

TRAFFIC ANALYSIS REPORT FOR:

**WISCONSIN AVENUE EXTENSION  
MAIN STREET TO PILGRIM PARKWAY**

CITY OF BROOKFIELD, WAUKESHA COUNTY, WISCONSIN

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**Wisconsin Avenue Extension  
Main Street to Pilgrim Parkway**

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# TRAFFIC ANALYSIS REPORT

## PART A – STUDY PURPOSE

The City of Brookfield is planning for the future extension of Wisconsin Avenue from its current terminus at Main Street east to Pilgrim Parkway. The Wisconsin Avenue extension will serve as a relief route to Bluemound Road, a major arterial already at or beyond capacity.

This traffic analysis report has been prepared to determine recommended improvements for design year operations at the Pilgrim Parkway intersection with the Wisconsin Avenue Extension; to compare seven scenarios prepared by the City of Brookfield for the Pilgrim Parkway corridor to ensure safe and efficient traffic flow with and without the extension; and to ensure the Pilgrim Parkway corridor operates well with improvements recommended in WisDOT's September of 2009 *USH 18 Corridor Study*. This report documents the procedures, findings and conclusions of the traffic impact analysis.

## PART B – OVERVIEW OF STUDY AREA

### B1. Study Area Intersections

The study area for the Wisconsin Avenue extension is shown in [Exhibit 1](#) and includes the following intersections. The existing traffic control type is listed after each intersection.

- Pilgrim Parkway/Moorland Road & Bluemound Road (USH 18) – *Traffic Signal Control*
- Pilgrim Parkway & Watertown Plank Road/Office Access – *Traffic Signal Control*
- Pilgrim Parkway & Ace Hardware/Office Access – *Two-Way Stop Control*

[Exhibit 2](#) shows the anticipated transportation detail for these intersections based on WisDOT's *USH 18 Traffic Study* prepared September 30, 2009 (Project IDs 2210-07-00, 2200-16-70 & 2200-16-71). More specifically, the exhibit illustrates anticipated intersection lane configurations, intersection traffic controls, posted speed limits, and approximate intersection spacing assuming completion of WisDOT's rehabilitation project. Note that the four-lane cross-section of Pilgrim Parkway through the Ace Hardware/Office Access intersection is assumed based on the close proximity and layout of the Watertown Plank Road/Office Access intersection.

### B2. Study Area Roadways

The study area roadways for the Wisconsin Avenue extension are discussed below:

*Pilgrim Parkway* is currently a north-south four-lane divided roadway from Bluemound Road to Watertown Plank Road, where it then transitions to the north to a two-lane undivided cross-section. The Pilgrim Parkway designation begins on the north side of Bluemound Road and is opposite the six-lane divided Moorland Road. The posted speed limit along Pilgrim Parkway is 30 mph and the posted speed limit along Moorland Road is 35 mph. The WisDOT Year 2009 annual average daily traffic (AADT) volumes were approximately 50,100 vehicles per day (vpd) on Moorland Road south of Bluemound Road, 17,000 vpd on Pilgrim Parkway between Bluemound Road and Watertown Plank Road, and 18,000 vpd on Pilgrim Parkway between Watertown Plank Road and Gebhardt Road.

*Bluemound Road*, also designated as United States Highway (USH) 18, is currently an east-west six-lane divided highway with auxiliary lanes west of Pilgrim Parkway/Moorland Road and a four-lane divided highway with auxiliary lanes east of Pilgrim Parkway/Moorland Road. The posted speed limit along Bluemound Road is 45 mph within the study area. The WisDOT Year 2009 AADT volumes were approximately 48,300 vpd west of Pilgrim Parkway/Moorland Road

and 39,500 vpd east of the intersection. WisDOT is planning a rehabilitation project along Bluemound Road from Manhattan Drive in the City of Waukesha to 124<sup>th</sup> Street in the Village of Elm Grove, which is planned to include improvements to intersection geometries and access along the corridor. This Wisconsin Avenue Extension study takes into consideration WisDOT's currently recommended geometrics for the Bluemound Road intersection with Pilgrim Parkway.

*Watertown Plank Road* is currently an east/west two-lane undivided roadway with a posted speed limit of 25 mph that intersects Pilgrim Parkway approximately 325-feet north of Bluemound Road (centerline-to-centerline) as a tee intersection from the east opposite an office access. The WisDOT Year 2009 AADT was approximately 8,200 vpd east of Pilgrim Parkway. Watertown Plank Road continues east into the Village of Elm Grove, and its signalized intersection with Pilgrim Parkway is under Village of Elm Grove jurisdiction. This Wisconsin Avenue Extension study takes into consideration WisDOT's currently recommended geometrics for the Pilgrim Parkway intersection with Watertown Plank Road.

*Wisconsin Avenue* is an east-west two-lane undivided roadway that terminates on its west end at Brookfield Road and terminates on its east end at Main Street. At its Main Street terminus the posted speed limit is 25 mph. Recorded AADT volumes could not be found for Wisconsin Avenue. The City of Brookfield 2035 Comprehensive Plan shows Wisconsin Avenue being extended approximately 1,275-feet east from Main Street to Pilgrim Parkway, where it will intersect Pilgrim Parkway approximately 860-feet north of Bluemound Road (centerline to centerline).

### **B3. Study Area Scenario Modes of Transportation**

Sidewalks are currently available along both sides of Bluemound Road west of Pilgrim Parkway/Moorland Road, along the south side of Bluemound Road east of Pilgrim Parkway/Moorland Road, along both sides of Moorland Road in short segments (non-continuous), and along the south side of Wisconsin Avenue from its terminus at Main Street to approximately 850-feet west. No sidewalks are currently provided along Pilgrim Parkway or Watertown Plank Road.

A multi-use trail exists along the west side of Pilgrim Parkway from Bluemound Road to north of the study area. No other multi-use trails exist within the study area, nor are any trails identified by the 2035 Comprehensive Plan. Auxiliary lanes along Bluemound Road serve a multi-modal purpose for bus transit, bicyclists and right-turn motorists. In the future, the auxiliary lanes may be converted to full travel lanes. Should this occur, current State and Federal laws will require sidewalk and on-street bike accommodations for any roadway projects using State or Federal monies.

Milwaukee County Transit Service route 10 travels along Bluemound Road within the study area. Route 10 connects Brookfield Square to the Milwaukee County Zoo, the Milwaukee Regional Medical Center, Miller Park, Marquette University, Downtown Milwaukee, and Bayshore Town Center with approximately 40-minute headways on weekdays, 20-minute headways on Saturdays and 25-minute headways on Sundays.

Waukesha Metro Transit route 218 passes through the Bluemound Road intersection with Pilgrim Parkway/Moorland Road on weekdays with approximately 30-minute headways from 2:45 to 5:10pm and 9:55 to 11:30pm. Route 218 connects Brookfield Square with the New Berlin Industrial Park to the south.

No designated park and ride lots exist within the study area.

#### **B4. Sources of Data**

The following sources of data were obtained for use in conducting this traffic analysis for the Wisconsin Avenue extension.

- Turning movement forecasts & anticipated transportation detail – *USH 18 Traffic Study*, Sept 30, 2009
- Sidewalk, bicycle and trail information – City of Brookfield 2035 Comprehensive Plan, Google Earth, field observation
- Transit information – Milwaukee County Transit System and Waukesha Metro Transit websites, accessed November 4, 2010

### **PART C – INTRODUCTION TO IMPROVEMENT SCENARIOS, ANALYSIS VOLUMES & LEVEL OF SERVICE**

#### **C1. Improvement Scenarios**

The City of Brookfield has identified seven potential scenarios for the Wisconsin Avenue extension. The following is a list of the scenarios:

- *Scenario 1:* Existing conditions with the USH 18 resurfacing and without the Wisconsin Avenue extension (“no extension” scenario).
- *Scenario 2:* Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access. Operate with two-way stop control.
- *Scenario 3:* Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access. Operate with traffic signal control.
- *Scenario 4A:* Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access. Operate with traffic signal control but remove traffic signal at Watertown Plank Road.
- *Scenario 4B:* Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access. Operate with roundabout control but remove traffic signal at Watertown Plank Road.
- *Scenario 5A:* Extension of Wisconsin Avenue to Pilgrim Parkway and realignment of Watertown Plank Road across from Wisconsin Avenue to create a four-leg intersection. Operate with traffic signal control.
- *Scenario 5B:* Extension of Wisconsin Avenue to Pilgrim Parkway and realignment of Watertown Plank Road across from Wisconsin Avenue to create a four-leg intersection. Operate with roundabout control.

#### **C2. Turning Movement Volumes for Improvement Scenarios**

Weekday morning and evening peak hour turning movement forecasts were prepared by WisDOT as part of the *USH 18 Traffic Study* submitted in September of 2009. The forecasts were prepared assuming various rehabilitation improvements will be made along Bluemound Road. As determined by WisDOT, the weekday morning and weekday evening peak hours are 7:15 to 8:15am and 4:45 to 5:45pm. Copies of the existing traffic counts and forecasts from the USH 18 study are included in [Appendix A](#). Note that traffic counts at the existing Ace Hardware/Office Access located north of the existing Watertown Plank Road alignment were conducted out of scope by Traffic Analysis & Design, Inc. and are shown in this study for an accurate understanding of traffic impacts.

Year 2011 & Year 2031 Scenario 1 Volumes

The Year 2011 and Year 2031 Scenario 1 (no extension) traffic volumes closely match those utilized in the *USH 18 Traffic Study* and are shown in [Exhibits 3a and 3b](#), respectively. The differences between the USH 18 study volumes and those shown in [Exhibits 3a and 3b](#) are 1) volumes have been rounded to the nearest 5 vehicles and 2) volumes have been balanced.

Year 2011 & Year 2031 Scenarios 2 & 3 Volumes

Scenarios 2 and 3 both assume the extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access. The Year 2011 and Year 2031 forecast traffic under Scenarios 2 and 3 are shown in [Exhibits 4a and 4b](#), respectively.

Year 2011 & Year 2031 Scenario 4 Volumes

Scenarios 4A and 4B both assume the extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access, but with the traffic signal at the existing Watertown Plank Road/Office Access intersection removed. Based on early traffic analysis, it was determined that under these two scenarios the existing Watertown Plank Road would need to be converted to three-quarters access (left-in/right-in/right-out) and its opposite office access would need to be converted to right-in/right-out only for safe and efficient operation. The Year 2011 and Year 2031 forecast traffic under Scenarios 4A and 4B are shown in [Exhibits 5a and 5b](#), respectively.

Year 2011 & Year 2031 Scenario 5 Volumes

Scenarios 5A and 5B both assume the extension of Wisconsin Avenue to Pilgrim Parkway with the realignment of Watertown Plank Road across from Wisconsin Avenue. The scenario assumes the existing Watertown Plank Road alignment is cul-de-sac'd with no access to Pilgrim Parkway, though right-in/right-out access to the existing Watertown Plank Road alignment could be considered. The Year 2011 and Year 2031 forecast traffic under Scenarios 5A and 5B are shown in [Exhibits 6a and 6b](#), respectively.

**C2. Level of Service Definitions**

The study area intersections were analyzed based on the procedures set forth in the *2000 Highway Capacity Manual* (HCM). Intersection operation is defined by “level of service”. Level of service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS ‘A’, to very poor, represented by LOS ‘F’. For the purpose of this study, LOS D was used to define acceptable peak hour operating conditions. Descriptions of the various levels of service are as follows. Note that roundabouts operate as unsignalized intersections:

**LOS A** is the highest level of service that can be achieved. Under this condition, intersection approaches appear quite open, turning movements are easily made, and nearly all drivers find freedom of operation. At signalized and unsignalized intersections, average delays are less than 10 seconds.

**LOS B** represents stable operation. At signalized intersections, average vehicle delays are 10 to 20 seconds. At unsignalized intersections, average delays are 10 to 15 seconds.

**LOS C** still represents stable operation, but periodic backups of a few vehicles may develop behind turning vehicles. Most drivers begin to feel restricted, but not objectionably so. At signalized intersections, average vehicle delays are 20 to 35 seconds. At unsignalized intersections, average delays are 15 to 25 seconds.

**LOS D** represents increasing traffic restrictions as the intersection approaches instability. Delays to approaching vehicles may be substantial during short peaks within the peak period, but periodic clearance of long lines occurs, thus preventing excessive backups.

At signalized intersections, average vehicle delays are 35 to 55 seconds. At unsignalized intersections, average delays are 25 to 35 seconds.

**LOS E** represents the capacity of the intersection. At signalized intersections, average vehicle delays are 55 to 80 seconds. At unsignalized intersections, average delays are 35 to 50 seconds.

**LOS F** represents jammed conditions where the intersection is over capacity and acceptable gaps for unsignalized intersections in the mainline traffic flow are minimal. At signalized intersections, average vehicle delays exceed 80 seconds. At unsignalized intersections, average delays exceed 50 seconds.

## **PART D – SCENARIO 1 ANALYSIS & RECOMMENDED IMPROVEMENTS**

Recall that Scenario 1 is the “no extension” scenario. As such, the analysis of Scenario 1 provides the baseline traffic operations should nothing be done to extend Wisconsin Avenue.

The Year 2011 and Year 2031 Scenario 1 traffic volumes ([Exhibits 3a and 3b](#)) were first analyzed with the anticipated intersection geometrics ([Exhibit 2](#)). The analysis assumes the same cycle lengths/splits/offsets at the Bluemound Road intersection as those utilized in the *USH 18 Traffic Study*. Based on the analysis, it was determined that the following improvements, shown in [Exhibit 7a](#), would be necessary to accommodate the Year 2011 and Year 2031 Scenario 1 traffic volumes.

### Pilgrim Parkway/Moorland Road & Bluemound Road

- Provide the improvements identified in WisDOT’s *USH 18 Traffic Study* on the Bluemound Road eastbound, Moorland Road northbound, and Bluemound Road westbound approaches.
- As identified in WisDOT’s *USH 18 Traffic Study*, provide six lanes on the Pilgrim Parkway southbound approach, including two left-turn lanes, three through lanes and one right-turn lane. Maximize the storage length of the southbound left-turn and right-turn lanes, noting that the approach storage lengths shown in [Exhibit 7a](#) are desirable but may not fit due to the close intersection spacing to Watertown Plank Road.

### Pilgrim Parkway & Watertown Plank Road/Office Access

- As identified in WisDOT’s *USH 18 Traffic Study*, provide four lanes on the Pilgrim Parkway northbound approach, including one left-turn lane, two through lanes and one right-turn lane. Maximize the storage length of the northbound left-turn and right-turn lanes, noting that the approach storage lengths shown in [Exhibit 7a](#) are desirable but may not fit due to the close intersection spacing to Bluemound Road.
- As identified in WisDOT’s *USH 18 Traffic Study*, provide four lanes on the Pilgrim Parkway southbound approach, including one left-turn lane, two through lanes and one shared through/right-turn lane. The left-turn lane is recommended to be at least 150-foot long. The shared through/right-turn lane is recommended to be at least 200-foot long.
- As identified in WisDOT’s *USH 18 Traffic Study*, provide two lanes on the Watertown Plank Road westbound approach, including one shared left-turn/through lane and one right-turn lane. The right-turn lane is recommended to be at least 150-foot long.
- As identified in WisDOT’s *USH 18 Traffic Study*, provide two lanes on the office access eastbound approach, including one shared left-turn/through lane and one right-turn lane. The right-turn lane is recommended to be at least 50-foot long.

- The office access should be reconfigured to allow for the elimination of eastbound/westbound split phasing at the intersection. No left-turn or right-turn signal phasing is expected to be necessary. The signal was assumed to run at half the cycle length of the Bluemound Road corridor (54-seconds AM, 65-seconds PM).

#### Pilgrim Parkway & Ace Hardware/Office Access

- Construct a median along Pilgrim Parkway at least 24-feet wide to accommodate two-stage left-turn maneuvers from the Ace Hardware and Office access.
- Provide three lanes on the Pilgrim Parkway northbound approach, including one left-turn lane, one through lane and one shared through/right-turn lane. The left-turn lane is recommended to be at least 150-feet long. North of the intersection, provide a 325-foot minimum tangent of the outside through lane then taper down to one lane.
- Provide three lanes on the Pilgrim Parkway southbound approach, including one left-turn lane, one through lane and one shared through/right-turn lane. The left-turn lane is recommended to be at least 75-feet long and the shared through/right-turn lane is recommended to be at least 400-feet long.
- Maintain one shared left-turn/through lane and one right-turn lane on the Ace Hardware westbound approach.
- Maintain one shared left-turn/through/right-turn lane on the office access eastbound approach.
- Maintain two-way stop control of the Ace Hardware and Office Access approaches.

The expected Year 2011 and Year 2031 Scenario 1 peak hour operating conditions are shown in [Exhibit 7b](#). The Year 2031 expected maximum queues with the recommended improvements are shown in [Exhibit 7c](#).

The Pilgrim Parkway intersections with Watertown Plank Road/Office Access and Ace Hardware/Office Access are expected to operate acceptably. However, the Pilgrim Parkway/Moorland Road intersection with Bluemound Road is expected to operate with undesirable LOS E/F conditions with queues in the peak hours that extend through the Watertown Plank Road intersection. Further, the recommended turn-bay storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road/Office Access, meaning the queue spillback may be worse than modeled depending on the roadway design.

