
NB N. Pierce St (L)	C	30	0.43	151	C	31	0.45	140	C	29	0.37	128

Wilson Boulevard/N. Quinn Street (Signalized)												
WB Wilson Blvd (T/R)	A	9	0.17	56	A	8	0.31	82	A	8	0.34	43
SB N. Quinn St. (T/R)	A	2	0.28	6	B	15	0.36	95	A	8	0.23	61

ESTIMATED TRIP GENERATION

In keeping with transportation planning standards, the Institute of Transportation Engineers (ITE) Trip Generation Manual was utilized to develop preliminary trip generation estimates for the 1555 Wilson Boulevard proposed development. It is important to note that the ITE rates are reflective of stand-alone suburban sites, which typically have little or no access to public transportation services, bicycle facilities, or a continuous and comprehensive pedestrian network that promote non-auto use. Accordingly, adjustment factors were applied to more appropriately reflect the context of the site and the multiple transportation options that serve it.

In order to develop appropriate trip reduction and mode split factors, Nelson\Nygaard utilized data on similar project developments both nationally and locally focusing on urban grocery stores, high-rise residential and office uses.

Two recent reports from the District of Columbia⁵ and Arlington County⁶ provide comparable examples to the subject property. These samples are summarized in Figure 3 (for comparison, the corresponding ITE trip rates are also included. The survey was performed on a weekday during the AM and PM periods in mid-March with trip counts and a survey of residents as they entered/exited the building to gain more information regarding their trip.

Figure 3 Vehicle Trip Generation Survey for Rosslyn Residential Development

Site Elements	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Corresponding ITE Trip Rates/Unit ¹	0.09	0.21	0.30	0.21	0.14	0.35
Arlington (499 Residential Units)						
- Observed Trips/ITE Estimated Trips (%)			60.47			49.7
- Computed Vehicle Trip Rates*	0.05	0.13	0.18	0.10	0.07	0.17
Corresponding ITE Trip Rates/Unit ¹	0.09	0.21	0.30	0.21	0.14	0.35

*Trips per residential unit

¹ ITE Land Use Code 222 (High-rise Apartment)

Source: ITE Trip Generation Manual and Nelson\Nygaard

As expected, observed vehicle trip generation rate are considerably lower than ITE estimates for high-rise residential apartment developments (by roughly half).

The 1555 Wilson Boulevard site will have approximately 50,000 sq. ft. of retail space, consisting of an anchor grocery store and two (2) to three (3) locally-serving retail establishments. This study assumes little to no appreciable vehicle trip generation will result from the small service retail, however,

⁵ R. Weinberger, L. Cohen, S. Dock, J. Rogers, J. Henson, "Predicting Travel Impacts of New Development in America's Major Cities: Testing Alternative Trip Generation Models." Transportation Research Board Annual Meeting, January 2015

⁶ Residential Building Transportation Performance Monitoring Study, Arlington County Commuter Services, September 2013

the 37,000 – 40,000 sq. ft grocer will have significant affects. Research of comparable urban grocery stores nationally has indicated that although trip generation rates may be higher overall than the average ITE rate, a larger portion of them are non-auto and pass-by trips.

In addition the proposed development will add 261,000 sq. ft. of office space to the existing 154,000 sq. ft. Based upon the surveyed residential development trip generation rates it is envisioned that the proposed office space will mimic a similar mode of travel pattern with a transit-oriented based location.

Based on the above, Figure 4 below presents the trip generation estimates of the proposed development site.

Figure 4 Vehicle Trip Generation (1555 Wilson Boulevard)

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Vehicle Trip Rates						
Trips per Apt. Unit <i>[Utilizing surveyed trip rate]</i>	0.05	0.13	0.18	0.10	0.07	0.17
Trips per 1,000 Sq Ft Grocery Store (per research) <i>Less 40% Pass-By</i> <i>Less 10% Internal Capture</i> <i>Less 10% Walk/Bike</i>	4.02	3.56	7.58	5.92	6.16	12.08
- With 60% non-auto/pass-by trips	1.61	1.42	3.03	2.37	2.46	4.83
Trips per 1,000 Sq Ft Office Building <i>[ITE Code 710]</i> - With 47% / 60% non-auto trips in AM / PM	1.37 0.73	0.19 0.10	1.56 0.83	0.25 0.10	1.24 0.50	1.49 0.60
Trip Generation						
Trip/700 Apt. Unit	14	98	112	56	42	98
Trip/ 37,000 sf Grocery Store	60	52	112	88	91	179
Trip/ 415,000 sf Office Building	303	42	345	42	208	250
Total Site Vehicle Trips	377	192	569	186	341	527

Source: ITE Trip Generation Manual (2012), and Nelson\Nygaard

The site is projected to generate 569 vehicle trips during the morning and 527 vehicle trips during the afternoon peak hours on typical weekdays with the proposed assumptions of non-auto vehicle trips.

The peak period vehicular trip generation of the proposed development will be more than the existing uses on the site which are currently estimated at 128 and 98 vehicle trips in the AM and PM peak hour respectively. Figure 5 below provides an estimation of the existing trip generation of the property, assuming relevant non-auto factors.

Figure 5 Vehicle Trip Generation Existing Use (1555 Wilson Boulevard)

	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Trip Rates						
Trips per 1,000 Sq Ft Office Building [ITE Code 710]	1.37	0.19	1.56	0.25	1.24	1.49
- With 47%/60% non-auto trips in AM and PM	0.73	0.10	0.83	0.10	0.50	0.60
Trip Generation						
Trip/ 154,922 sf Office Building	113	15	128	15	78	93
Total Vehicle Site Trips – Existing Use	113	15	128	15	78	93
Total Vehicle Site Trips – Proposed Use	377	192	569	186	341	527
NET NEW TRIPS	264	177	441	171	263	434

Source: ITE Trip Generation Manual (2012), and Nelson\Nygaard

ALTERNATIVES

Four alternatives, including three variations on Alternative 3, were developed for the site. This section assesses the access and circulation associated with each, together with potential impacts on pedestrian network and safety.

In each case access to the site is estimated for vehicle trips originating from:

- I-66 and points north and west via Key Boulevard and N. Quinn Street
- Clarendon Boulevard and points west and south via Wilson Blvd. and N. Pierce St.
- Wilson Boulevard and points east and south via Lynn Street/N. Fort Myer Drive
- Oak/Nash Street and points north and east via Fort Myer Drive and the Key Bridge

Wilson Boulevard is assumed to remain the primary pedestrian route with the north-south connecting streets distributing pedestrian access. Bicycle paths of travel to and around the site are assumed to be concentrated, as they are today, along Wilson Boulevard, Quinn and Oak Streets.

Site plan concepts were assessed based on access and egress to the site and overall network circulation patterns. Loading demand and operations were evaluated and modeled to assess adequacy of space for maneuvering of these large vehicles. The quality of the pedestrian network and experience was assessed given the very high pedestrian volumes in this area and the desire to improve the pedestrian experience in the Rosslyn community. Additionally, site concept plans were assessed against the known proposed concepts for the Arlington Partnership for Affordable Housing (APAH) at the corner of Quinn and 18th Street and the interaction with the proposed new HB Woodlawn school program.

Several concepts contemplate a shared use (woonerf) type of street design. This design approach permits all users to mix in the space of the street and maintains travel speeds appropriate to the comfort and safety of all users – particularly vulnerable pedestrians. The shared street concept is discussed in a subsequent section.

Loading demand and operations

Loading access for the grocery store use is contemplated via two alternative approaches – utilizing a curb-cut along the south side of 18th Street or off of a proposed new segment of N. Ode Street. Loading for the high rise residential is provided in loading berths with back-in access off of 18th Street. Loading facilities for

the office and retail uses are contemplated in a number of different configurations and discussed in the alternative assessment below.

For the purposes of this study the operations and access of the grocery store loading facilities are of primary concern as these will have the highest rates of use and utilize the largest vehicles. The proposed grocer loading dock will consist of three loading berths with vehicles required to reverse into the dock either from 18th Street or a new Ode Street.