*Due to queue spillback problems between Bluemound Road and Watertown Plank Road, and because recommended turn-bay storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road which may further exacerbate the queue spillback problems, it is recommended to **drop** Scenario 1 from the list of feasible scenarios for Pilgrim Parkway.*

## **PART E – SCENARIO 2 ANALYSIS & RECOMMENDED IMPROVEMENTS**

Recall that Scenario 2 includes the extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access and operating under two-way stop control.

The Year 2011 and Year 2031 Scenario 2 traffic volumes ([Exhibits 4a and 4b](#)) were utilized in the analysis. The analysis assumes the same cycle lengths/splits/offsets at the Bluemound Road intersection as those utilized in the *USH 18 Traffic Study*.

As shown in [Exhibit 8a](#), due to fatal flaws with the operation of the Pilgrim Parkway intersection with the Wisconsin Avenue Extension/Ace Hardware, Scenario 2 is not recommended. As shown in [Exhibits 8b and 8c](#), stop sign control results in LOS F conditions and greater than 3-

minutes of delay for traffic on the Wisconsin Avenue Extension/Ace Hardware approaches. Consideration was given to three-quarter access (left-in/right-in/right-out) at the intersection, but the eastbound right-turn movement from the Wisconsin Avenue Extension was shown to operate at LOS F, and the improvements needed at the Watertown Plank Road/Office Access intersection (dual southbound left-turns) was shown to be problematic in terms of operations and geometric design.

*Due to fatal flaws with the operation of the Pilgrim Parkway intersection with the Wisconsin Avenue Extension/Ace Hardware under two-way stop control, it is recommended to **drop** Scenario 2 from the list of feasible scenarios for Pilgrim Parkway.*

## **PART F – SCENARIO 3 ANALYSIS & RECOMMENDED IMPROVEMENTS**

Recall that Scenario 3 includes the extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access and operating under traffic signal control.

The Year 2011 and Year 2031 Scenario 3 traffic volumes ([Exhibits 4a and 4b](#)) were utilized in the analysis. The analysis assumes the same cycle lengths/splits/offsets at the Bluemound Road intersection as those utilized in the *USH 18 Traffic Study*. Based on the analysis, it was determined that the following improvements, shown in [Exhibit 9a](#), would be necessary to accommodate the Year 2011 and Year 2031 Scenario 3 traffic volumes.

### Pilgrim Parkway/Moorland Road & Bluemound Road

- Provide the improvements identified in WisDOT's *USH 18 Traffic Study* on the Bluemound Road eastbound, Moorland Road northbound, and Bluemound Road westbound approaches.
- As identified in WisDOT's *USH 18 Traffic Study*, provide six lanes on the Pilgrim Parkway southbound approach, including two left-turn lanes, three through lanes and one right-turn lane. Maximize the storage length of the southbound left-turn and right-turn lanes, noting that the approach storage lengths shown in [Exhibit 9a](#) are desirable but may not fit due to the close intersection spacing to Watertown Plank Road.

### Pilgrim Parkway & Watertown Plank Road/Office Access

- As identified in WisDOT's *USH 18 Traffic Study*, provide four lanes on the Pilgrim Parkway northbound approach, including one left-turn lane, two through lanes and one right-turn lane. Maximize the storage length of the northbound left-turn and right-turn lanes, noting that the approach storage lengths shown in [Exhibit 9a](#) are desirable but may not fit due to the close intersection spacing to Bluemound Road.
- As identified in WisDOT's *USH 18 Traffic Study*, provide four lanes on the Pilgrim Parkway southbound approach, including one left-turn lane, two through lanes and one shared through/right-turn lane. The left-turn lane is recommended to be at least 150-foot long. The shared through/right-turn lane is recommended to be at least 200-foot long.
- Provide three lanes on the Watertown Plank Road westbound approach, including one left-turn lane, one through lane and one right-turn lane. The left-turn lane is recommended to be at least 325-foot long and the right-turn lane is recommended to be at least 75-foot long.
- As identified in WisDOT's *USH 18 Traffic Study*, provide two lanes on the office access eastbound approach, including one shared left-turn/through lane and one right-turn lane. The right-turn lane is recommended to be at least 50-foot long.

- The office access should be reconfigured to allow for the elimination of eastbound/westbound split phasing at the intersection. Southbound protected-permitted left-turn signal heads are recommended. The signal was assumed to run at half the cycle length of the Bluemound Road corridor (54-seconds AM, 65-seconds PM).

Pilgrim Parkway & Wisconsin Avenue Extension/Ace Hardware Access

- Construct a median along Pilgrim Parkway.
- Provide three lanes on the Pilgrim Parkway northbound approach, including one left-turn lane, one through lane and one shared through/right-turn lane. The left-turn lane is recommended to be at least 150-feet long. North of the intersection, provide a 325-foot minimum tangent of the outside through lane then taper down to one lane.
- Provide four lanes on the Pilgrim Parkway southbound approach, including one left-turn lane, two through lanes and one right-turn lane. The left-turn lane is recommended to be at least 75-feet long, the outside through lane is recommended to be at least 400-feet long, and the right-turn lane is recommended to be at least 150-feet long.
- Maintain one shared left-turn/through lane and one right-turn lane on the Ace Hardware westbound approach.
- Provide two lanes on the Wisconsin Avenue Extension eastbound approach, including one shared through/left-turn lane and one right-turn lane. The right-turn lane is recommended to be at least 150-feet long.
- Install traffic signal control, including northbound protected-permitted left-turn signal heads. The signal was assumed to run at half the cycle length of the Bluemound Road corridor (54-seconds AM, 65-seconds PM).

The expected Year 2011 and Year 2031 Scenario 3 peak hour operating conditions are shown in [Exhibit 9b](#). The Year 2031 expected maximum queues with the recommended improvements are shown in [Exhibit 9c](#).

The Pilgrim Parkway intersections with Watertown Plank Road/Office Access and Ace Hardware/Office Access are expected to operate acceptably. However, the Pilgrim Parkway/Moorland Road intersection with Bluemound Road is expected to operate with undesirable LOS E/F conditions with queues in the peak hours that extend through the Watertown Plank Road intersection. Further, the recommended turn-bay storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road/Office Access, meaning the queue spillback may be worse than modeled depending on the roadway design.

*Due to queue spillback problems between Bluemound Road and Watertown Plank Road, and because recommended turn-bay storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road which may further exacerbate the queue spillback problems, it is recommended to **drop** Scenario 3 from the list of feasible scenarios for Pilgrim Parkway.*

## **PART F – SCENARIOS 4A & 4B ANALYSIS & RECOMMENDED IMPROVEMENTS**

Recall that both Scenarios 4A and 4B include the extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware access and removing the traffic signal at the existing Watertown Plank Road/Office Access intersection. Scenario 4A includes traffic signal control at the Wisconsin Avenue Extension/Ace Hardware intersection while Scenario 4B includes roundabout control.

The Year 2011 and Year 2031 Scenario 4A & 4B traffic volumes ([Exhibits 5a and 5b](#)) were utilized in the analysis. The analysis also assumes the same cycle lengths/splits/offsets at the Bluemound Road intersection as those utilized in the *USH 18 Traffic Study*. Based on the analysis, it was determined that the following improvements, shown in [Exhibit 10a](#), are recommended to accommodate the Year 2011 and Year 2031 Scenario 4A and 4B traffic volumes.

*Pilgrim Parkway/Moorland Road & Bluemound Road*

- Provide the improvements identified in WisDOT's *USH 18 Traffic Study* on the Bluemound Road eastbound, Moorland Road northbound, and Bluemound Road westbound approaches.
- As identified in WisDOT's *USH 18 Traffic Study*, provide six lanes on the Pilgrim Parkway southbound approach, including two left-turn lanes, three through lanes and one right-turn lane. Maximize the storage length of the southbound left-turn and right-turn lanes, noting that the approach storage lengths shown in [Exhibit 10a](#) are desirable but may not fit due to the close intersection spacing to Watertown Plank Road.

*Pilgrim Parkway & Watertown Plank Road/Office Access*

- The Watertown Plank Road/Office Access was initially analyzed as a full movement, two-way stop controlled intersection. However, the intersection cannot operate safely or efficiently with full access. Therefore, it is recommended to provide three-quarters (left-in/right-in/right-out) access to Watertown Plank Road and right-in/right-out access to the office parking lot under Scenarios 4A and 4B.
- Provide three lanes on the Pilgrim Parkway northbound approach, including two through lanes and one right-turn lane. Maximize the storage length of the northbound right-turn lanes, noting that the approach storage length shown in [Exhibit 10a](#) is desirable but may not fit due to the close intersection spacing to Bluemound Road.
- As identified in WisDOT's *USH 18 Traffic Study*, provide four lanes on the Pilgrim Parkway southbound approach, including one left-turn lane, two through lanes and one shared through/right-turn lane. The left-turn lane is recommended to be at least 150-feet long.
  - *Scenario 4A (Traffic Signal)*: The shared through/right-turn lane is recommended to be continuous to the Wisconsin Avenue Extension/Ace Hardware intersection to accommodate northbound-to-southbound U-turn traffic at the Wisconsin Avenue Extension/Ace Hardware intersection.
  - *Scenario 4B (Roundabout)*: The shared through/right-turn lane is recommended to be at least 200-feet long.
- Restrict Watertown Plank Road to left-in/right-in/right-out only.
  - Westbound traffic destined for the office building on the west side of Pilgrim Parkway may proceed northbound and gain access off of the Wisconsin Avenue Extension or by performing a U-turn.
  - Westbound traffic destined for Bluemound Road or Moorland Road may proceed northbound and perform a U-turn maneuver at the Wisconsin Avenue Extension/Ace Hardware access – OR – may travel west on Wisconsin Avenue to Main Street – OR – may revise their trip by utilizing Terrace Drive or Sunnyslope Road to gain access to Bluemound Road.

- Restrict the office access to right-in/right-out only. Affected motorists may utilize access to the Wisconsin Avenue Extension to gain access to Pilgrim Parkway and Watertown Plank Road.
- Remove the traffic signal control. Install stop signs to control the Watertown Plank Road/Office Access approaches.

Pilgrim Parkway & Wisconsin Avenue Extension/Ace Hardware Access

- *Scenario 4A (Traffic Signal):*
  - Construct a median along Pilgrim Parkway of sufficient width to accommodate U-turn maneuvers and traffic signal pole placement.
  - Provide four lanes on the Pilgrim Parkway northbound approach, including two left-turn lanes, one through lane and one shared through/right-turn lane. The left-turn lanes are recommended to be at least 225-feet long. North of the intersection, on Pilgrim Parkway, provide a 325-foot minimum tangent of the outside through lane then taper down to one lane. East of the intersection, on the Wisconsin Avenue Extension, provide two westbound lanes for a minimum of 250-feet then taper down to one lane. Note that the northbound median-side left-turn lane is expected to accommodate a high volume of U-turn traffic.
  - Provide four lanes on the Pilgrim Parkway southbound approach, including one left-turn lane, two through lanes and one right-turn lane. The left-turn lane is recommended to be at least 75-feet long, the outside through lane is recommended to be at least 400-feet long, and the right-turn lane is recommended to be at least 150-feet long.
  - Maintain one shared left-turn/through lane and one right-turn lane on the Ace Hardware westbound approach.
  - Provide three lanes on the Wisconsin Avenue Extension eastbound approach, including one left-turn lane, one through lane and one right-turn lane. The left-turn and right-turn lanes are recommended to be at least 225-feet long each. Prohibit the eastbound right-turns on red to safely accommodate the northbound-to-southbound U-turn movement.
  - Install traffic signal control, including northbound and southbound protected-only left-turn signal heads. The signal was assumed to run at half the cycle length of the Bluemound Road corridor (54-seconds AM, 65-seconds PM).
- *Scenario 4B (Roundabout):*
  - Construct a two-lane modern roundabout.
  - Provide two-lanes, striped as one shared left-turn/through lane and one shared through/right-turn lane, on the Pilgrim Parkway northbound approach. North of the intersection, provide a 200-foot minimum tangent of the outside through lane then taper down to one lane. Note that the central island-side lane must be designed to accommodate a high volume of U-turn traffic.
  - Provide one-lane flaring to two-lanes, striped as one shared left-turn/through lane and one shared through/right-turn lane, on the Pilgrim Parkway southbound approach.

- Provide one-lane, flared at the intersection, on the Ace Hardware westbound approach.
- Provide one-lane, flared at the intersection, on the Wisconsin Avenue Extension eastbound approach to accommodate left-turn/through traffic. Provide a dedicated right-turn lane operating under yield control.
- Consider installing queue detection in the southbound travel lanes between the Wisconsin Avenue Extension and Bluemound Road to minimize the chance of southbound traffic at the Bluemound Road signal from spilling back into the roundabout. Note that this is not expected to occur based on the modeling but is recommended as an operational measure to ensure the roundabout does not become gridlocked. This improvement will require WisDOT approval, and it is unlikely WisDOT will allow the green time on Bluemound Road to be reduced as a result of the queue detection.

The expected Year 2011 and Year 2031 Scenario 4A and 4B peak hour operating conditions are shown in [Exhibit 10b](#). The Year 2031 expected maximum queues with the recommended improvements are shown in [Exhibit 10c](#).

The Pilgrim Parkway/Moorland Road intersection with Bluemound Road is expected to operate with undesirable LOS E/F conditions with queues in the peak hours that extend through the Watertown Plank Road intersection. With three-quarters access and the traffic signal removal at the existing Watertown Plank Road intersection, acceptable storage and room for queue spillback from the Bluemound Road intersection is expected to be accommodated with this scenario.

*Due to changes in traffic control and access control at the Pilgrim Parkway intersection with Watertown Plank Road/Office Access, it is recommended to **retain** Scenarios 4A and 4B in the list of feasible scenarios for Pilgrim Parkway.*

## **PART G – SCENARIOS 5A & 5B ANALYSIS & RECOMMENDED IMPROVEMENTS**

Recall that both Scenarios 5A and 5B include the extension of Wisconsin Avenue to Pilgrim Parkway and realignment of Watertown Plank Road across from Wisconsin Avenue to create a four-leg intersection. The existing Watertown Plank Road alignment is assumed to be cul-de-sac'd with no access to Pilgrim Parkway, though right-in/right-out access to the existing Watertown Plank Road alignment could be considered. The existing office access opposite Watertown Plank Road was assumed to be converted to right-in/right-out only. Recall that Scenario 5A includes traffic signal control at the Wisconsin Avenue Extension/Watertown Plank Road intersection while Scenario 5B includes roundabout control.

The Year 2011 and Year 2031 Scenario 5A & 5B traffic volumes ([Exhibits 6a and 6b](#)) were utilized in the analysis. The analysis assumes the same cycle lengths/splits/offsets at the Bluemound Road intersection as those utilized in the *USH 18 Traffic Study*. Based on the analysis, it was determined that the following improvements, shown in [Exhibit 11a](#), are recommended to accommodate the Year 2011 and Year 2031 Scenario 5A and 5B traffic volumes.

### *Pilgrim Parkway/Moorland Road & Bluemound Road*

- Provide the improvements identified in WisDOT's *USH 18 Traffic Study* on the Bluemound Road eastbound, Moorland Road northbound, and Bluemound Road westbound approaches.
- As identified in WisDOT's *USH 18 Traffic Study*, provide six lanes on the Pilgrim Parkway southbound approach, including two left-turn lanes, three through lanes and one

right-turn lane. Maximize the storage length of the southbound left-turn and right-turn lanes, noting that the approach storage lengths shown in [Exhibit 11a](#) are desirable but may not fit due to the close intersection spacing to Watertown Plank Road.

#### Pilgrim Parkway & Office Access

- The existing Watertown Plank Road alignment is assumed to be cul-de-sac'd with no access to Pilgrim Parkway, though right-in/right-out access to the existing Watertown Plank Road alignment could be considered.
- Provide two through lanes on the Pilgrim Parkway northbound approach
- Provide three lanes on the Pilgrim Parkway southbound approach, including two through lanes and one shared through/right-turn lane. The shared through/right-turn lane is recommended to be at least 200-feet long.
- The office access was initially analyzed as a full movement, two-way stop controlled intersection. However, the intersection cannot operate safely or efficiently with full access. Therefore, it is recommended to provide right-in/right-out access to the office parking lot under Scenarios 5A and 5B. Affected motorists may utilize access to the Wisconsin Avenue Extension to gain access to Pilgrim Parkway and Watertown Plank Road.
- Remove the traffic signal control. Install stop signs to control the office access approach.

#### Pilgrim Parkway & Wisconsin Avenue Extension/Watertown Plank Road-Realigned

- *Scenario 5A (Traffic Signal):*
  - Construct a median along Pilgrim Parkway of sufficient width to accommodate traffic signal pole placement.
  - Provide four lanes on the Pilgrim Parkway northbound approach, including one left-turn lane, two through lanes and one right-turn lane. The left-turn lane is recommended to be at least 200-feet long, and the right-turn lane is recommended to be at least 150-feet long. North of the intersection, provide a 325-foot minimum tangent of the outside through lane then taper down to one lane.
  - Provide four lanes on the Pilgrim Parkway southbound approach, including one left-turn lane, two through lanes and one right-turn lane. The left-turn lane is recommended to be at least 200-feet long, the outside through lane is recommended to be at least 400-feet long, and the right-turn lane is recommended to be at least 150-feet long.
  - Provide three lanes on the realigned Watertown Plank Road westbound approach, including one left-turn lane, one through lane and one right-turn lane. The left-turn is recommended to be at least 375-feet long, and the right-turn lane is recommended to be at least 150-feet long.
  - Provide three lanes on the Wisconsin Avenue Extension eastbound approach, including one left-turn lane, one through lane and one right-turn lane. The left-turn is recommended to be at least 225-feet long, and the right-turn lane is recommended to be at least 150-feet long.
  - Install traffic signal control, including northbound, eastbound and westbound protected-permitted left-turn signal heads and northbound permitted-overlap

right-turn signal heads. The signal was assumed to run at the same cycle length as the Bluemound Road corridor (108-seconds AM, 130-seconds PM).

- *Scenario 5B (Roundabout):*
  - Construct a two-lane modern roundabout.
  - Provide two-lanes, striped as one shared left-turn/through lane and one shared through/right-turn lane, on the Pilgrim Parkway northbound approach. North of the intersection, provide a 200-foot minimum tangent of the outside through lane then taper down to one lane.
  - Provide one-lane flaring to two-lanes, striped as one shared left-turn/through lane and one shared through/right-turn lane, on the Pilgrim Parkway southbound approach.
  - Provide one-lane, flared at the intersection, on the Ace Hardware westbound approach.
  - Provide one-lane, flared at the intersection, on the Wisconsin Avenue Extension eastbound approach to accommodate left-turn/through traffic. Provide a dedicated right-turn lane operating under yield control.
  - Consider installing queue detection in the southbound travel lanes between the Wisconsin Avenue Extension and Bluemound Road to minimize the chance of southbound traffic at the Bluemound Road signal from spilling back into the roundabout. Note that this is not expected to occur based on the modeling but is recommended as an operational measure to ensure the roundabout does not become gridlocked. This improvement will require WisDOT approval, and it is unlikely WisDOT will allow the green time on Bluemound Road to be reduced as a result of the queue detection.

The expected Year 2011 and Year 2031 Scenario 5A and 5B peak hour operating conditions are shown in [Exhibit 11b](#). The Year 2031 expected maximum queues with the recommended improvements are shown in [Exhibit 11c](#).

The Pilgrim Parkway/Moorland Road intersection with Bluemound Road is expected to operate with undesirable LOS E/F conditions with queues in the peak hours that extend through the office access intersection. With right-in/right-out and the traffic signal removal at the office access intersection, acceptable storage and room for queue spillback from the Bluemound Road intersection is expected to be accommodated with this scenario.

Note that the eastbound through movement from the Wisconsin Avenue Extension to the realigned Watertown Plank Road is expected to operate at LOS E conditions with approximately 5-seconds of average vehicle delay beyond the LOS D/E threshold during the weekday evening peak hour in Year 2031. This movement accommodates fewer than 100-vehicles in the peak hour and does not impact access to the eastbound left-turn and right-turn lanes. Therefore the LOS E condition is recommended to be allowed.

*Due to changes in traffic control and access control at the Pilgrim Parkway intersection with Watertown Plank Road/Office Access, it is recommended to **retain** Scenarios 5A and 5B in the list of feasible scenarios for Pilgrim Parkway.*

## PART H – INTERSECTION CONTROL EVALUATION

Due to queue spillback problems between Bluemound Road and Watertown Plank Road, and because recommended turn-bay storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road which may further exacerbate the queue spillback problems, it is recommended to drop Scenarios 1, 2 and 3 from the list of feasible scenarios for Pilgrim Parkway. Scenarios 4A, 4B, 5A and 5B have been retained as feasible scenarios for Pilgrim Parkway.

An intersection control evaluation (ICE) matrix, comparing Scenarios 4A, 4B, 5A and 5B, is included in [Exhibit 12a](#). Property and right-of-way impacts between the scenarios are compared in [Exhibit 12b](#). Eight factors were used to compare the four scenarios.

- Safety
- Operational Analysis
- Right-of-Way Impacts ([Exhibit 12b](#))
- Access
- Pedestrians/Bicycles
- Operation and Maintenance Costs
- Construction Cost
- Practical Feasibility

### H1. Safety

In general, traffic signal controlled intersections (Scenarios 4A & 5A) have four-times the number of vehicle-to-vehicle conflict points and two-times the number of vehicle-to-pedestrian conflict points, as well as a higher exposure to injury-related crashes due to left-turn and through movements. Roundabout intersections (Scenarios 4B & 5B) typically have fewer injury-related crashes but may have a higher total number of crashes due to rear-ends and sideswipes. Note that the roundabouts under consideration are multi-lane, and snow-covered markings in the roundabout pose a greater risk than snow-covered markings at a signalized intersection.

Comparing Scenarios 4A & 4B to Scenarios 5A & 5B, the former will have a higher number of U-turn maneuvers. To safely accommodate the U-turn maneuvers, the signalized Scenario 4A is recommended to have an eastbound “No Right-Turn-On-Red” restriction. Due to the realignment of Watertown Plank Road under Scenarios 5A & 5B, the existing Watertown Plank Road intersection is expected to be safer due to fewer turn maneuvers.

Pedestrian safety is discussed in greater detail under *H5. Pedestrians/Bicycles*.

### H2. Operational Analysis

Recall that LOS D or better conditions are defined as acceptable traffic operations for both unsignalized and signalized intersection control types, and level of service results are included in [Exhibits 10b and 11b](#). The roundabout scenarios (Scenarios 4B & 5B) are expected to operate at LOS B or better conditions and the signalized Scenario 4A is expected to operate at LOS D or better conditions. Signalized Scenario 5B is anticipated to operate at LOS D or better conditions with the exception of the eastbound through movement, which may operate at LOS E conditions with 5-seconds of delay beyond the LOS D/E threshold. Since the volume is relatively light and based on a 20-year forecast, it is recommended to allow this LOS E condition for this movement under Scenario 5B if selected as the preferred scenario.

The operational analysis shows that, in general, queues under the traffic signalized Scenarios 4A & 5A are expected to be approximately equal to or greater than the roundabout queues ([Exhibits 10c and 11c](#)). Note, however, that the design recommendations for all four scenarios are expected to accommodate their respective maximum queues ([Exhibits 10c and 11c](#)). The traffic signalized scenarios provide the benefit of the “metering effect” in that queues between signalized intersections may be more easily controlled. The roundabout scenarios do not have a metering benefit and, therefore, queue loops between Wisconsin Avenue and Bluemound Road should be considered to ensure the roundabout at Wisconsin Avenue does not become gridlocked. However it is unlikely WisDOT will allow the green time on Bluemound Road to be reduced as a result of the queue detection.

### **H3. Right-of-Way Impacts**

A list of preliminary property and access impacts are shown in [Exhibits 12a and 12b](#). OneSource Consulting estimates the following real estate acquisition costs for each scenario, which include acquisition costs for constructing the Wisconsin Avenue Extension:

- Scenario 4A (Signal): \$725,000 to \$1,030,000;
- Scenario 4B (Roundabout): \$1,025,000 to \$1,530,000;
- Scenario 5A (Signal): \$1,525,000 to \$2,530,000; and
- Scenario 5B (Roundabout): \$1,525,000 to \$2,530,000

Signalized Scenario 4A is expected to be the lowest cost/least property impact scenario, with costs possibly one-third to one-half the cost of Scenarios 5A and 5B.

The reason for the wide range of costs under each scenario is because wetland impacts on the west side of Pilgrim Parkway may force the roadway & intersections to be moved further east, which in turn impacts developed real estate. Scenarios 5A & 5B incorporate a realigned Watertown Plank Road that requires substantial private property takings which makes them the most costly. In general, traffic signal controlled intersections (Scenarios 4A & 5A) will require a small intersection footprint but wider intersection approaches while the reverse is typical of roundabout controlled intersections (Scenarios 4B & 5B).

### **H4. Access**

A list of preliminary property and access impacts are shown in [Exhibits 12a and 12b](#).

Recall that Scenarios 4A & 4B assume three-quarters access to the existing Watertown Plank Road alignment (left-in/right-in/right-out) while Scenarios 5A & 5B assume Watertown Plank Road is realigned and the existing roadway cul-de-sac'd. Consideration could be given to providing right-in/right-out access to the existing roadway under Scenarios 5A & 5B if desired.

### **H5. Pedestrians/Bicycles**

If on-street bicycles are accommodated along Pilgrim Parkway, the operation of the bicycles through traffic signalized and roundabout intersections differs. Under signalized Scenarios 4A & 5A, on-street bicyclists may remain on-street to continue through the intersection. Under roundabout Scenarios 4B & 5B, on-street bicycles may require special ramps be constructed to allow bicyclists to maneuver around the intersection. These special ramps may pose pedestrian-bicycle conflicts and injuries as bicyclists often travel at higher speeds and mix with their slower pedestrian counterparts.

In general, traffic signalized intersections are easier to use by pedestrians with visual impairments but require longer crossing distances. The signal timings can be adjusted to provide

safer crossings of said pedestrians. Roundabout intersections, though designed with shorter crossing distances, may pose difficulties for the visually impaired as they judge safe gaps in vehicular traffic to cross. Pedestrian hybrid beacons could be considered on the approaches, which aid visually-impaired pedestrians but introduce queues and delays not modeled in this study.

Comparing signalized Scenario 4A with signalized Scenario 5A, it is noted that Scenario 4A was modeled at a half-cycle and, as such, may require the traffic signal timings to exit coordination to safely accommodate pedestrian crossings. Pedestrians are expected to fit within the signalized timings of Scenario 5A and, thus, coordination is expected to be maintained at all necessary times of day.

## **H6. Operation and Maintenance Costs**

Generally, traffic signal control (Scenarios 4A & 5A) is expected to have a higher cost for controller/signal upkeep while roundabout control (Scenarios 4B & 5B) is expected to have higher illumination costs for upstream approaches, each corner and the central island. If pedestrian hybrid beacons become necessary to service visually impaired pedestrians, controller costs/beacon upkeep costs will also be incurred under roundabout control. Electrical fees may be approximately equal under both scenarios.

Most pavement markings at traffic signalized intersections are straight lines in the direction of travel. Pavement markings inside the roundabouts are curved and require motorists to traverse over them with greater frequency. The costs to maintain pavement markings are expected to be higher under the roundabout scenarios (Scenarios 4B & 5B).

## **H7. Construction Costs**

The construction costs of each of the four retained scenarios will greatly depend on how the design will be performed to avoid property and wetlands. The following preliminary costs were prepared by OneSource Consulting for each of the four scenarios. A note of caution that the actual costs may differ and should be refined depending on the scenarios ultimately chosen by the community to move onto the preliminary design stage:

- Scenario 4A (Signal): \$1,700,000 to \$2,200,000;
- Scenario 4B (Roundabout): \$2,000,000 to \$2,500,000;
- Scenario 5A (Signal): \$2,500,000 to \$3,000,000; and
- Scenario 5B (Roundabout): \$2,200,000 to \$2,700,000

Signalized Scenario 4A is expected to have the lowest construction cost of the four scenarios, and Scenarios 5A and 5B are expected to be the highest cost due to the realignment of Watertown Plank Road.

These costs include the extension of Wisconsin Avenue, modification to Watertown Plank Road, parking lot alterations for Ace Hardware and North Shore Bank, and all work on Pilgrim Parkway north of Bluemound Road not to be constructed in 2012/2013 by WisDOT.

## **H8. Practical Feasibility**

Comparing the traffic signal to roundabout scenarios, it is important to note that traffic signal installations (Scenarios 4A & 5A) are generally accepted by the public before and after construction due to their widespread use. Roundabouts (Scenarios 4B and 5B) are typically accepted by the public after construction if they are properly designed and constructed, but often

face resistance prior to their construction. Public acceptance differs by location, as it may take several months to several years for the motoring public to acclimate to a multi-lane roundabout.

Comparing Scenarios 4A & 4B to Scenarios 5A & 5B, it is noted that the former may be more practical because they maintain the existing Watertown Plank Road alignment without constructing a new roadway through existing properties. This is why Scenarios 4A & 4B are expected to have lower property/access costs and overall construction costs than Scenarios 5A & 5B.

Taking into consideration environmental implications for the wetlands and a navigable waterway west of Pilgrim Parkway, as well as consideration to the need for substantial property takings under Scenarios 5A and 5B, it is anticipated that the most practical scenario will be signalized Scenario 4A.

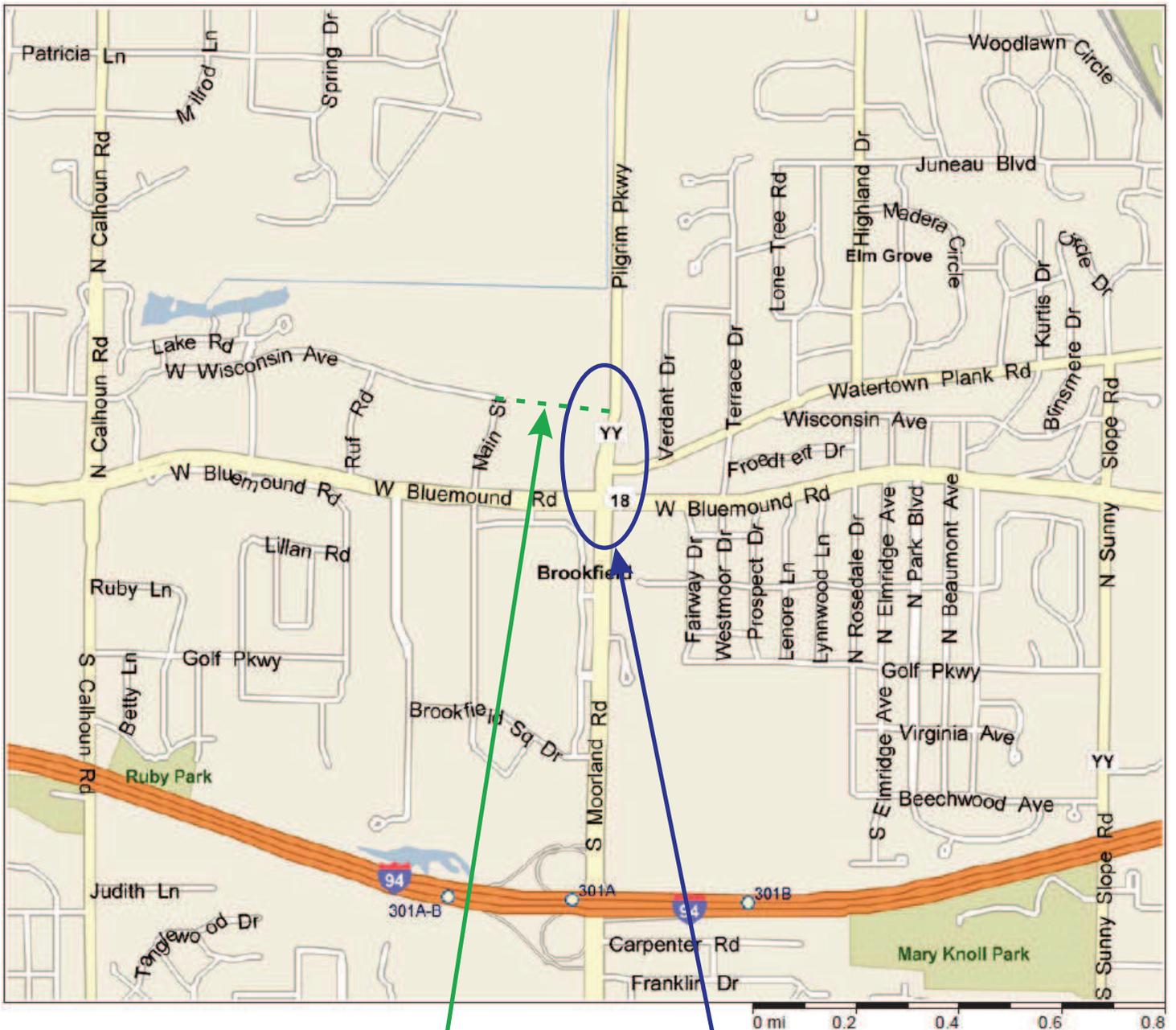
## **PART I – CONCLUSION**

Due to queue spillback problems between Bluemound Road and Watertown Plank Road, and because recommended turn-bay storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road which may further exacerbate the queue spillback problems, it is recommended to drop Scenarios 1, 2 and 3 from the list of feasible scenarios for Pilgrim Parkway. Scenarios 4A, 4B, 5A and 5B should be retained as feasible scenarios for Pilgrim Parkway.

After consideration of the eight factors explored above – safety, operations, right-of-way impacts, access, pedestrians/bicycles, operation and maintenance costs, construction cost, and practical feasibility – it is realized that Scenarios 5A (signal) and 5B (roundabout) are likely to be the most intrusive scenarios due to property takings required, right-of-way and access costs, and overall construction cost. Roundabouts (Scenarios 4B & 5B) are proliferating through the State of Wisconsin, are becoming more understood by motorists, and should be retained as feasible improvement scenarios for Pilgrim Parkway.