Loading operations

The swept path for three vehicle types were evaluated: a large tractor-trailer (WB-67), the more common type of semi-truck used in this region (WB-50) and a trash truck (SU-30), which shares many characteristics with typical moving trucks and vendor/supplier trucks. Swept path analysis for the largest vehicle type (WB-67) are included in Appendix C.

Loading demand and trip generation

Research of similar sized urban grocery stores and the freight trip generation of such uses, as highlighted in NCHRP Report 739 – Freight Trip Generation and Land-Use, provide good estimates of daily and peak hour truck trip generation for the proposed development. Figure 6 below summarizes the estimated trip generation for the grocery store use.

Figure 6 Estimated Truck Trip Generation

Site Elements	Ave. Weekday Trips	Ave. Weekend Trips
37,000 sq. ft Grocery Store		
- Daily Truck Trip Rates <i>[per NCHRP 739]</i>	30	9
- Peak Period [3:00 AM – 3:00 PM]	26	8
- Peak Hour	3.5	1
	[11:00am – 12:00pm]	[7:00am – 8:00am]

Source: National Cooperative Highway Research Program Report 739

Further research by the University of Washington (Research Project Agreement No. 61-7170) found that the average delivery time of trucks at grocery stores was 27 minutes in length. Using this average timeframe indicates that the three (3) loading docks for proposed commercial use on the proposed site would be adequate for estimated truck trip generation. In fact the proposed loading docks would be approximately 50% more than the required demand during the peak hour.

Shared Use Street

Several alternatives propose that new streets or access ways be designed as curbsless, shared use spaces. Shared use streets, also known as “woonerfs” or “home zone” streets, are viable and appropriate where traffic volumes are very low (ideally less than 1,000 vehicles per day) and where very slow travel (less than 15 MPH) is expected and desired. In very constrained conditions, shared use streets can provide a much more appealing, unique, flexible and comfortable non-motorized accommodation than narrow sidewalks or bicycle facilities. Shared use streets lack definition of specific zones or lines of travel for pedestrians, bicycles or bi-directional auto travel. The whole of the street is available for use by any travel mode traveling in any direction. Vehicles typically may only travel as fast as the slowest shared user.

Several examples of shared use streets and curbsless environments exist throughout the country and in the Washington Region. Some, like Cady’s Alley in Georgetown, are specifically designed to accommodate delivery vehicles and permit the safe mixing with pedestrians, bicycles, passenger vehicles, and dynamic public space activities.

Good design is essential to a successful shared use street. The design must indicate the presence and priority of pedestrians. It must reinforce the necessity of very slow speeds. And it must contribute to a distinctive character and definition of space and place. (Figure 7)

Figure 7 Examples of shared use streets



Nassau Street, Manhattan NYC



Wall Street Plaza, Orlando, FL



Cady's Alley, Georgetown, Washington, DC
Source: Eric Fidler

Interaction with Adjacent Redevelopment Sites

Immediately to the west of the subject sites, the Wilson School site is slated for redevelopment to house the H-B Woodlawn School and a pre-Kindergarten program. The alternative education H-B Woodlawn is a countywide magnet accommodating 775 secondary students. The Pre-K program is proposed to accommodate 125 students. Students arrive by foot, bicycle, private auto drop off and public school bus. According to student travel behaviors gathered by the County, approximately 40% of students are anticipated to arrive by public school bus, 30% dropped off by car, and 20% arriving on foot. A minority of students arrive by bicycle (3%), carpool (5%) or public transit (2%). To the extent practical, it is desirable to increase accessibility by non-motorized modes of arrival and decrease private auto drop off.

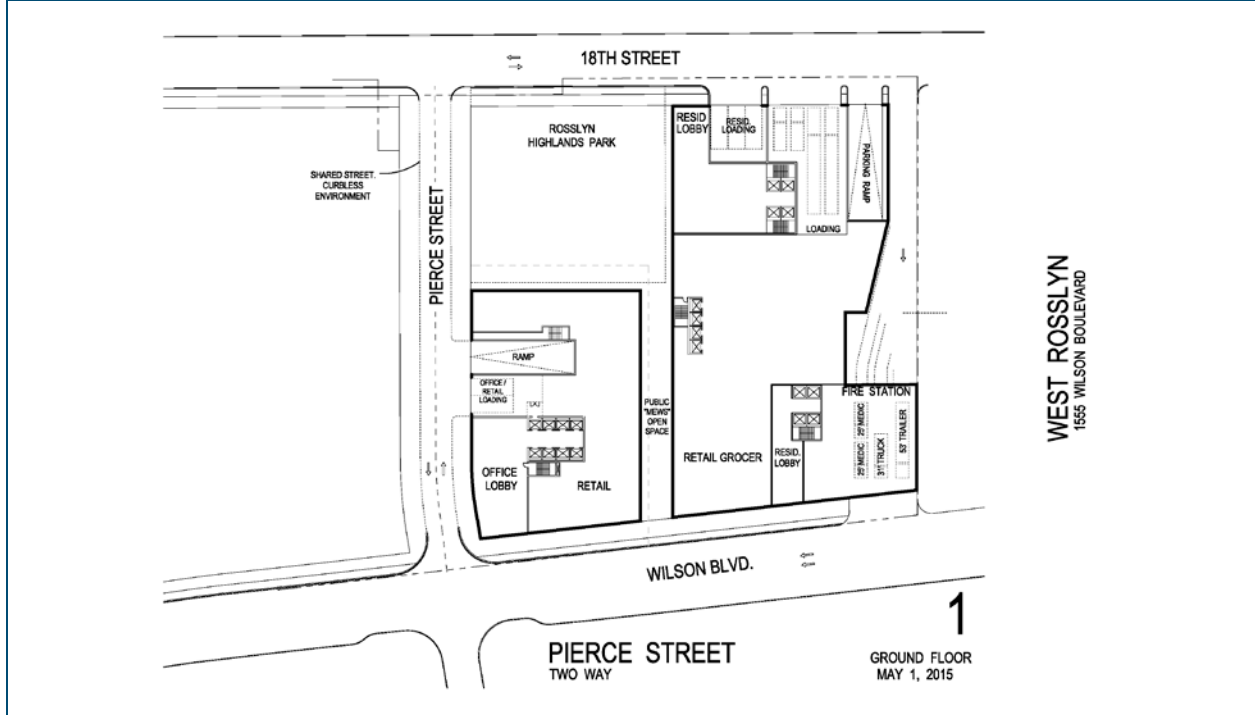
For the purposes of this analysis, we have used the Superintendent's recommendation for the Wilson School site to provide accommodation for 11 school buses, 91 off-street parking spaces, and 8 drop off spaces.

Northwest of the subject site is the existing APAH housing site consisting of 35 affordable garden-style apartments. This site too is anticipated to be redeveloped to accommodate 250 affordable housing units. Parking for the redeveloped site will be underground and accessed from Key Boulevard.

Alternative 1

Alternative 1 (Figure 8) establishes a northern extension of Pierce Street connecting between Wilson Boulevard and 18th Street. Parking and loading are accommodated off the new Pierce Street (for the office development) and 18th Street (for the residential and retail building).