Based on the professional opinion of the engineers at Traffic Analysis & Design, Inc., signalized Scenario 4A may be the best option for Pilgrim Parkway for the following reasons:

- Safely accommodates pedestrians and bicyclists;
- Operates acceptably and with queues that can be accommodated with design;
- Provides a metering effect on Pilgrim Parkway to minimize chances of queue spillback;
- Results in the least right-of-way and access impact and cost;
- Maintains the existing Watertown Plank Road and provides three-quarters access to it;
- Provides for visually-impaired pedestrians and keeps on-street bicyclists on the street;
- Provides for lower pavement marking maintenance costs and for less confusion in cases of pavement markings being covered by snow;
- Is the least cost scenario; and
- Is expected to be the most practically feasible alternative.



**Wisconsin Avenue  
Extension**

**Study Area  
Intersections**

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**TRAFFIC  
ANALYSIS &  
DESIGN, INC.**



Exhibits: 03-18-11

**EXHIBIT 1  
STUDY AREA MAP**

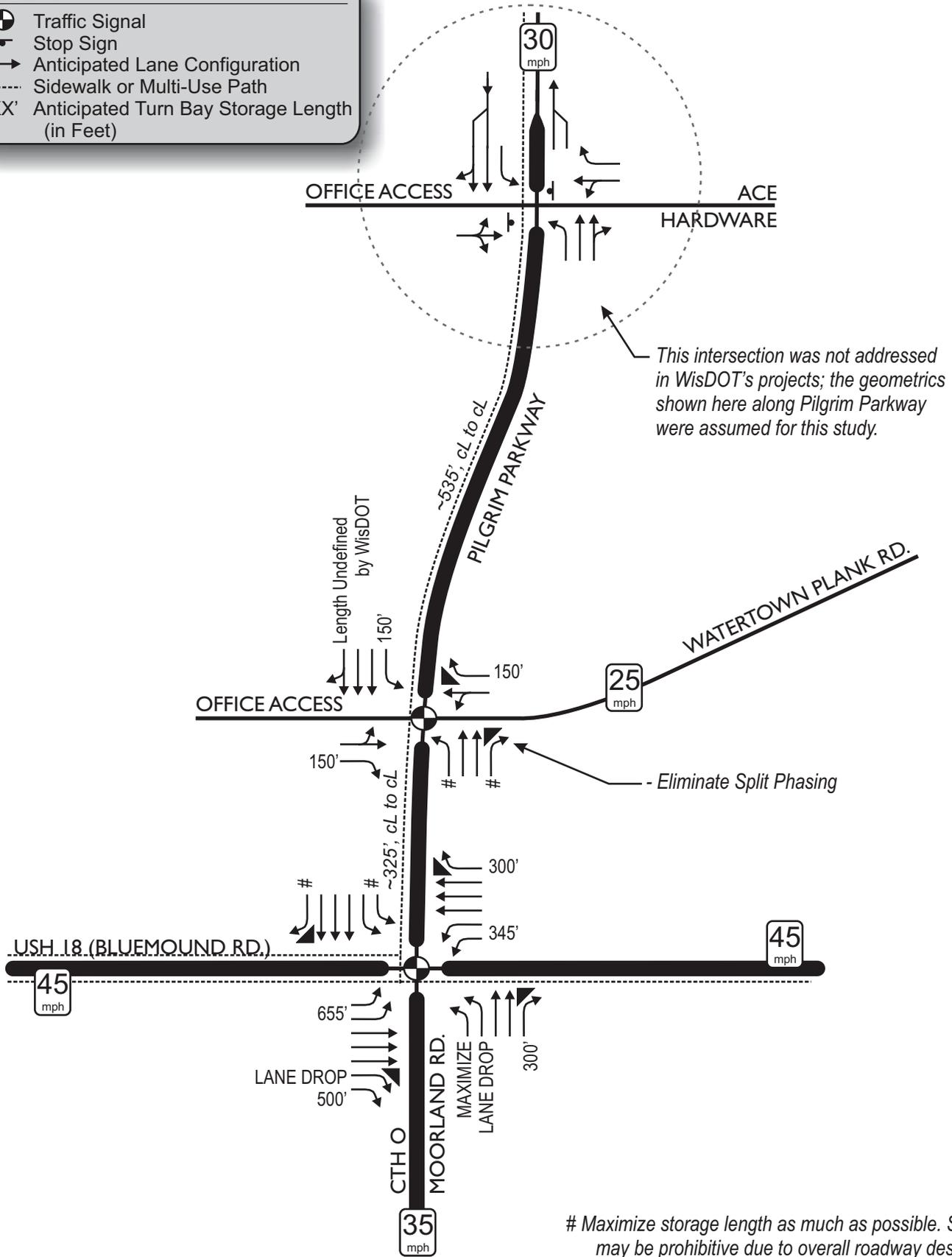
**BROOKFIELD, WISCONSIN**



NOT TO SCALE

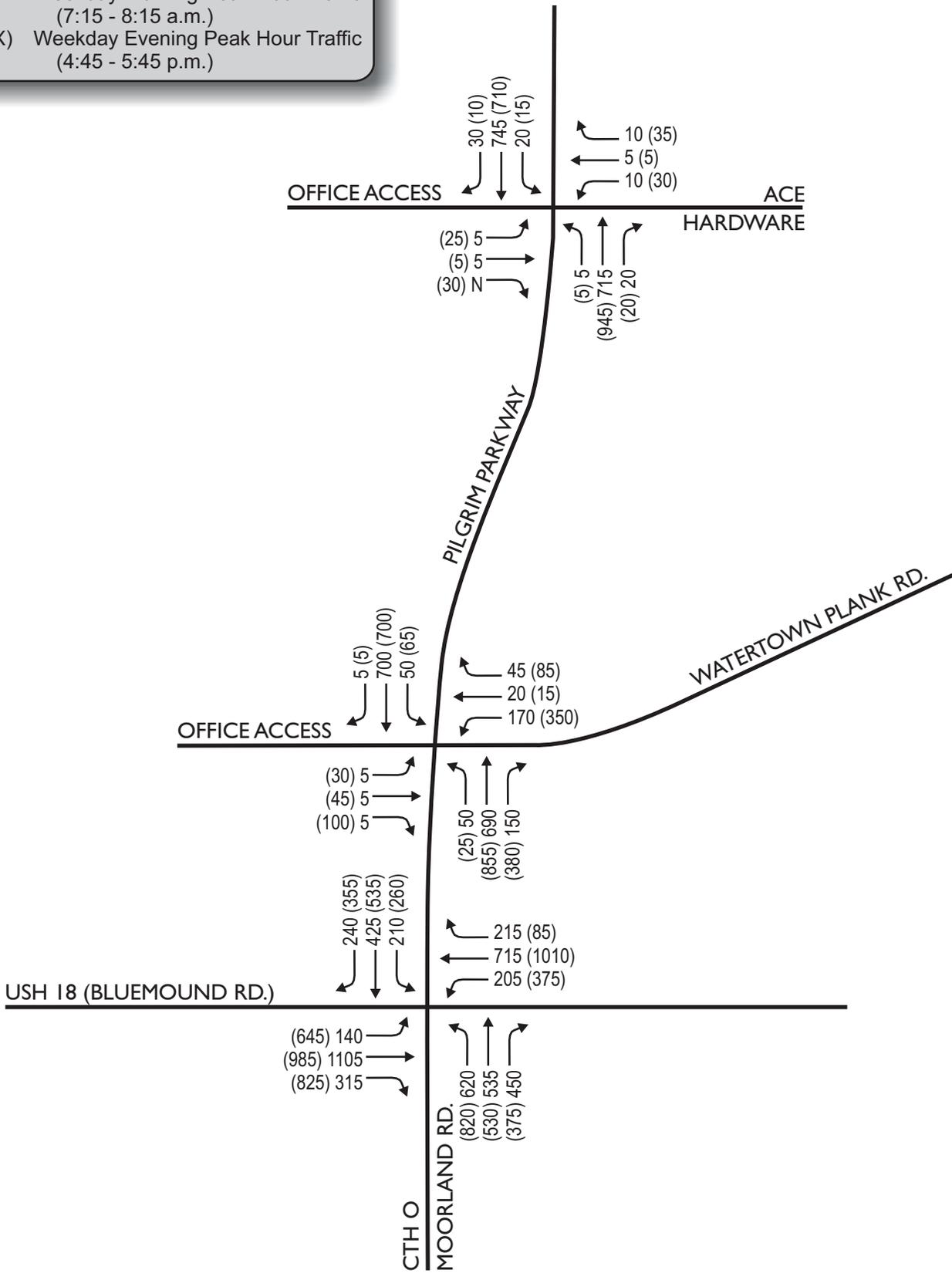
**LEGEND**

-  Traffic Signal
-  Stop Sign
-  Anticipated Lane Configuration
-  Sidewalk or Multi-Use Path
-  Anticipated Turn Bay Storage Length (in Feet)



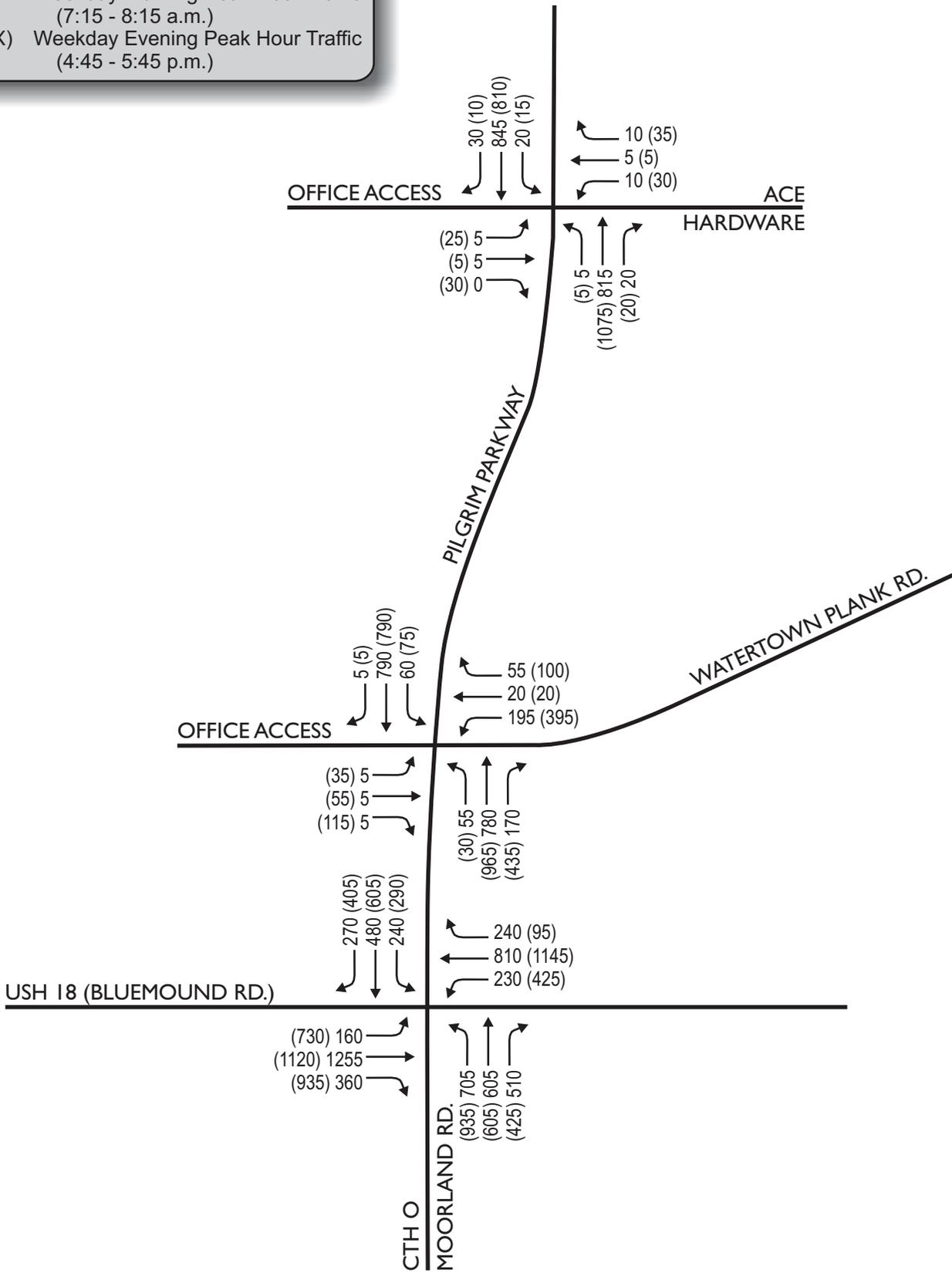
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



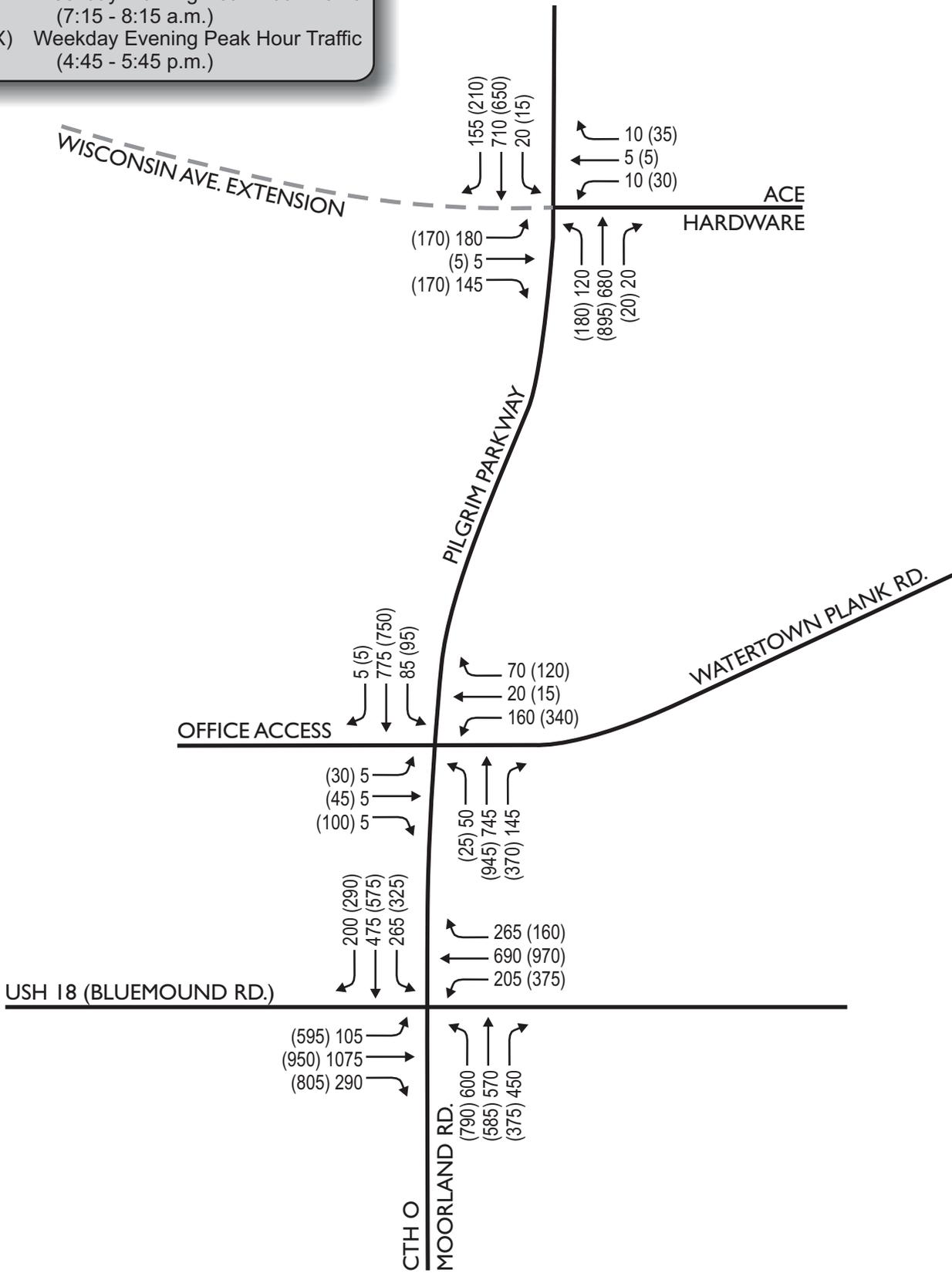
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



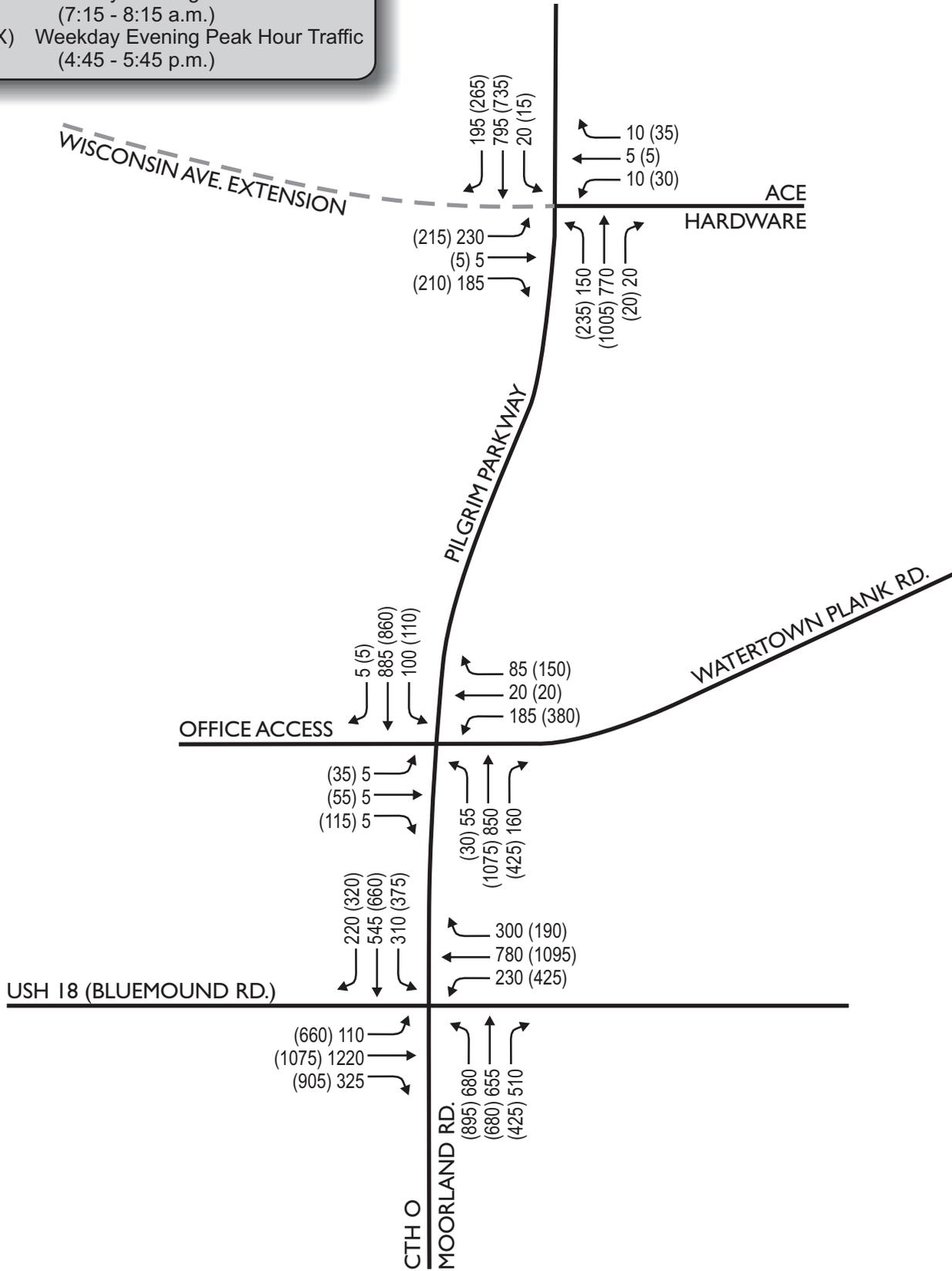
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



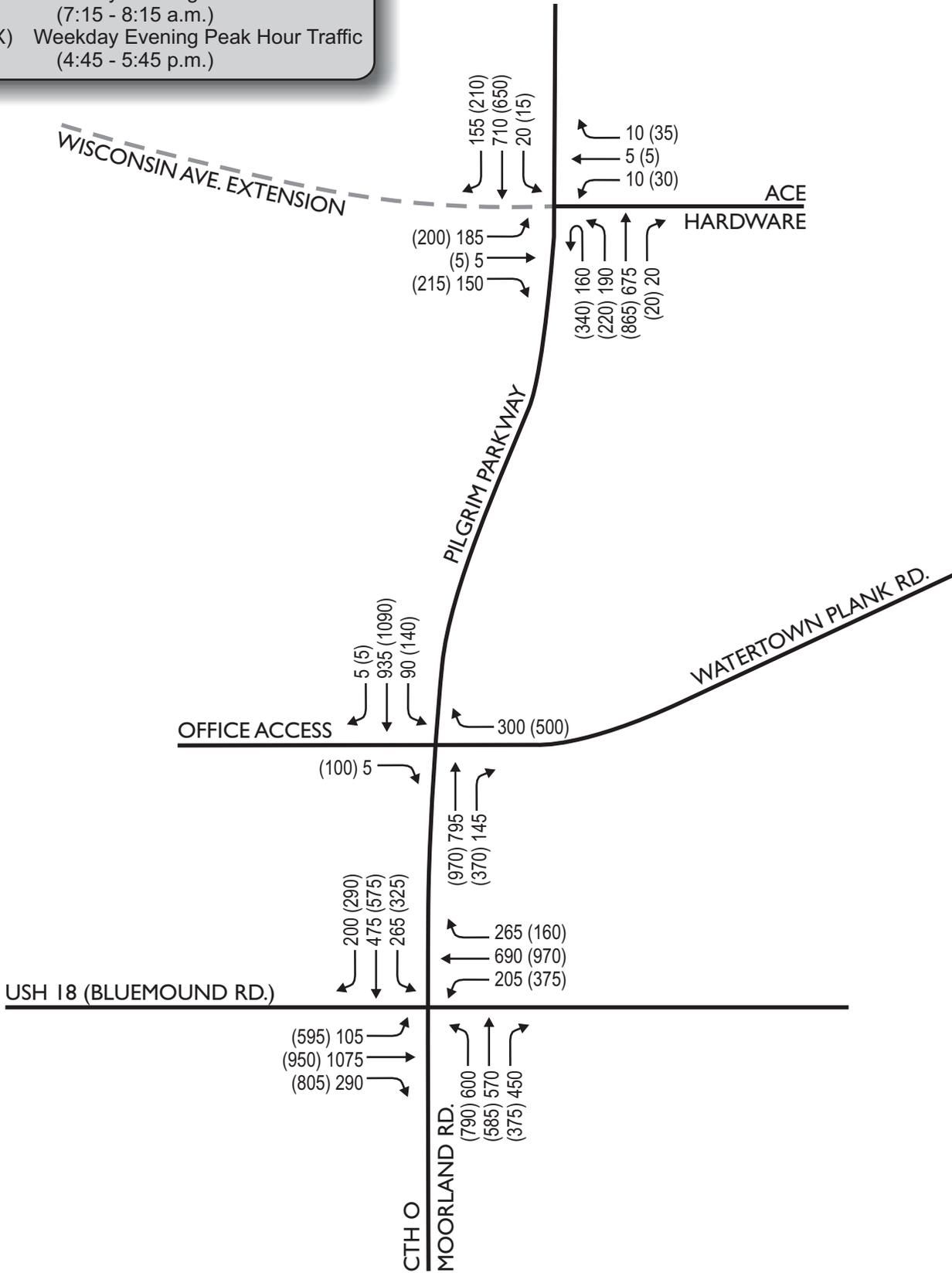
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



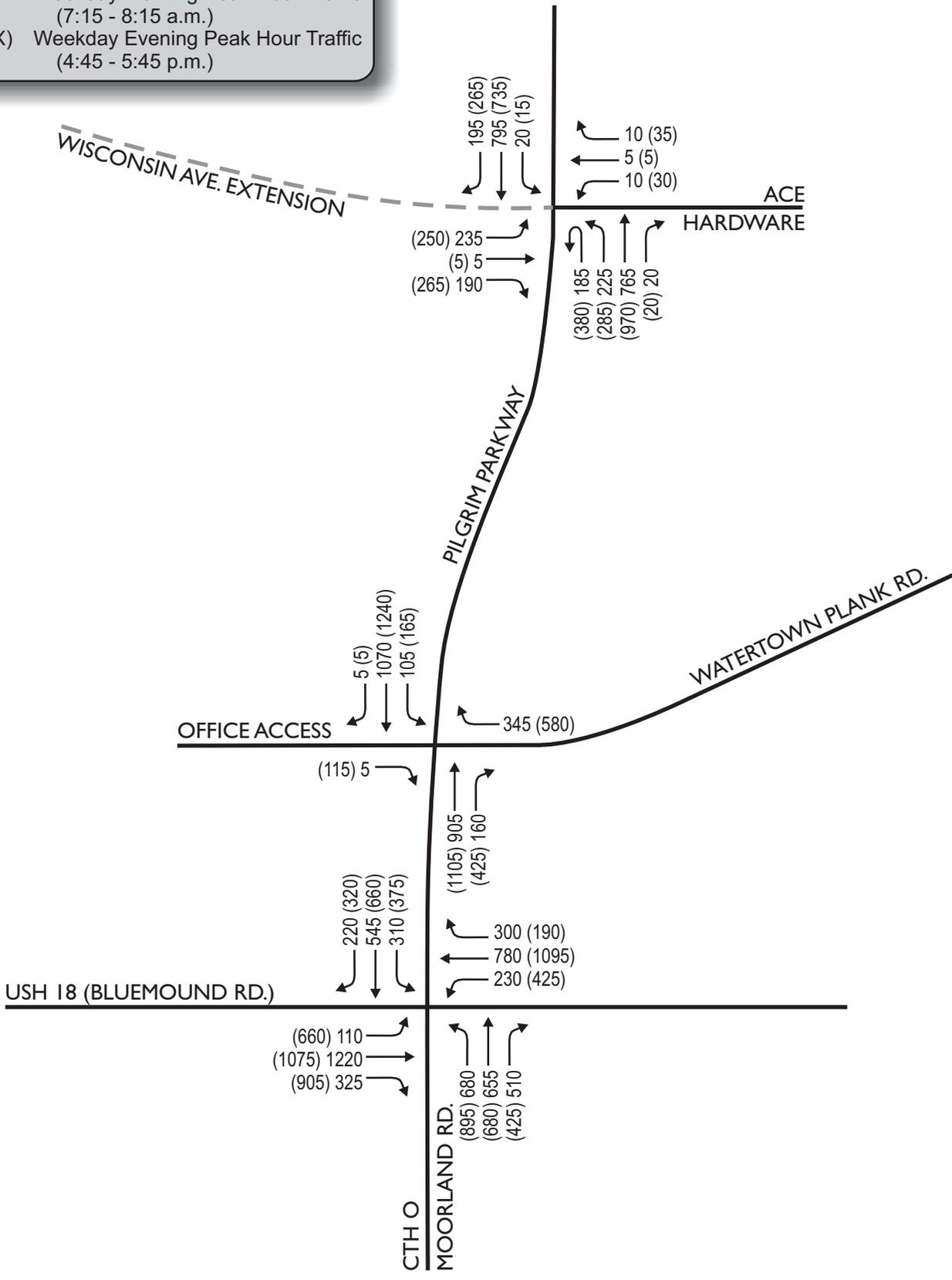
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



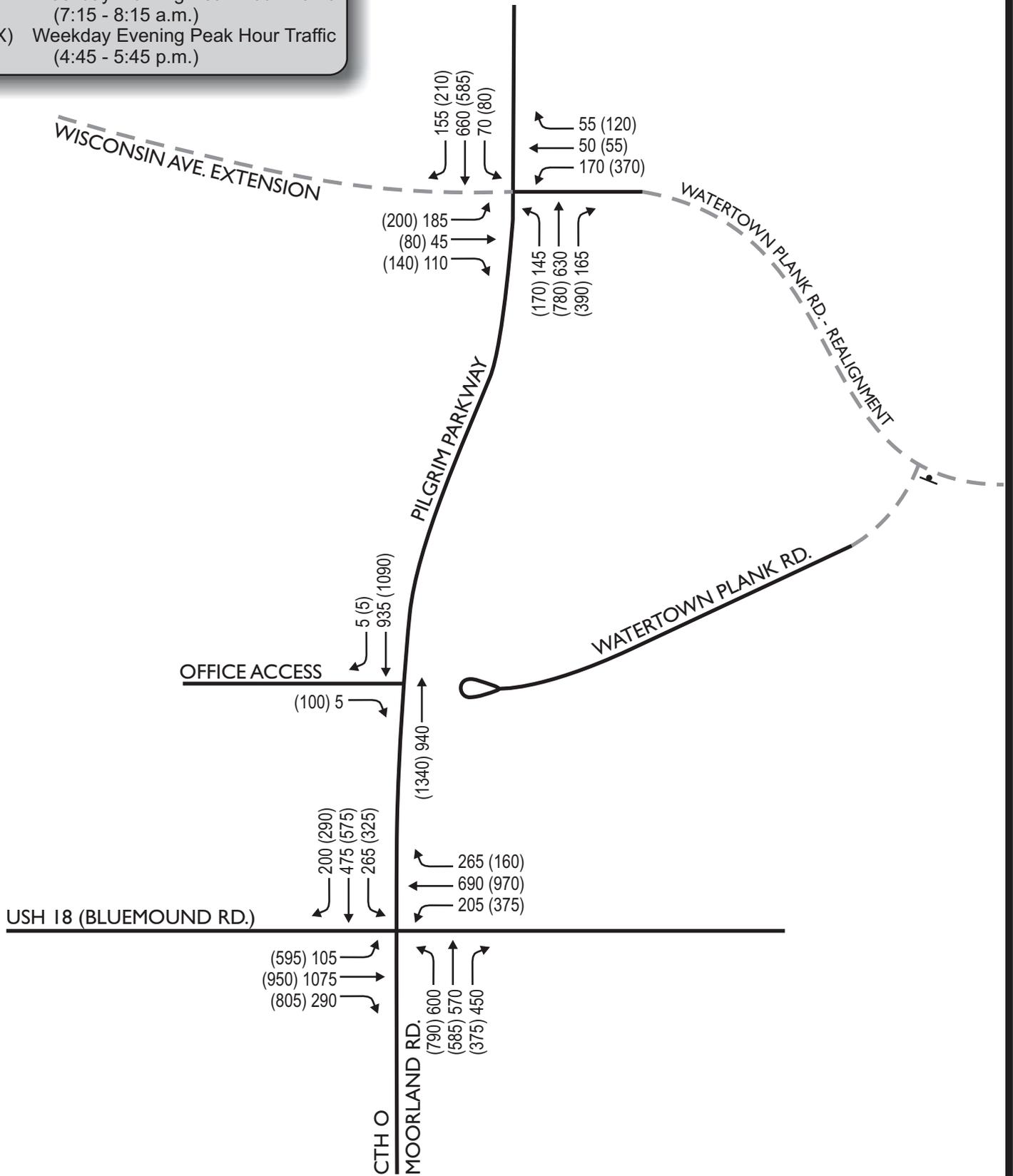
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



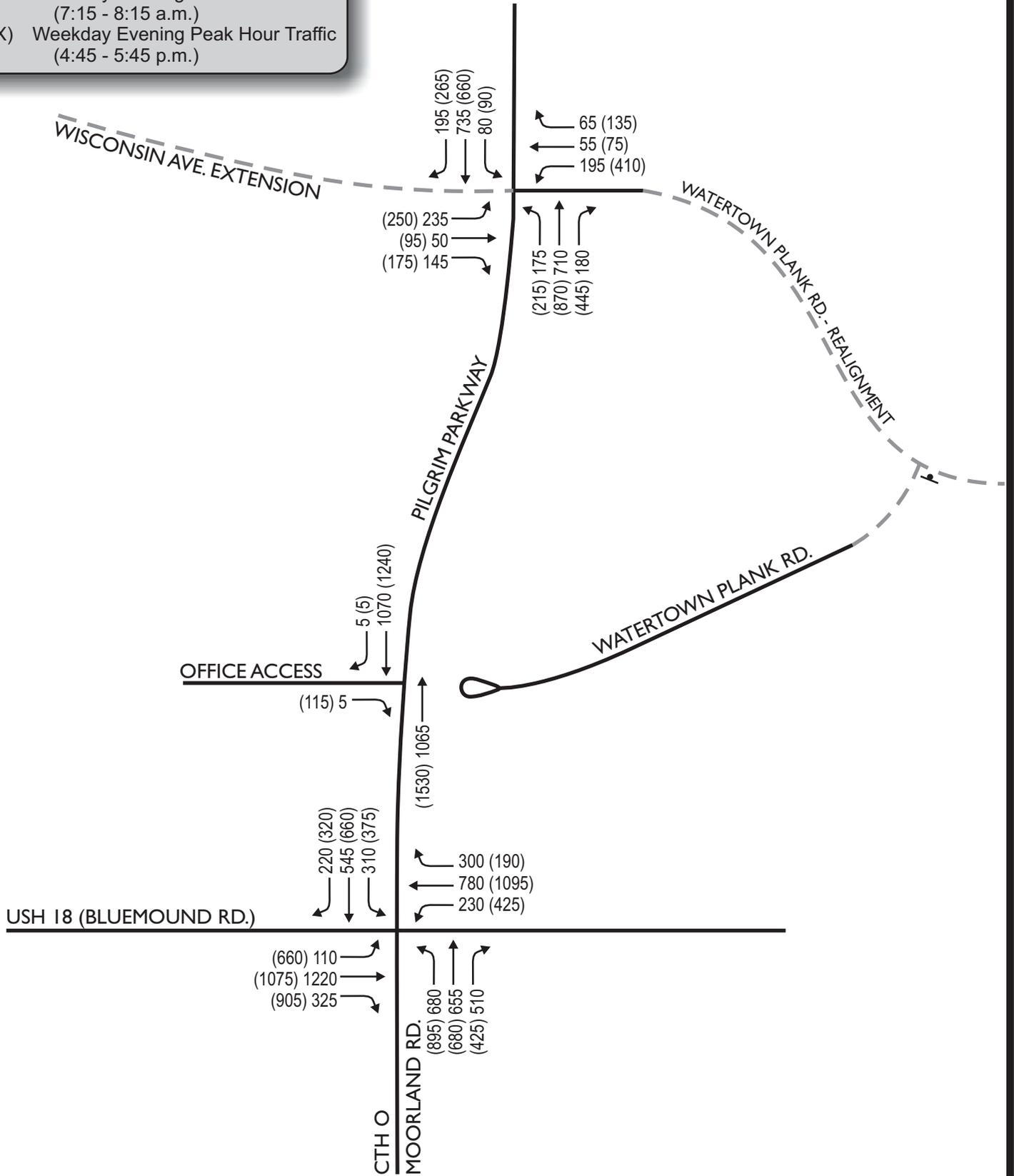
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