Figure 8 Alternative 1 - Pierce Street Two Way

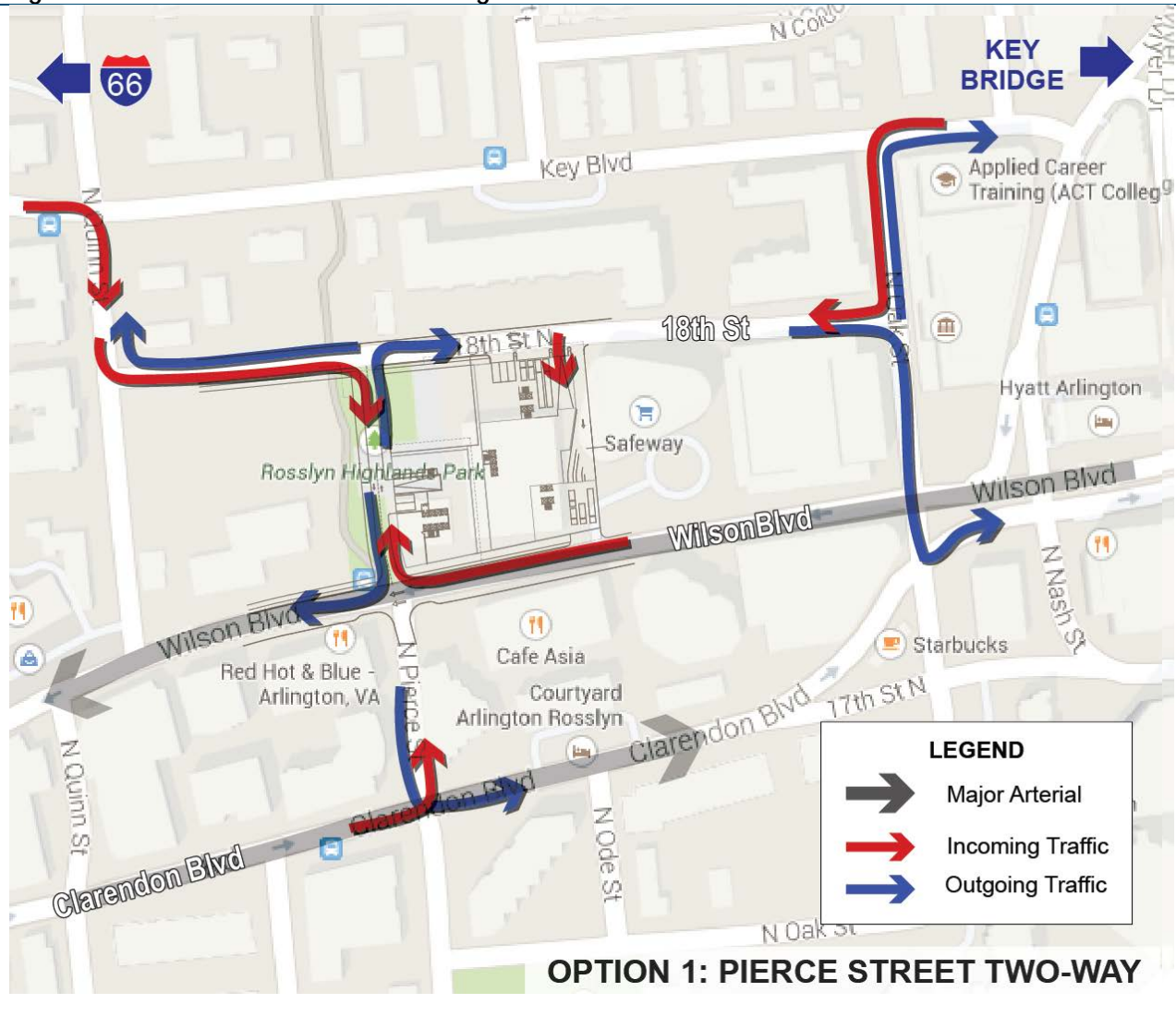


Auto Access/Egress:

Alternative 1 provides good access and egress from all points and provides the opportunity for an even distribution of traffic (Figure 9). The aligned Pierce Street extended provides a signalized juncture with Wilson Boulevard and direct access to Clarendon Boulevard.

Access to the grocer parking facility is fairly intuitive *after full construction* however, Pierce Street extended could not be provided until the latter phase of the project, potentially some years after delivery of the first building. This significantly complicates access and circulation issues to the site. All trips would be concentrated on 18th Street with a significant majority traversing Oak Street. Residents, patrons and visitors arriving from the west would be the most challenged.

Figure 9 Alternative 1 - Access and Egress



Loading

Loading will occur along the same access/egress routes as autos. Given the narrow width of 18th Street, curbside parking must be restricted along both the north and south sides of the street in the vicinity of loading bay. Loading is back-in from 18th Street. This may cause significant delays and disruptions to multimodal travel along 18th Street while trucks, especially the larger vehicles, are maneuvering into the loading bays.

Pedestrian quality and safety

Having a signal at the Pierce Street access/egress point will generally hold traffic at a designated stop bar maintaining clear pedestrian crossing along the heavily traveled Wilson Boulevard sidewalk. Further, the single access point minimized intrusion of vehicles across the pedestrian path of travel. A sizable extent of curb cuts accessing the retail and residential loading facilities and parking access for the garage facility somewhat diminishes the pedestrian realm of 18th Street but can be managed if sensitively designed.

Interaction with Adjacent Redevelopment sites

Alternative 1 provides the Pierce Street extended as envisioned in the preferred Arlington Public Schools (APS) drop off option. However, access to the loading dock becomes more difficult during the AM arrival and PM dismissal school periods when school buses are aligned along the western curb edge and functionality of this access may be compromised. Furthermore, as previously mentioned, the inability to deliver this street during the first phase of construction introduces additional conflicts as a higher concentration of truck and passenger vehicle traffic will use the Quinn Street and 18th Street segments adjacent to the housing and school sites.

Given that parking for APAH housing is located off of Key Boulevard, few traffic interactions are anticipated with this site. Pedestrian accommodation may be degraded by the curb cuts on 18th Street for the retail and residential building access and service.

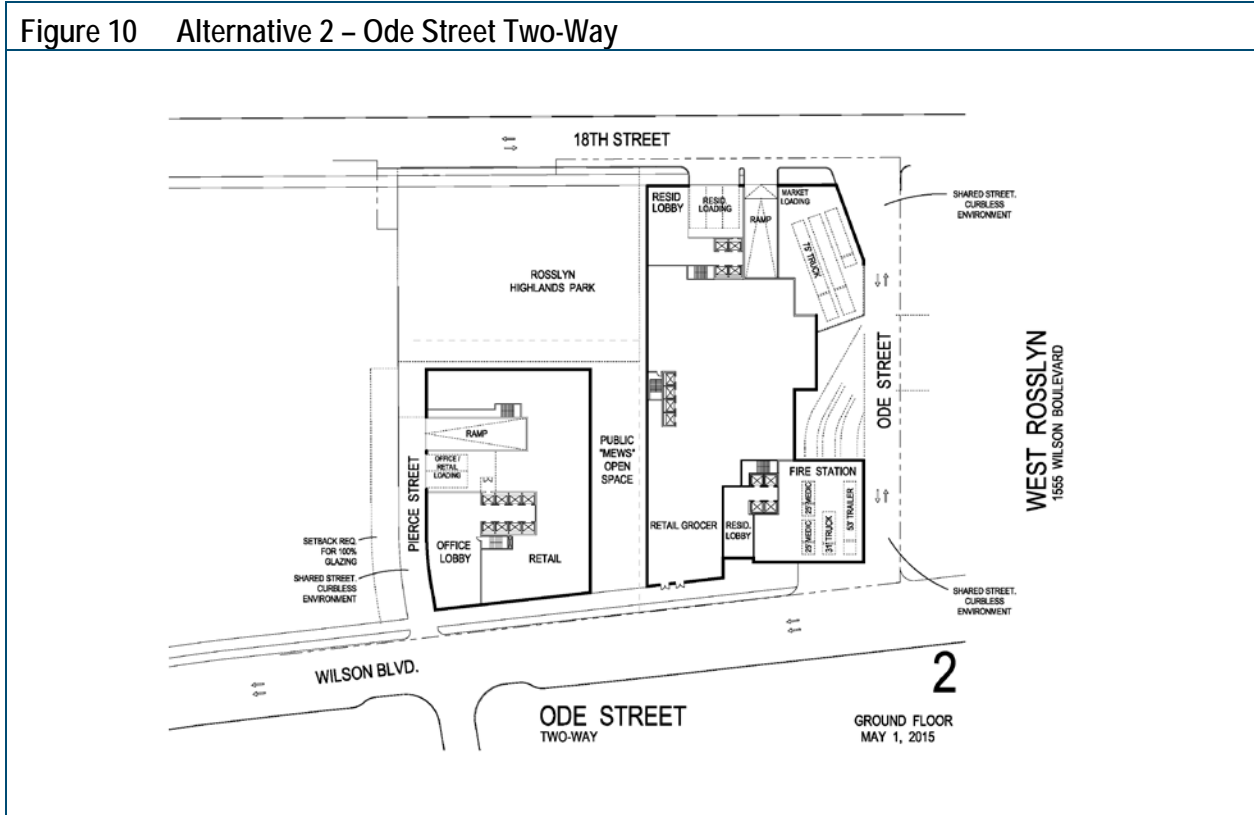
Alternative 1 Summary Assessment

At full build out, Alternative 1 provides benefits in terms of access and integration with the pedestrian realm, HOWEVER the necessary phasing of the project, introduces substantial complications in access and loading that make this a less desirable alternative. Loading access to the office building off of Pierce Street extended may be compromised while school buses are present. The loading maneuvers for larger vehicles on 18th Street cannot be accommodated within the existing cartway of 18th Street likely rendering this alternative infeasible.

Alternative 2

Alternative 2 (Figure 10) bifurcates the block by establishing a segment of Ode Street between 18th Street and Wilson Boulevard. N. Ode Street would not connect through to eastbound Clarendon Boulevard, however. N. Ode Street is conceived as curbless, shared street (woonerf) sensitively designed to permit the safe and inviting comingling of autos, bicycles and pedestrians in a very low speed environment. A narrow curbless, shared service lane would provide access to the second phase of development (the office tower) onto and off of Wilson Boulevard.

Figure 10 Alternative 2 - Ode Street Two-Way



Auto Access/Egress:

Alternative 2 would enable the establishment of N. Ode Street during the first phase of construction – an important consideration. This provides good and logical access to the grocer and large residential property right from the onset of occupancy. Vehicle access is relatively evenly distributed between N. Quinn, N. Oak/Nash and Wilson Boulevard. Residents, patrons and visitors accessing the site from the west along Clarendon Boulevard would need to make a small amount of circuitous travel, bypassing Pierce to access from N. Oak Street, as they must do to access the site today.

Egressing vehicles would be similarly distributed with multiple options.

Figure 11 Alternative 2 – Access and Egress



Loading

Loading for the retail will be back-in loading from the new Ode Street. This angled loading is maneuverable for all sizes of vehicles. Back in access should be able to occur expeditiously, though there is the potential for conflict between the grocery loading and fire department operations. Loading for the residential building will be back-in loading from 18th Street.

Truck access is similarly distributed as with autos. Trucks servicing the grocer will access the site using N. Oak Street or N. Quinn then onto southbound Ode Street. Trucks will typically egress southbound on Ode Street and onto Wilson Boulevard. Trucks servicing the office building will utilize the service road off Wilson Boulevard.

Pedestrian quality and safety

Alternative 2 includes two curb cuts off of Wilson Boulevard and a series of curb cuts along the south side of 18th Street N. The woonerf design of N. Ode Street will create a convenient multimodal link with the north-south courtyard creating alternate pedestrian-only connections between Wilson Boulevard and 18th Street.

The interruptions along Wilson Boulevard should not introduce a significant issue if designed such that pedestrian dominance is clear at the curb cuts.

The series of curb cuts along 18th Street could once again be mitigated with sensitive design along the street. Given the introduction of a curbless shared space on N. Oak Street, the County may wish to consider a unique curbless design for 18th Street as well to unite and compliment the whole space and diminish the visual presence of the curb cuts. This could play off the existing character of 18th Street as it joins Quinn Street where this segment of street is currently a curbless, shared and unmarked space.

Interaction with Adjacent Redevelopment sites

Alternative 2 does not provide the Pierce Street extended as envisioned in the preferred Arlington Public Schools (APS) drop off option and therefore this alternative is not possible. However, a long, uninterrupted block face is provided along 18th Street between N. Quinn Street and the proposed Ode Street. This relatively quiet street provides a safe and attractive location for bus drop off. Buses may circulate and egress the area via the new Ode Street which provides a safe merge point back onto Wilson Boulevard (or they may continue east on 18th Street). Parent drop off can be accommodated along 18th Street without incident.

The quality of the pedestrian environment along 18th Street is generally maintained and the public mews provides additional connectivity between the APAH site and the main corridor of Wilson Boulevard.

Alternative 2 Summary Assessment

Overall, Alternative 2 provides a number of appealing features that make it a very viable alternative for further refinement, modeling and consideration. Loading from Ode Street reduces the curb cuts along 18th Street and minimized disruptions to that street. School drop off is easily accommodated along the 18th Street school and park frontage area and school bus circulation is efficient.

Alternative 3a

Alternative 3a (Figure 12) establishes a new two-way street (New Street) connecting between Wilson Boulevard and 18th Street slightly offset to the east of the current Pierce Street. The street provides direct access parking for the retail and residential building. A curbless, shared service alley is provided off Wilson Boulevard approximately at the termination of the existing Pierce Street to service the proposed office building.

Figure 12 Alternative 3a – New Street Midblock Two-Way



Auto Access/Egress:

Alternative 3a provides good and logical access to the grocer and large residential property right from the onset of occupancy. Vehicle access is relatively evenly distributed between N. Quinn, N. Oak/Nash and Wilson Boulevard (Figure 13). Patrons accessing the grocer and residential building via auto approach from the north or south onto New Street and enter the garage from that point. Visitors of staff of the office building would access from a small stub extension of Pierce Street thus further distributing the traffic between the two access points.

Vehicles exiting the grocer would be similarly distributed with the option to leave the site traveling northbound (and on to points east and west) or southbound (to points west). Proper signage and design could encourage patrons bound for Clarendon Boulevard and N. Fort Myer to utilize N. Oak as the most efficient route to the south and east.

Figure 13 Alternative 3a – Access and Egress



Loading

Loading for the retail/residential building will be back-in angled loading from 18th Street. Loading for the office building will be accessed by vehicles turning into an access drive off of Wilson Boulevard and backing into a loading berth from this alleyway. Trucks may only access the grocer using Oak Street.

The rear-in angled loading may cause some disruptions on operations of 18th Street, especially as larger vehicles maneuver into loading bays.

Pedestrian quality and safety

New Street in all Alternative 3 concepts is conceived as a traditional street with curb separating vehicle travel ways and the pedestrian zone of the street. The street is anticipated to be a low volume and low speed short block where bicyclists can comfortably use the street without a dedicated facility. Dividing the volume of vehicles accessing the site between the office access point off of Pierce Street extended and New Street aids in maintaining low vehicle volumes. Vehicle parking will be provided along the east side of the street.

Although two curb cuts remain on Wilson Boulevard these are not anticipated to interrupt pedestrian progression along Wilson Boulevard in any significant way.

Curb cuts along 18th Street are still significant in this option but somewhat reduced given that parking garage access is removed to New Street . Once again, the curb cuts that remain could be mitigated through good and creative design techniques.

Interaction with Adjacent Redevelopment Sites

The two-way access along New Street provides more accommodation for the adjacent sites. Not only may parents utilize some drop off along the New Street segment, but New Street also provides another opportunity for school bus egress. The weave onto Wilson Boulevard however would be a concern for School bus usage and the use of N. Quinn St and N. Oak St would be encouraged.

School bus drop off would be accommodated along 18th Street as with Alternative 2 and this provides adequate curb space for the necessary buses. Parent drop off may be considered along the northern segment of the new New Street (in addition to Quinn Street), however children would need to traverse the park to access the school.

Pedestrian circulation is maintained along many corridors linking the APAH site to Wilson Boulevard to the south and the Metro station to the east.