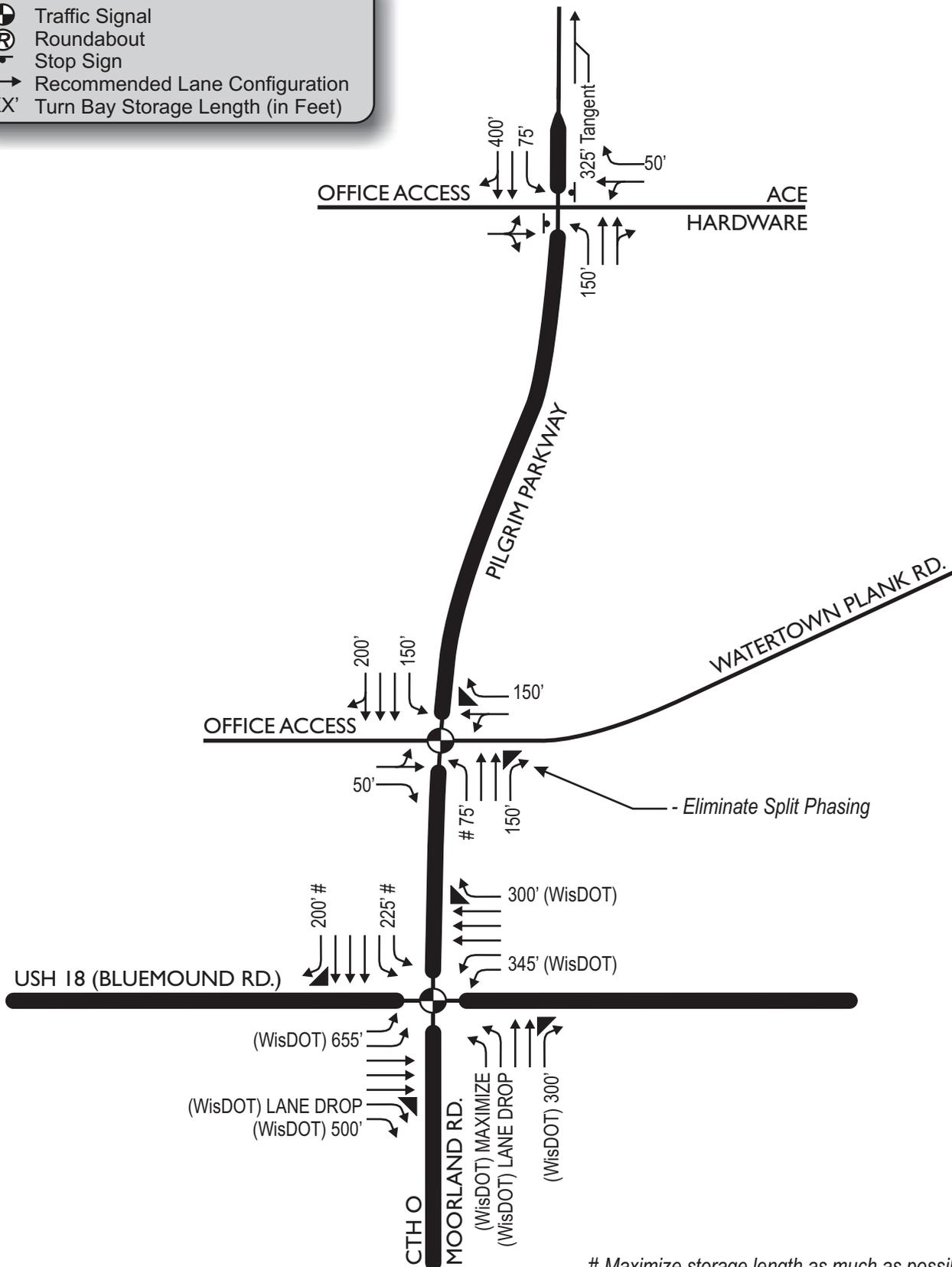
**LEGEND**

- XX Weekday Morning Peak Hour Traffic (7:15 - 8:15 a.m.)
- (XX) Weekday Evening Peak Hour Traffic (4:45 - 5:45 p.m.)



**LEGEND**

-  Traffic Signal
-  Roundabout
-  Stop Sign
-  Recommended Lane Configuration
- XX' Turn Bay Storage Length (in Feet)



**Year 2011 Scenario 1 Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	E	D	D	D	D	D
		PM	F	D	B	E	D	C	F	D	C	E	F	C
Pilgrim Parkway & Watertown Plank Road/Office Access	Traffic Signal	AM	B	B	B	C	C	B	A	A	A	A	A	A
		PM	B	B	B	D	D	B	B	B	D	B	B	B
Pilgrim Parkway & Office Access/ Ace Hardware	Two-Way Stop Sign	AM	C	C	C	C	C	A	A	*	*	A	*	*
		PM	C	C	C	C	C	A	A	*	*	A	*	*

Notes: (-) indicates a movement that is not possible or is prohibited.  
(\* ) indicates a movement that is not controlled or is free-flow.

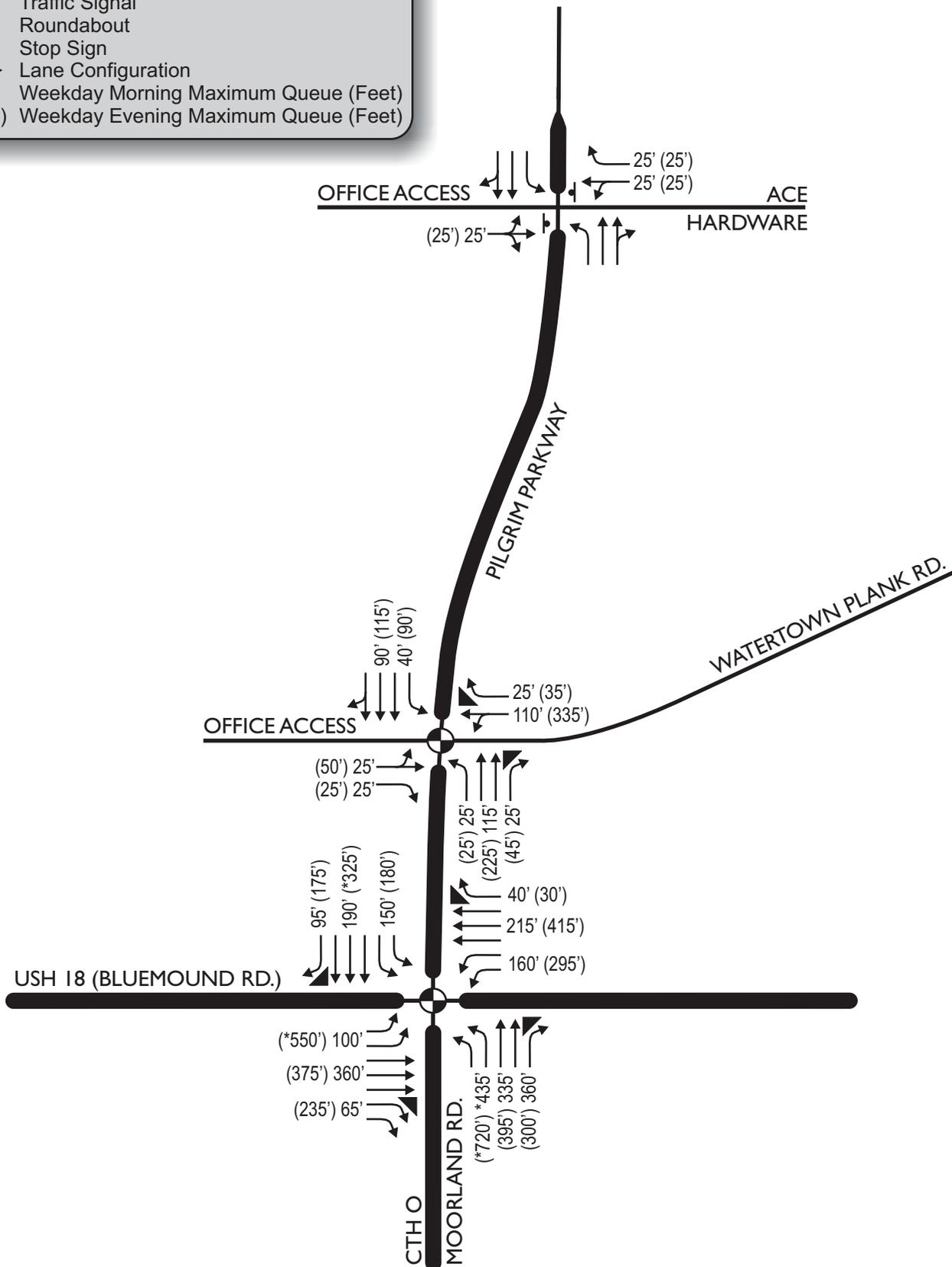
**Year 2031 Scenario 1 Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	F	D	D	E	E	D
		PM	F	D	B	E	D	C	F	E	D	E	F	C
Pilgrim Parkway & Watertown Plank Road/Office Access	Traffic Signal	AM	B	B	B	C	C	B	A	A	A	A	A	A
		PM	B	B	B	D	D	B	B	B	D	C	B	B
Pilgrim Parkway & Office Access/ Ace Hardware	Two-Way Stop Sign	AM	C	C	C	C	C	A	B	*	*	A	*	*
		PM	C	C	C	D	D	A	A	*	*	B	*	*

Notes: (-) indicates a movement that is not possible or is prohibited.  
(\* ) indicates a movement that is not controlled or is free-flow.

**LEGEND**

-  Traffic Signal
-  Roundabout
-  Stop Sign
-  Lane Configuration
- XX' Weekday Morning Maximum Queue (Feet)
- (XX') Weekday Evening Maximum Queue (Feet)



\* Volume exceeds capacity, the queue is theoretically infinite



**LEGEND**

- ⊙ Traffic Signal
- Ⓜ Roundabout
- ⊥ Stop Sign
- Recommended Lane Configuration
- XX' Turn Bay Storage Length (in Feet)



**Year 2011 Scenario 2 Peak Hour Operating Conditions**  
**With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	E	D	D	E	E	D
		PM	F	D	B	E	D	C	F	E	C	E	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Traffic Signal	AM	B	B	B	D	B	B	A	A	B	A	A	A
		PM	B	B	B	D	B	B	B	B	D	B	A	A
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Two-Way Stop Sign	AM	F	F	B	E	E	A	B	*	*	A	*	*
		PM	F	F	B	F	F	A	B	*	*	A	*	*

Notes: (-) indicates a movement that is not possible or is prohibited.  
 (\*) indicates a movement that is not controlled or is free-flow.

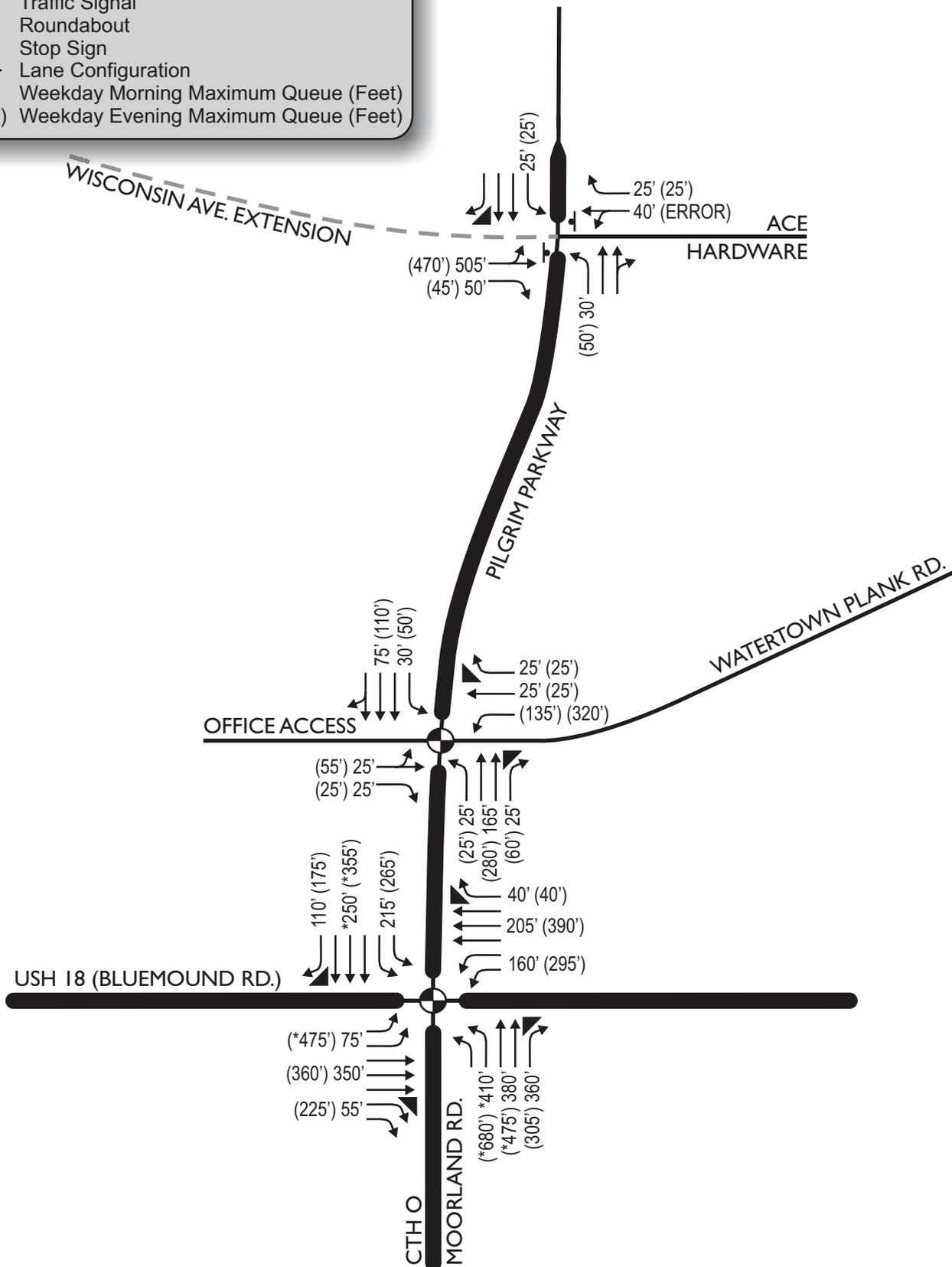
**Year 2031 Scenario 2 Peak Hour Operating Conditions**  
**With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	F	E	D	F	F	D
		PM	F	D	B	E	D	C	F	F	D	F	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Traffic Signal	AM	B	B	B	C	B	B	B	B	B	A	A	A
		PM	B	B	B	D	B	B	B	B	D	B	B	B
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Two-Way Stop Sign	AM	F	F	C	F	F	A	B	*	*	A	*	*
		PM	F	F	B	F	F	A	B	*	*	A	*	*

Notes: (-) indicates a movement that is not possible or is prohibited.  
 (\*) indicates a movement that is not controlled or is free-flow.

**LEGEND**

-  Traffic Signal
-  Roundabout
-  Stop Sign
-  Lane Configuration
- XX' Weekday Morning Maximum Queue (Feet)
- (XX') Weekday Evening Maximum Queue (Feet)

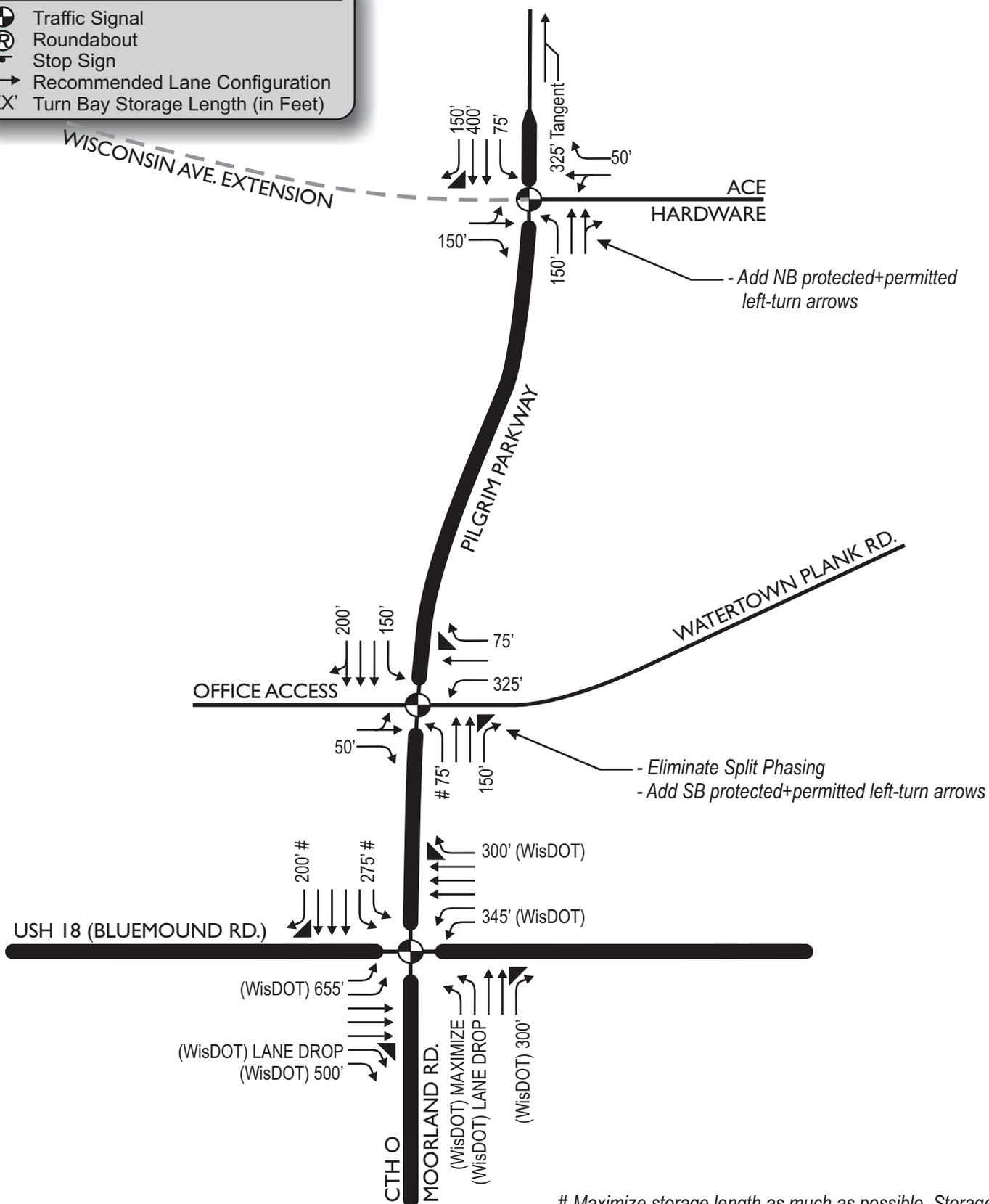


\* Volume exceeds capacity, the queue is theoretically infinite



**LEGEND**

-  Traffic Signal
-  Roundabout
-  Stop Sign
-  Recommended Lane Configuration
- XX' Turn Bay Storage Length (in Feet)



# Maximize storage length as much as possible. Storage may be prohibitive due to overall roadway design.

**Year 2011 Scenario 3 Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	E	D	D	E	E	D
		PM	F	D	B	E	D	C	F	E	C	E	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Traffic Signal	AM	B	B	B	D	B	B	A	A	B	A	A	A
		PM	B	B	B	D	B	B	B	B	D	B	B	B
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	C	C	B	B	B	B	A	A	A	B	B	A
		PM	C	C	C	C	C	B	A	A	A	B	B	B

Notes: (-) indicates a movement that is not possible or is prohibited.  
 (\*) indicates a movement that is not controlled or is free-flow.

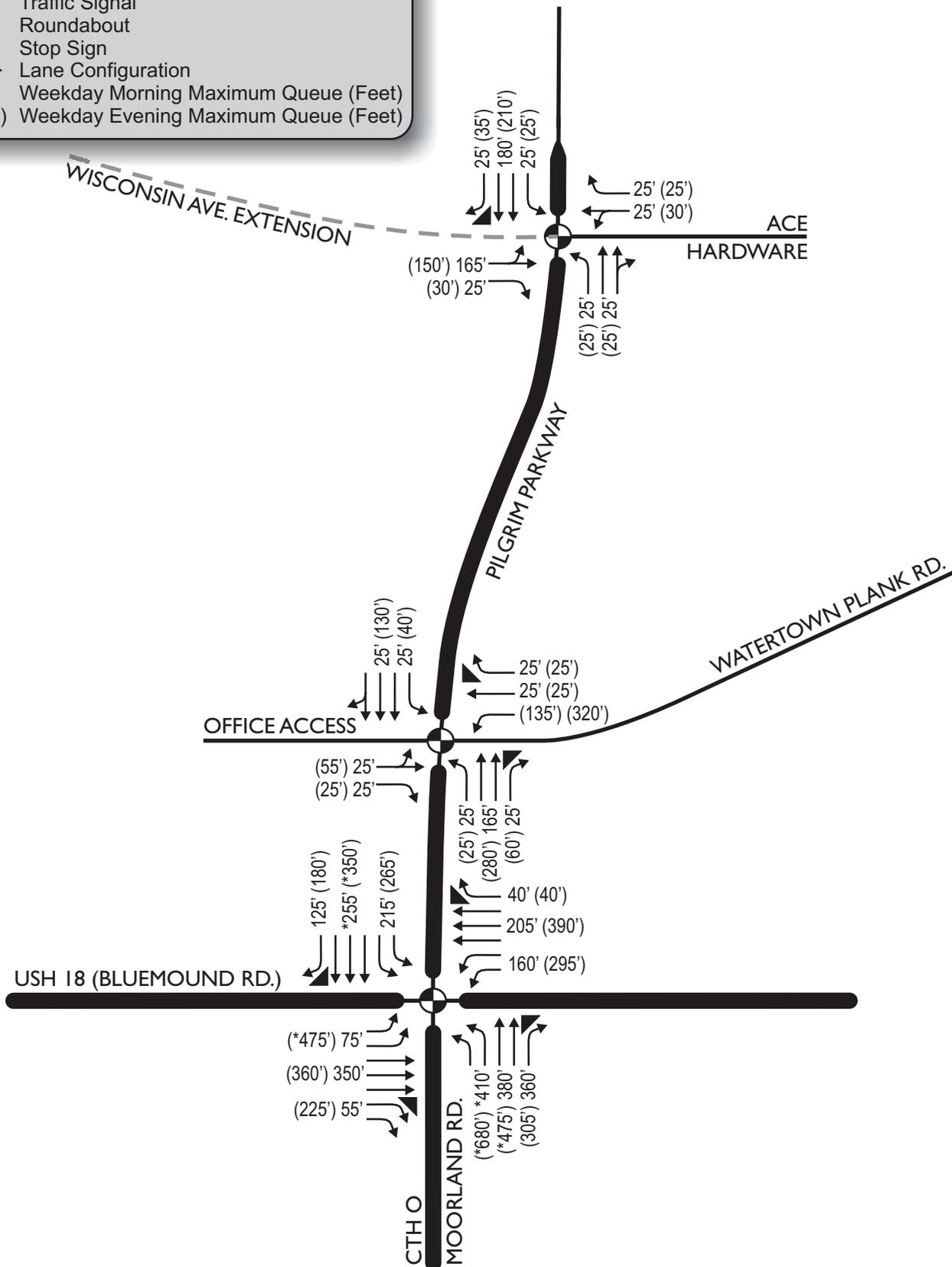
**Year 2031 Scenario 3 Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	F	E	D	F	F	D
		PM	F	D	B	E	D	C	F	F	D	F	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Traffic Signal	AM	B	B	B	C	B	B	B	B	B	A	A	A
		PM	B	B	B	D	B	B	B	B	D	B	B	B
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	C	C	B	B	B	B	A	A	A	B	B	B
		PM	C	C	B	B	B	B	A	A	A	B	B	B

Notes: (-) indicates a movement that is not possible or is prohibited.  
 (\*) indicates a movement that is not controlled or is free-flow.

**LEGEND**

-  Traffic Signal
-  Roundabout
-  Stop Sign
-  Lane Configuration
- XX' Weekday Morning Maximum Queue (Feet)
- (XX') Weekday Evening Maximum Queue (Feet)

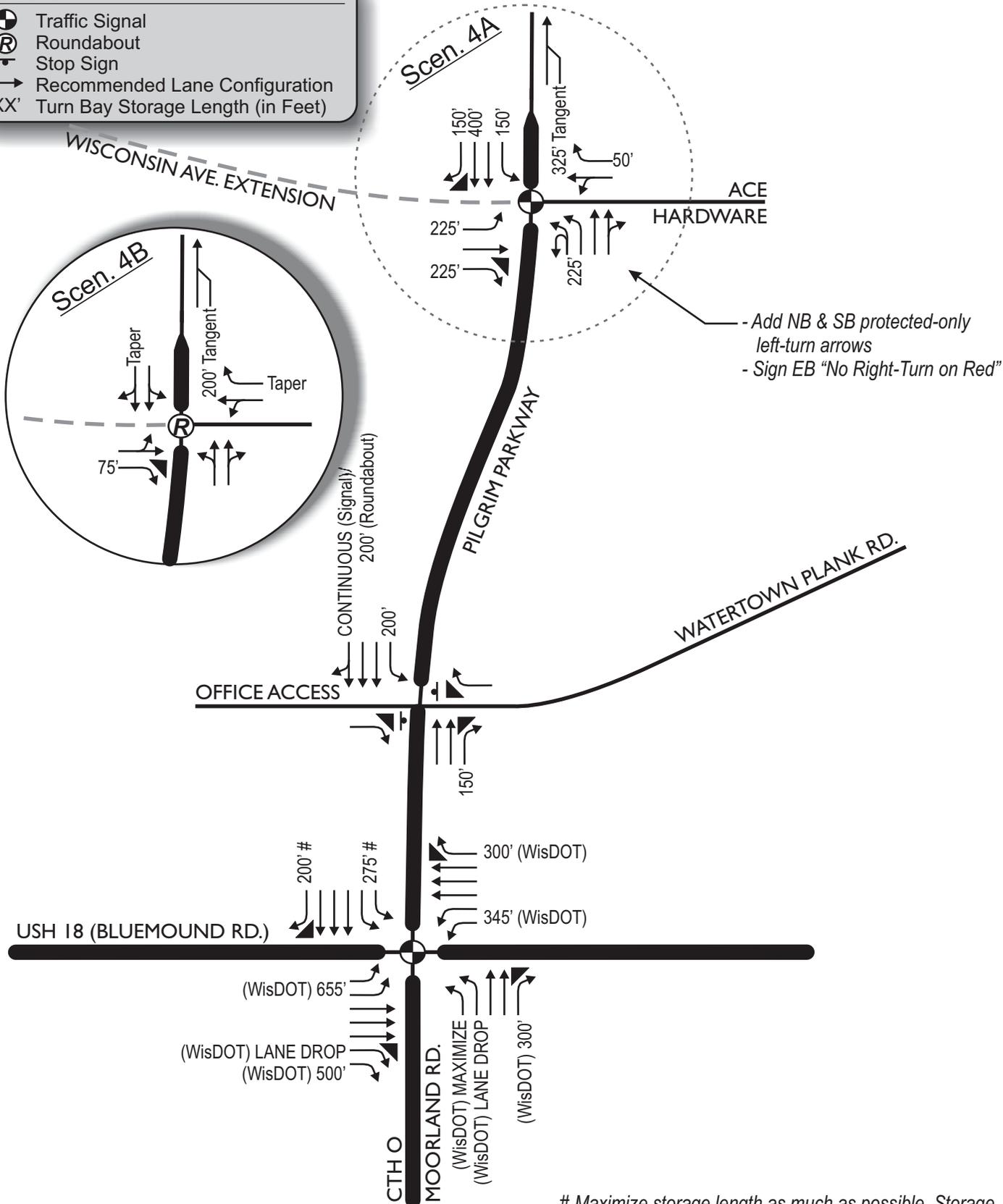


\* Volume exceeds capacity, the queue is theoretically infinite



**LEGEND**

- ⊕ Traffic Signal
- ⊙ Roundabout
- ⊥ Stop Sign
- Recommended Lane Configuration
- XX' Turn Bay Storage Length (in Feet)



# Maximize storage length as much as possible. Storage may be prohibitive due to overall roadway design.

**Year 2011 Scenario 4A Peak Hour Operating Conditions**  
**With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	E	D	D	E	D	D
		PM	F	D	B	E	D	C	F	E	C	E	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Two-Way Stop Sign	AM	-	-	B	-	-	B	-	*	*	B	*	*
		PM	-	-	B	-	-	C	-	*	*	C	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	C	B	B	B	B	B	B	B	B	C	C	B
		PM	D	C	C	C	C	C	C	B	B	C	B	B

Notes: (-) indicates a movement that is not possible or is prohibited.  
 (\*) indicates a movement that is not controlled or is free-flow.

**Year 2011 Scenario 4B Peak Hour Operating Conditions**  
**With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	E	D	D	E	E	D
		PM	F	D	B	E	D	C	F	E	C	E	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Two-Way Stop Sign	AM	-	-	B	-	-	B	-	*	*	B	*	*
		PM	-	-	B	-	-	C	-	*	*	C	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Roundab	AM	A			A			A			A		
		PM	A			A			A			A		

Notes: (-) indicates a movement that is not possible or is prohibited.  
 (\*) indicates a movement that is not controlled or is free-flow.

**Year 2031 Scenario 4A Peak Hour Operating Conditions**  
**With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	F	E	D	E	F	D
		PM	F	D	B	E	D	C	F	F	D	F	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Two-Way Stop Sign	AM	-	-	A	-	-	B	-	*	*	B	*	*
		PM	-	-	B	-	-	C	-	*	*	C	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	D	B	C	B	B	B	C	B	B	C	C	B
		PM	D	B	D	C	C	B	C	B	B	C	C	B

Notes: (-) indicates a movement that is not possible or is prohibited.  
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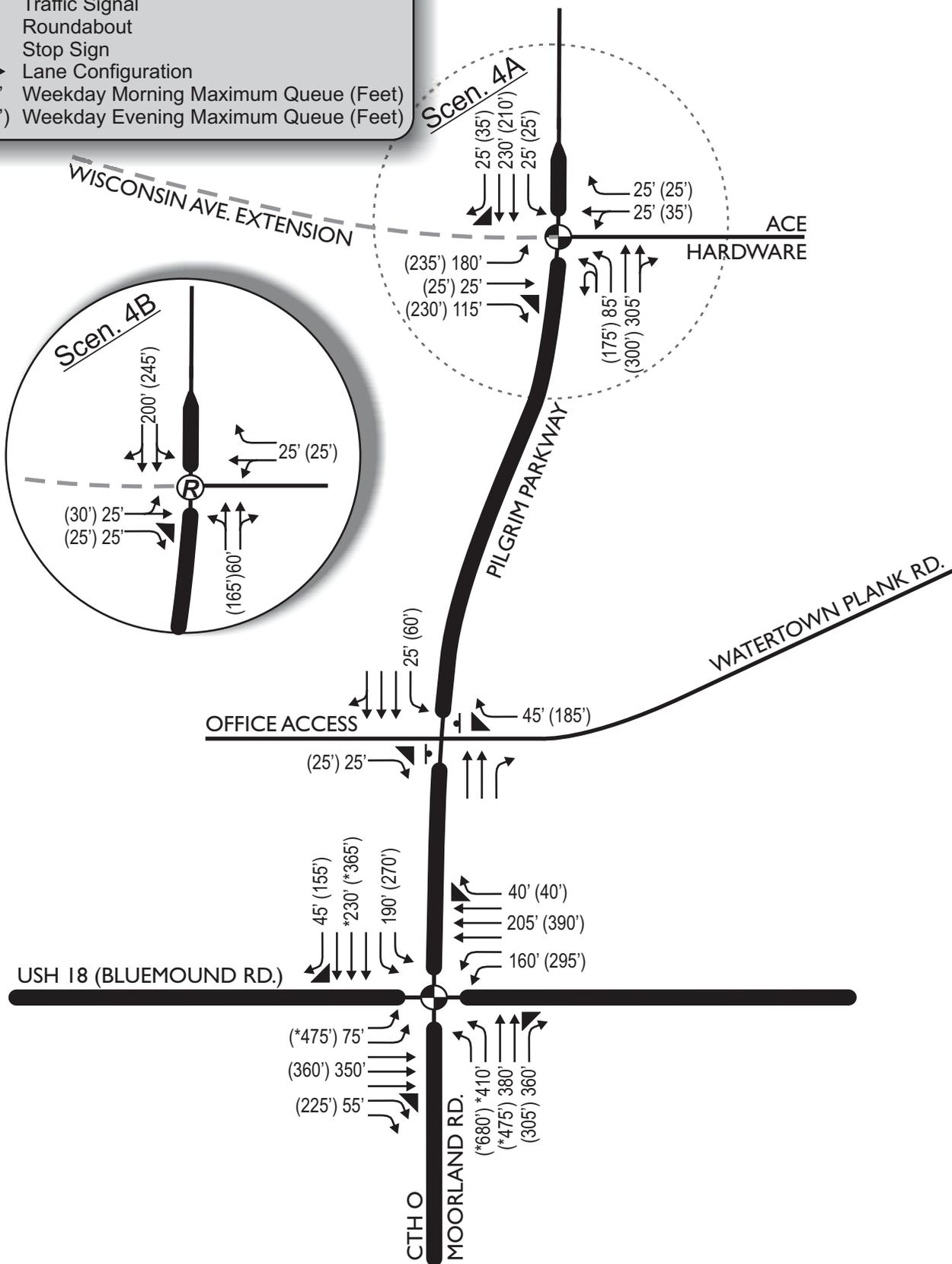
**Year 2031 Scenario 4B Peak Hour Operating Conditions**  
**With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	F	E	D	E	F	D
		PM	F	D	B	E	D	C	F	F	D	F	F	D
Pilgrim Parkway & Watertown Plank Road/Office Access	Two-Way Stop Sign	AM	-	-	B	-	-	B	-	*	*	B	*	*
		PM	-	-	B	-	-	C	-	*	*	C	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Roundab	AM	A			A			A			A		
		PM	A			B			A			B		

Notes: (-) indicates a movement that is not possible or is prohibited.  
 (\*) indicates a movement that is not controlled or is free-flow.