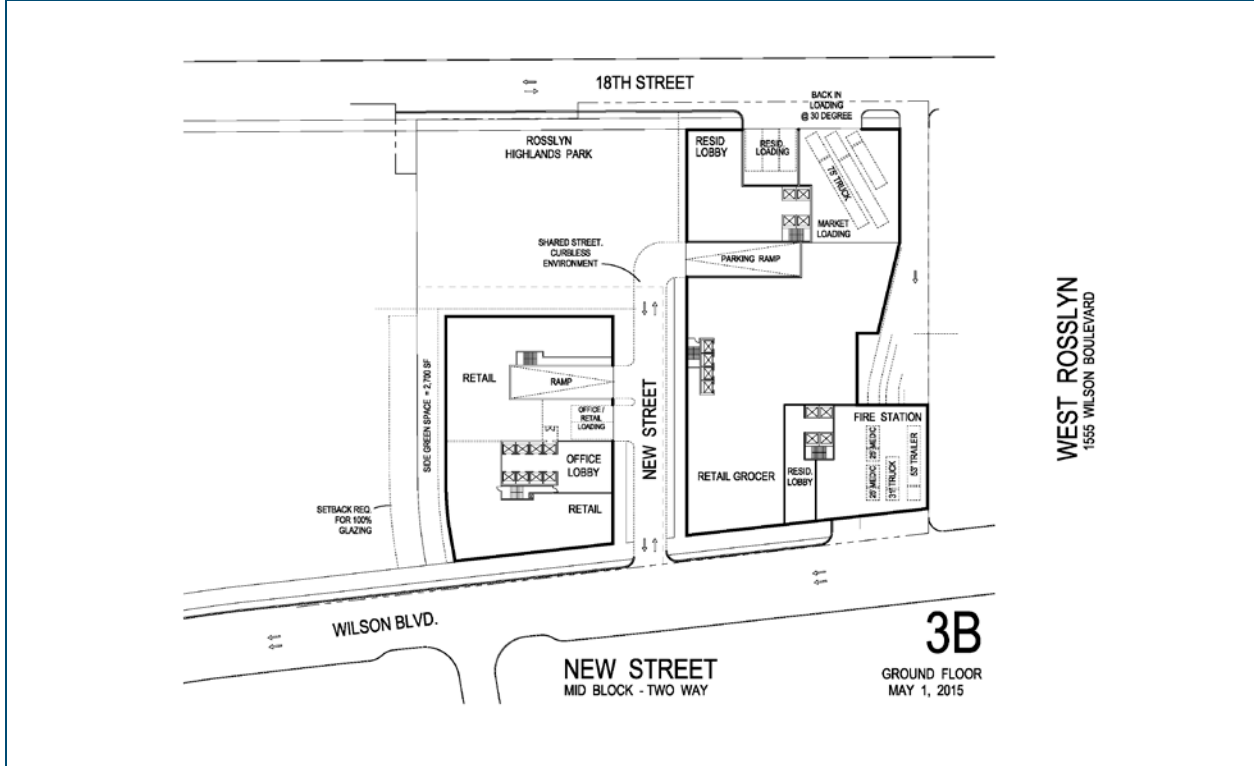
Alternative 3a Summary Assessment

Overall, Alternative 3a provides a viable alternative for site development with balanced and even distribution of access and egress. The division of vehicle volumes between New Street and the Pierce extension is an advantage of this site design. Although some vehicle traffic is forced into a circuitous pattern, as is currently the case, and loading facilities somewhat disrupt the pedestrian experience and overall operation of 18th Street, the site plan offers a number of alternative means of access and circulation.

Alternative 3b

Alternative 3b (Figure 14) is arranged much the same as Alternative 3a with the notable exception that the proposed New Street does not connect all the way through to 18th Street and operates in two directions off of Wilson Boulevard.

Figure 14 Alternative 3b – New Street Midblock Two-Way

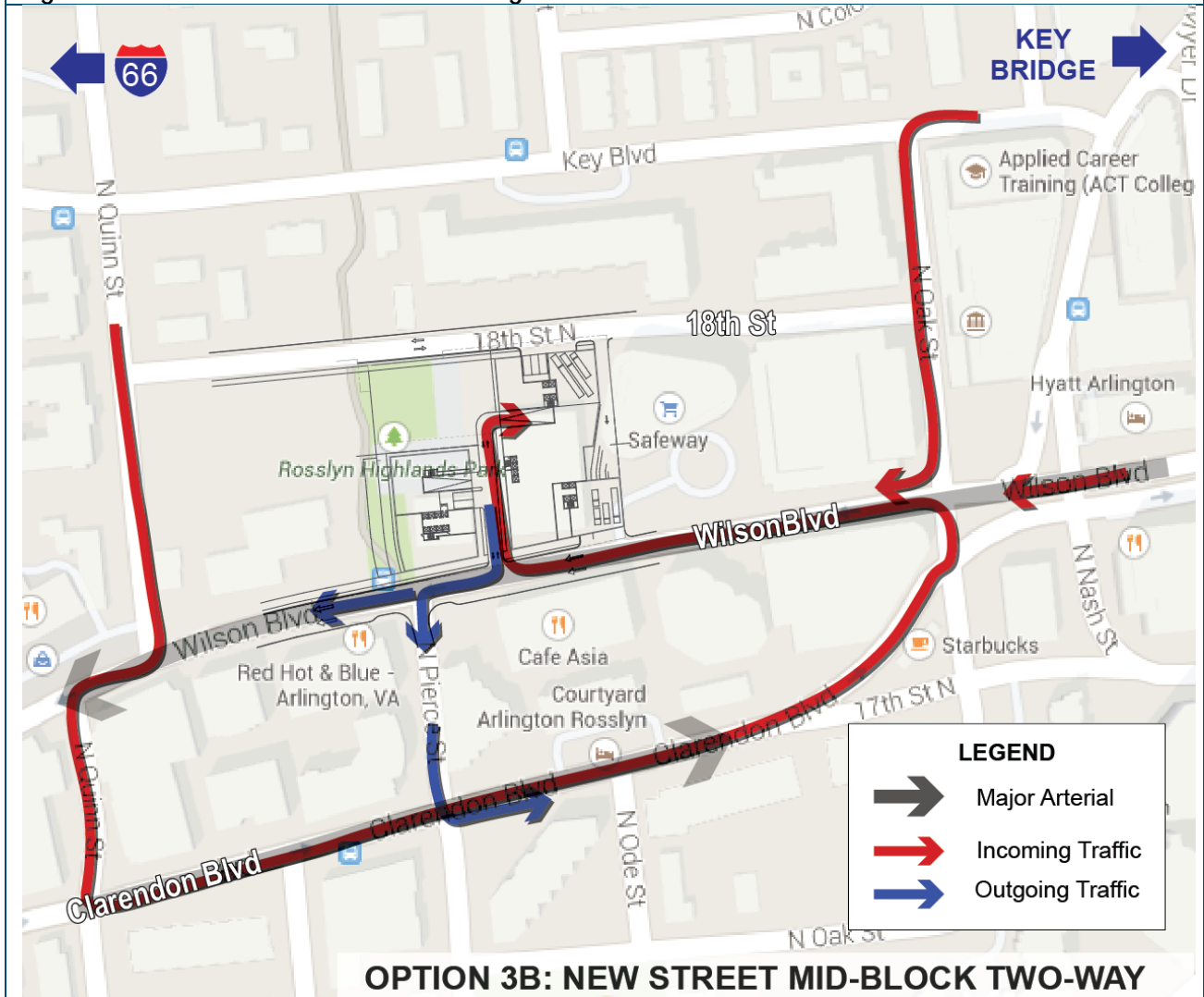


Auto Access/Egress:

Alternative 3b requires that all traffic, except loading vehicles servicing the retail/residential building access the property utilizing the segment of Wilson Boulevard between N. Oak and N. Pierce Street and that all traffic egress the property at an unsignalized location on Wilson Boulevard (Figure 15). This concentrates the vast majority of traffic onto Wilson Boulevard and does not permit a dispersal of trips throughout the available network. This raises significant concerns about potential queuing issues as vehicles access the site and queuing on New Street as vehicles attempt to egress during the peak hours. Given the proximity to the existing Pierce Street, vehicle egressing from the project may attempt to weave over to continue on southbound Pierce and onto eastbound Clarendon. The platooning effect from the upstream signals, combined with the 25MPH speed limit and minimal westbound queuing, however, provides adequate gaps in traffic to accommodate the weaving maneuver. Nonetheless, efforts should be made to reduce the number of drivers exercising this option.

One advantage is that access for grocery patrons is clear and direct via the parking ramp access that will be clearly visible and logically accessed from the proposed New Street .

Figure 15 Alternative 3b – Access and Egress



Loading

Loading for the retail/residential building will be back-in angled loading from 18th Street. Loading for the office building will have back-in accessed from the proposed New Street . Trucks may access the grocer via the existing Oak Street. Trucks servicing the office building must arrive and depart via Wilson Boulevard. As with alternative 3a, trucks maneuvering into the loading bays off 18th Street may cause minor disruption in that corridor operations and pedestrian experience.

Pedestrian quality and safety

The New Street in Alternative 3b will provide through pedestrian access between Wilson Boulevard and 18th Street through the park at the termination of the street. The quality of the walk environment, however, may not be ideal given the number of curb cuts along the street and the concentration of vehicles anticipated. An alternate pedestrian connection is, however, provided to the west of the proposed office building in the second phase of development.

Although Alternative 3b includes only one curbcut on Wilson Boulevard, it is at an unsignalized location. This raises concern of the high likelihood that vehicles waiting for a gap in traffic to egress from New Street

onto Wilson Boulevard will block the Wilson Boulevard sidewalk pathway forcing pedestrians into the street or around waiting vehicles. This is particularly hazardous for pedestrians with mobility challenges such as seniors or those in strollers, wheelchairs or other mobility assistance devices.

Interaction with Adjacent Redevelopment sites

Interaction with the adjacent redevelopment sites is largely identical in Alternative 3b as with 3a with the exception that the northern segment of New Street is not accessible for drop off or for school bus egress which as previously highlighted those vehicles would be encouraged to utilize N. Quinn St or N. Oak Street for egress purposes.

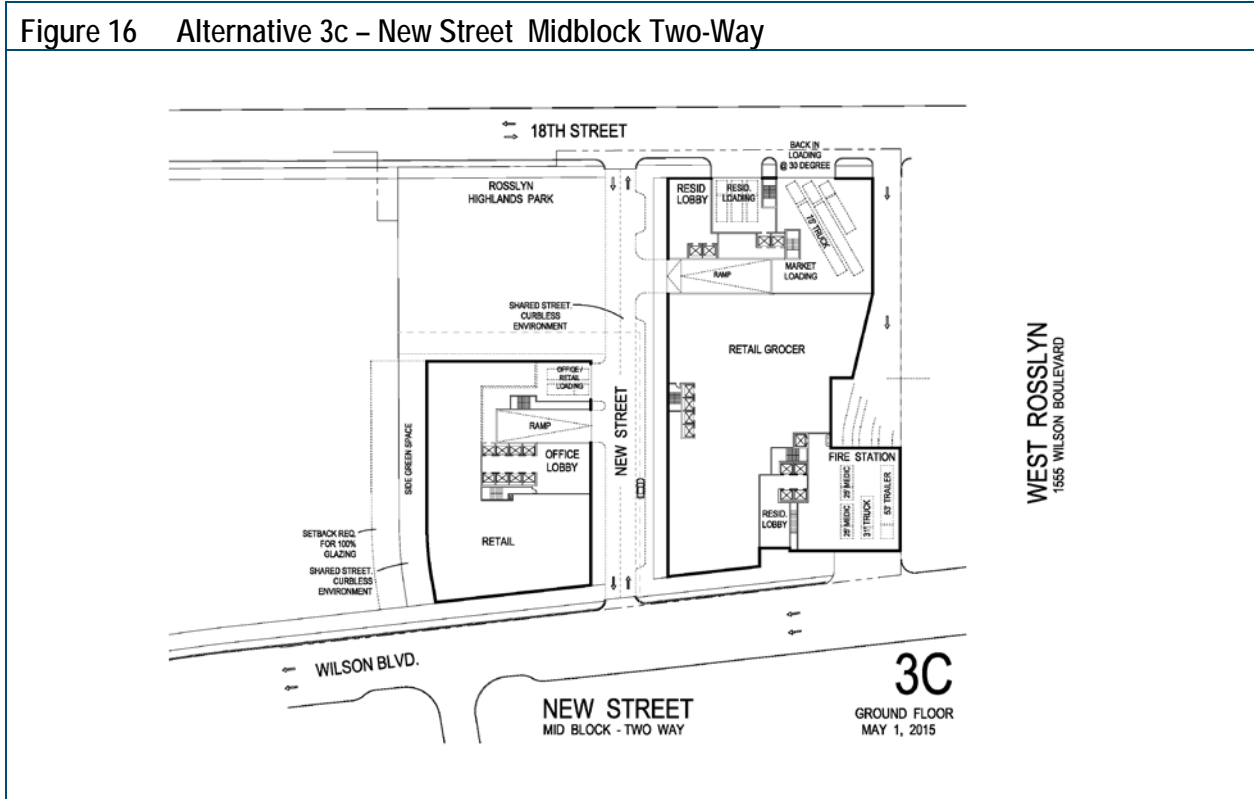
Alternative 3b Summary Assessment

From a traffic and transportation perspective, Alternative 3b is considered the worst case scenario and the one most likely to lead to concentrations of traffic, potential queuing issues, and uninviting and potentially hazardous pedestrian conditions.

Alternative 3c

Alternative 3c (Figure 16) is another variation on the New Street midblock concept. This alternative provides through connection to 18th Street and relocates all access for parking and the loading access for the office building onto the new New Street segment.

Figure 16 Alternative 3c – New Street Midblock Two-Way



Auto Access/Egress:

Alternative 3c, with through two-way operations of New Street provides similar alternatives for accessing the site as in 3a. The primary difference is the office parking ramp and loading being accessed from New Street. The site plan provides clear access for grocery patrons and minimizes curb cuts along Wilson Boulevard.

Figure 17 Alternative 3c – Access and Egress



Loading

Loading for the retail/residential building will be back-in angled loading from 18th Street. Loading for the office building will have back-in accessed from the New Street. Trucks may access the grocer via the existing Oak Street. Large trucks may cause some delay on 18th Street as they maneuver into bays. Trucks servicing the office building can arrive and depart via either 18th Street or Wilson Boulevard.

Pedestrian quality and safety

Alternative 3c's New Street will consistently provide safe and inviting through-pedestrian access between Wilson Boulevard and 18th Street. The quality of the walk environment may not be ideal given the number of curb cuts along the street and the concentration of vehicles anticipated. However, as in Alternative 3b, an alternate pedestrian connection is provided to the west of the proposed office building in the second phase of development which provides another route for access.

Interaction with Adjacent Redevelopment sites

The two-way access along New Street provides more accommodation for the adjacent sites. Not only may parents utilize some drop off along the New Street segment, but New Street also provides another opportunity for school bus egress. The weave onto Wilson Boulevard however would be a concern for School bus usage and the use of N. Quinn St and N. Oak St would be encouraged. School bus drop off would be accommodated along 18th Street as with Alternative 2 and this provides adequate curb space for the necessary buses. Parent drop off may be considered along the northern segment of New Street (in addition to Quinn Street), however children would need to traverse the park to access the school.

Pedestrian circulation is maintained along many corridors linking the APAH site to Wilson Boulevard to the south and the Metro station to the east.

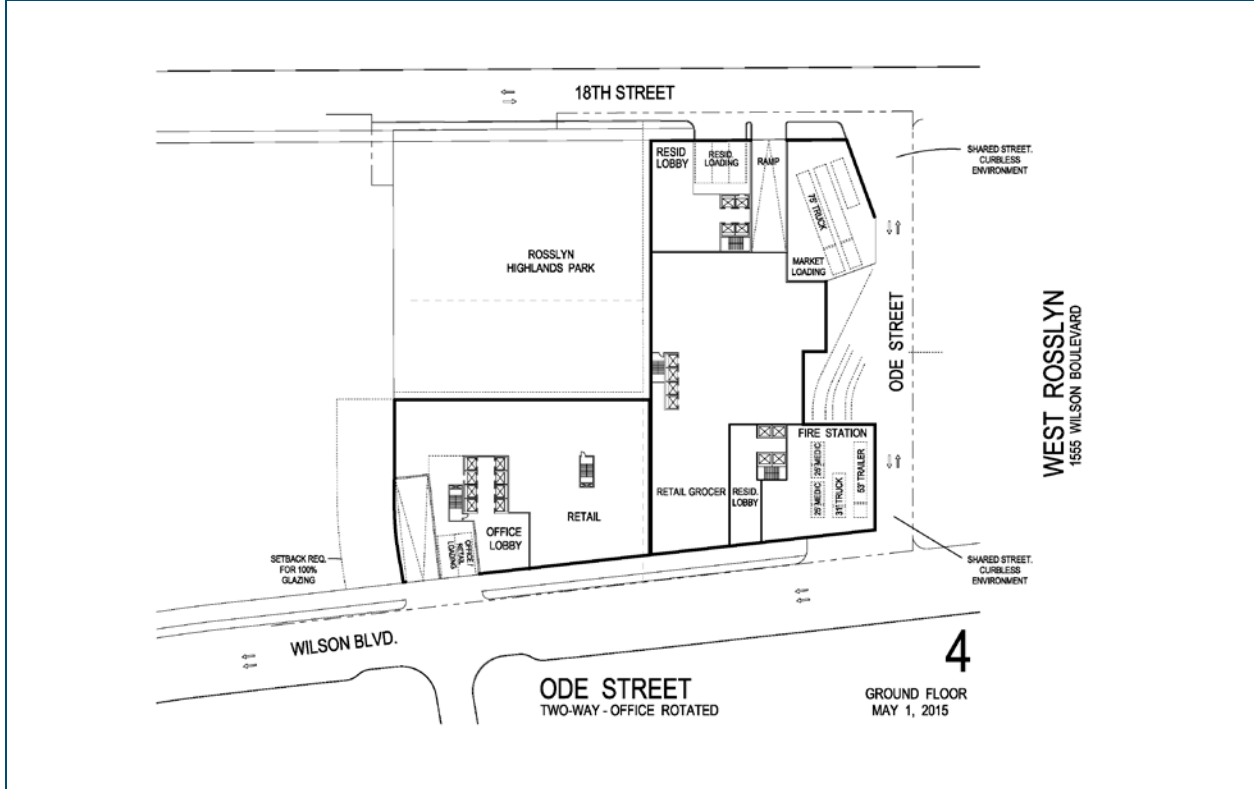
Alternative 3c Summary Assessment

Overall, Alternative 3c provides a viable alternative for site development with balanced and even distribution of access and egress. Distinguished from 3a in that all parking traffic utilizes New Street, the site plan nonetheless offers a number of alternative means of access and circulation.

Alternative 4

Alternative 4 (Figure 18) provides a connection between 18th Street and Wilson Boulevard via a bi-directional Ode Street. Loading and access for the residential building and grocer occurs off the newly created Ode Street while loading and access for the office building is from Wilson Boulevard.

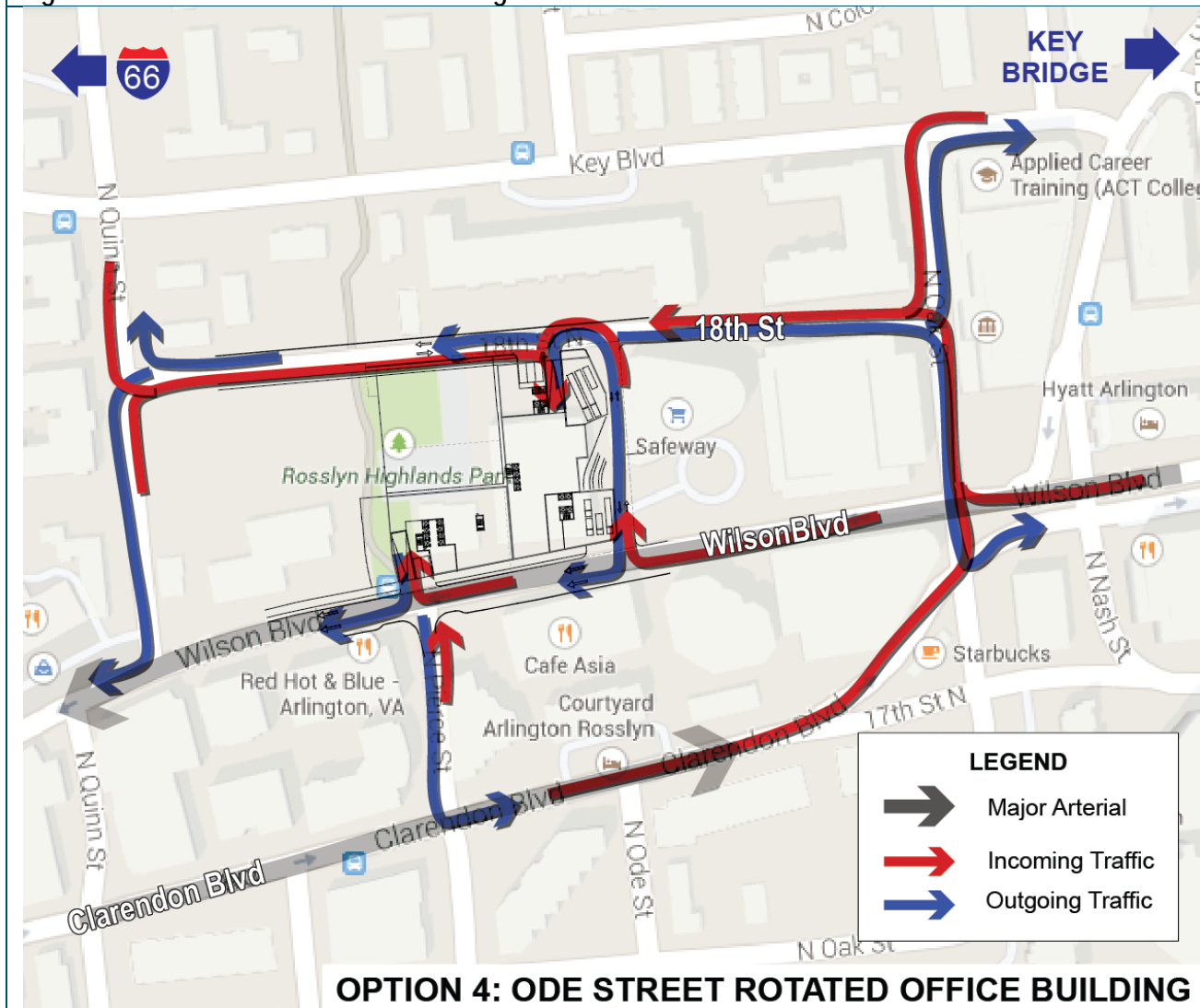
Figure 18 Alternative 4 – Ode Street Rotated Office Building



Auto Access/Egress:

From the perspective of auto access to the building, Alternative 4 provides a number of different paths of access to the building and disperses traffic across the grid which eases concentrations of traffic at any one location in the network (Figure 19). The egress point of the new Ode Street provides enough separation from Pierce Street to enable additional for any vehicles wishing to progress onto southbound Pierce Street.

Figure 19 Alternative 4 – Access and Egress



Loading

Loading is angled back-in from the new Ode Street for the proposed grocer. Loading for the residential element of the phase I building is back in from 18th Street as it is in other schemes. Loading for the office building is from Wilson Boulevard, however this too is conceived as back-in access. Office loading could be significant. Material delivery (paper goods and office supplies) will be fairly limited, however loading for the retail ground floor tenant and delivery by FedEx and other carriers can be quite frequent – up to 15 deliveries per day. The back-in loading maneuvers could cause significant hazards and disruptions on the corridor for both traffic and pedestrians.

Pedestrian quality and safety

Alternative 4 includes a significant curb cut on Wilson Boulevard which would cause a highly disruptive condition in the pedestrian environment on this highly used and valued pedestrian corridor. The back-in loading is a concern, again given the high pedestrian volumes. The introduction of an even higher concentration of youth pedestrians associated with the school heighten this concern.

Interaction with Adjacent Redevelopment sites

Alternative 4 provides the widest block segment between N. Quinn Street and the first curb cuts on 18th Street and should be more than adequate for bus loading and unloading. Buses may egress using the new proposed Ode Street.

Pedestrian connectivity through the site to the APAH property is least accommodated in this option. Pedestrians may traverse the park and mews between the school and office building parking lot or continue down to the new Ode Street.

Alternative 4 Summary Assessment

While Alternative 4 could would operate reasonably well from an auto vehicle access perspective, the loading condition for the office building is not a recommended nor endorsed condition.

Comparison of Alternatives

The five alternatives propose three different alignments for a through, public street. Alternative 3 proposes two different ways to operate the proposed street. The table below summarizes the benefits and concerns of each of the proposed alternatives:

Alternative	Proposed Street and Operations	Benefits	Concerns
Alternative 1	2-way Pierce Street aligned with existing signalized intersection	<ul style="list-style-type: none"> ▪ Traffic is controlled by a signal. Signal provides protected pedestrian crossing phase. 	<ul style="list-style-type: none"> ▪ Street will not be constructed until Phase II of development thus limiting dispersal of traffic. ▪ Access to grocery parking would be circuitous and hidden.
Alternative 2	2-way Ode Street approximately 260' east of existing signal at Pierce	<ul style="list-style-type: none"> ▪ 2-way operations better distribute traffic. ▪ Access to grocery is clear and logical. ▪ Greater distance between Ode and Pierce Street increases gap associated with weave to access southbound Pierce Street and avoids queues / stacking that may occur at the signal. 	<ul style="list-style-type: none"> ▪ Some traffic may exit at an unsignalized location. ▪ Traffic exiting via southbound Ode St may block pedestrian line of travel.
Alternative 3a	2-way shared use New Street offset approximately 150' east of existing signal	<ul style="list-style-type: none"> ▪ 2-way New Street better distributes traffic. ▪ reduces risk of vehicles blocking line of pedestrian travel. ▪ Access to grocer is clear and logical. 	<ul style="list-style-type: none"> ▪ There is a probability that vehicles will intrude on the pedestrian line of travel when waiting to exit the site.
Alternative 3b	2-way New Street cul de sac offset approximately 150' east of existing signal	<ul style="list-style-type: none"> ▪ Limited number of curb cuts along Wilson Boulevard frontage. ▪ Access to grocer is clear and logical. 	<ul style="list-style-type: none"> ▪ All traffic must utilize Wilson Boulevard between Oak Street and the new New Street to access the site. ▪ All traffic must utilize Wilson Boulevard between the new New Street and existing Pierce Street. ▪ A significant number of vehicles may exit from New Street and weave over two lanes of traffic to southbound Pierce St ▪ There is a high probability vehicles will intrude on the pedestrian line of travel when waiting to exit the

			<ul style="list-style-type: none"> ▪ site. ▪ New Street may be blocked when vehicles queue to exit onto Wilson Blvd during peak hours.
Alternative 3c	2-way New Street offset approximately 150' east of existing signal	<ul style="list-style-type: none"> ▪ 2-way operations better distribute traffic. ▪ Limited number of curb cuts along Wilson Boulevard frontage. ▪ Access to grocer is clear and logical. 	<ul style="list-style-type: none"> ▪ All parking traffic must utilize New Street .
Alternative 4	2-way Ode Street approximately 260' east of existing signal at Pierce	<ul style="list-style-type: none"> ▪ 2-way operations better distribute traffic. ▪ Greater distance between Ode and Pierce Street increases gap associated with weave to access southbound Pierce Street and avoids queues / stacking that may occur at the signal. 	<ul style="list-style-type: none"> ▪ Some traffic may exit at an unsignalized location. ▪ Traffic exiting via southbound Ode St may block pedestrian line of travel ▪ Office parking and loading is accessed directly from Wilson Blvd

FUTURE TRAFFIC OPERATIONS ANALYSIS

In order for the future traffic operations of the site to be analyzed a worse-case scenario was utilized where all future vehicle traffic would ingress and egress via New Street access road intersecting with Wilson Boulevard at an unsignalized intersection. This scenario is proposed in alternative 3B whereas the remaining alternatives provide for multiple access points enabling vehicles to utilize the roadway network more evenly.

The future network was completed by adding the Site generated vehicle trips to the existing network. Each intersection within the study area was again analyzed for level-of-service (LOS), reporting the quality of traffic with a letter grade A to F, volume to capacity ratio (V/C), the stop time delay in seconds and the 95th percentile queue lengths. The intersection capacity analysis worksheets are provided in the Appendix of this report. A summary chart of the results of this analysis is shown in Figure 20 below.

Traffic operations in the future conditions at study area intersections continue to operate at LOS C or better, with minimal delay and queue lengths. The future analysis also includes the proposed access and its intersection with Wilson Boulevard.

Figure 20 Future Level of Service Summary

Intersection	AM Peak Hour				PM Peak Hour			
	LOS	Delay	V/C	95 th % Queue	LOS	Delay	V/C	95 th % Queue
Wilson Boulevard/N. Oak Street (Signalized)								
WB Wilson Blvd (T/R)	C	23	0.65	205	C	20	0.53	174
NB N. Oak St. (L/T)	A	10	0.48	39	A	9	0.31	25
SB N. Oak St.(T/R)	C	27	0.52	95	C	30	0.43	101
Wilson Boulevard/N. Pierce Street (Signalized)								
WB Wilson Blvd (L/T)	A	7	0.49	84	A	9	0.68	131
NB N. Pierce St (L)	C	30	0.43	151	C	31	0.45	140
Wilson Boulevard/N. Quinn Street (Signalized)								
WB Wilson Blvd (T/R)	A	8	0.23	63	A	7	0.41	83
SB N. Quinn St. (T/R)	A	4	0.31	34	C	20	0.38	116
Wilson Boulevard/ New Street (Unsignalized)								
WB Wilson Blvd (T/R)	-	-	-	-	-	-	-	-
SB N. Pierce St. (Site Access) R	B	12.2	0.30	67	D	26.4	0.70	189

Adequate vehicle storage should be provided at the site driveways to insure that traffic would not block access to parking ramps or spill onto the public street. Utilizing the Synchro model for the future traffic conditions, queues were estimated and are shown in Figure 20 above. The proposed vehicle storage capacity of New Street would be 200-ft. The analysis indicated that the maximum vehicle queues for the southbound right turn at Wilson Blvd and the site access would be 189-ft. While the southbound queues could utilize most of the storage space in this worse-case scenario, this would not affect public street operations of Wilson Boulevard and would be for a limited time during the peak hour only.

RECOMMENDATIONS

The four alternatives offer significantly different approaches to the site. Each alternative offers certain benefits and trade-offs. Alternatives 2, 3a and 3c all offer a variety of benefits to both the site and the surrounding contextual area and network. These options offer flexible accommodation for a variety of modes, efficient circulation, and quality public spaces in an arrangement that can be sensitively delivered in phases. Attention to design and management will be vital to ensure the shared street is successful as a safe and inviting place.