**LEGEND**

-  Traffic Signal
-  Roundabout
-  Stop Sign
-  Lane Configuration
- XX' Weekday Morning Maximum Queue (Feet)
- (XX') Weekday Evening Maximum Queue (Feet)

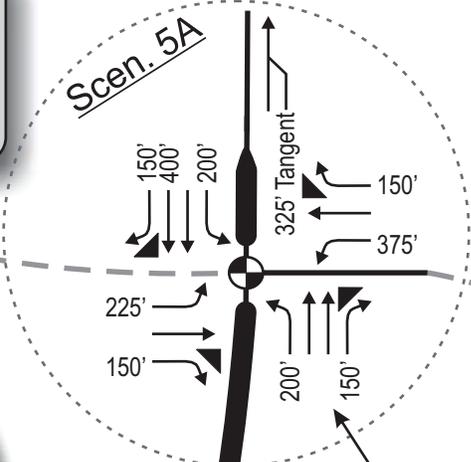
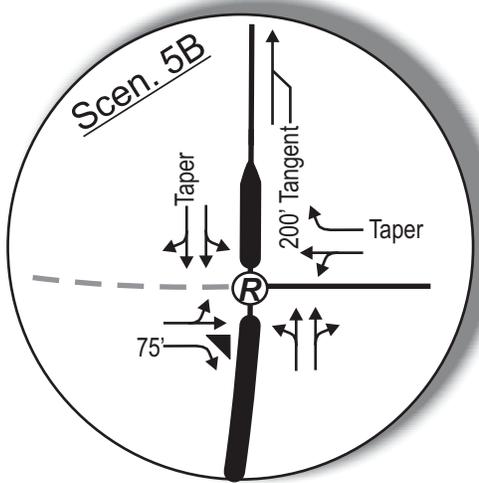
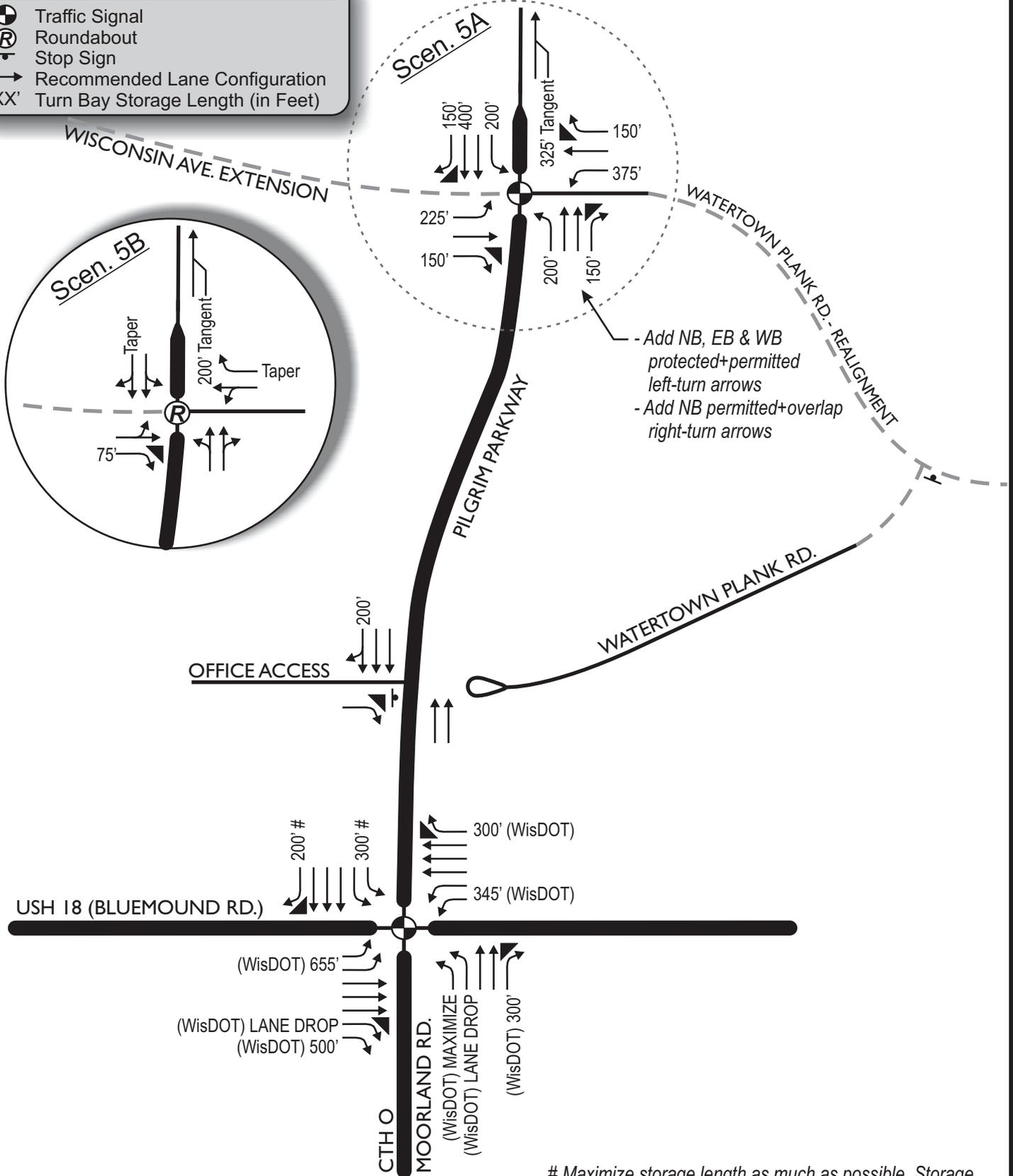


\* Volume exceeds capacity, the queue is theoretically infinite



**LEGEND**

- ⊙ Traffic Signal
- ⊙ Roundabout
- ⊙ Stop Sign
- Recommended Lane Configuration
- XX' Turn Bay Storage Length (in Feet)



- Add NB, EB & WB protected+permitted left-turn arrows  
 - Add NB permitted+overlap right-turn arrows

# Maximize storage length as much as possible. Storage may be prohibitive due to overall roadway design.

**Year 2011 Scenario 5A Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	E	D	D	E	E	D
		PM	F	D	B	E	D	C	F	E	C	E	F	D
Pilgrim Parkway & Office Access	Two-Way Stop Sign	AM	-	-	A	-	-	-	-	*	*	-	*	*
		PM	-	-	A	-	-	-	-	*	*	-	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	D	D	D	D	D	D	A	A	A	B	B	B
		PM	D	E	D	D	D	D	A	A	A	C	C	C

Notes: (-) indicates a movement that is not possible or is prohibited.  
(\* ) indicates a movement that is not controlled or is free-flow.

**Year 2011 Scenario 5B Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	E	D	D	E	E	D
		PM	F	D	B	E	D	C	F	E	C	E	F	D
Pilgrim Parkway & Office Access	Two-Way Stop Sign	AM	-	-	B	-	-	-	-	*	*	-	*	*
		PM	-	-	B	-	-	-	-	*	*	-	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	A			A			A			A		
		PM	A			A			A			A		

Notes: (-) indicates a movement that is not possible or is prohibited.  
(\* ) indicates a movement that is not controlled or is free-flow.

**Year 2031 Scenario 5A Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	F	E	D	E	F	D
		PM	F	D	B	E	D	C	F	F	D	F	F	D
Pilgrim Parkway & Office Access	Two-Way Stop Sign	AM	-	-	A	-	-	-	-	*	*	-	*	*
		PM	-	-	A	-	-	-	-	*	*	-	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	D	D	D	D	D	D	A	A	A	B	B	B
		PM	D	E	D	D	D	D	A	A	A	C	C	C

Notes: (-) indicates a movement that is not possible or is prohibited.  
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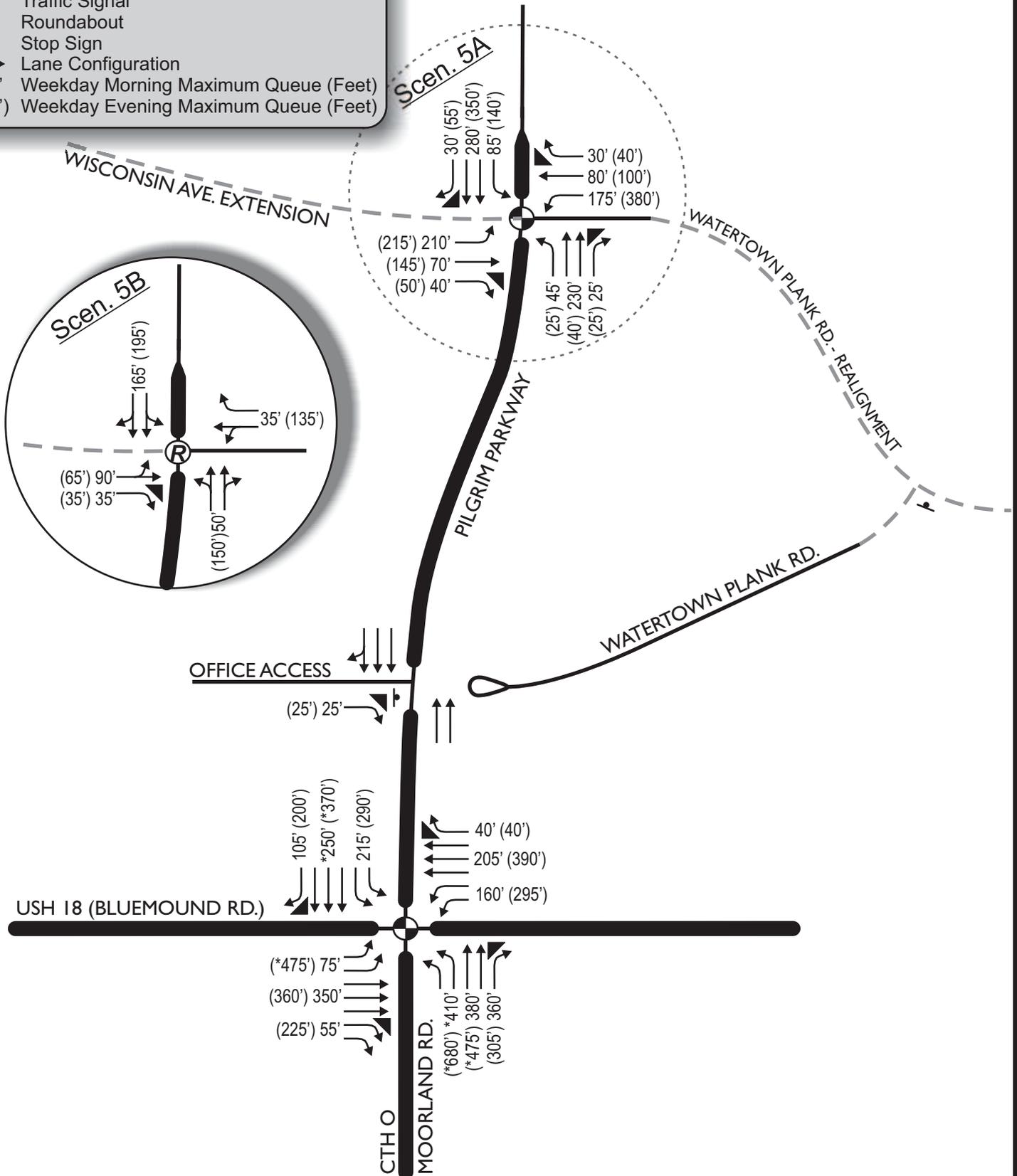
**Year 2031 Scenario 5B Peak Hour Operating Conditions  
With Recommended Geometrics and Traffic Control**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Pilgrim Parkway/Moorland Road & Bluemound Road	Traffic Signal	AM	D	C	A	E	C	C	F	E	D	F	F	D
		PM	F	D	B	E	D	C	F	F	D	F	F	D
Pilgrim Parkway & Office Access	Two-Way Stop Sign	AM	-	-	B	-	-	-	-	*	*	-	*	*
		PM	-	-	B	-	-	-	-	*	*	-	*	*
Pilgrim Parkway & Wisconsin Avenue Extension/ Ace Hardware	Traffic Signal	AM	A			A			A			A		
		PM	A			A			A			A		

Notes: (-) indicates a movement that is not possible or is prohibited.  
(\* ) indicates a movement that is not controlled or is free-flow.

**LEGEND**

-  Traffic Signal
-  Roundabout
-  Stop Sign
-  Lane Configuration
- XX' Weekday Morning Maximum Queue (Feet)
- (XX') Weekday Evening Maximum Queue (Feet)



\* Volume exceeds capacity, the queue is theoretically infinite



Pilgrim Parkway  
 Intersections with Wisconsin Avenue & Watertown Plank Road  
 City of Brookfield/Village of Elm Grove, WI

**INTERSECTION CONTROL EVALUATION SUMMARY**

Factor	SCENARIO 4A - Traffic Signal	SCENARIO 4B - Multi-Lane Roundabout	SCENARIO 5A - Traffic Signal	SCENARIO 5B - Multi-Lane Roundabout
SAFETY	<ul style="list-style-type: none"> <li>32+ vehicle-vehicle conflict points, 16 +/- vehicle-pedestrian conflict points</li> <li>Potentially fewer crashes, but higher exposure to injury-related crashes</li> <li>High-volume U-Turn will require EB "No Right-Turn-On-Red" restriction for safe operation</li> </ul>	<ul style="list-style-type: none"> <li>8 vehicle-vehicle conflict points, 8 +/- vehicle-pedestrian conflict points</li> <li>Crashes are typically of low severity with property-damage only</li> <li>Snow-covered markings greater risk to motorists.</li> <li>High-volume U-turn, but no restrictions</li> </ul>	<ul style="list-style-type: none"> <li>32+ vehicle-vehicle conflict points, 16 +/- vehicle-pedestrian conflict points</li> <li>Potentially fewer crashes, but higher exposure to injury-related crashes</li> </ul>	<ul style="list-style-type: none"> <li>8 vehicle-vehicle conflict points, 8 +/- vehicle-pedestrian conflict points</li> <li>Crashes are typically of low severity with property-damage only</li> <li>Snow-covered markings greater risk to motorists.</li> </ul>
OPERATIONAL ANALYSIS	<ul style="list-style-type: none"> <li>LOS D or better for all movements</li> <li>Queues: 305' NB, 230' SB, 235' EB, 35' WB</li> <li>Signal provides positive metering effects on SB queues at Bluemound Road.</li> <li>NB U-Turn not expected to accommodate single-unit or WB trucks; trucks can use Wisconsin to Main to arrive at Bluemound.</li> </ul>	<ul style="list-style-type: none"> <li>LOS B or better for all movements</li> <li>Queues: 165' NB, 245' SB, 30' EB, 25' WB</li> <li>Queue loops may be considered to ensure spillback into roundabout does not occur, but not likely to be accepted by WisDOT.</li> <li>NB U-Turn design can accommodate up to WB-67 trucks</li> </ul>	<ul style="list-style-type: none"> <li>LOS D or better for all movements, except EB Thru at LOS E in PM Peak</li> <li>Signal provides positive metering effects on SB queues at Bluemound Road.</li> <li>Queues: 230' NB, 350' SB, 215' EB, 380' WB</li> </ul>	<ul style="list-style-type: none"> <li>LOS A or better for all movements</li> <li>Queue loops may be considered to ensure spillback into roundabout does not occur, but not likely to be accepted by WisDOT.</li> <li>Queues: 150' NB, 195' SB, 65' EB, 135' WB</li> </ul>
RIGHT-OF-WAY IMPACTS <i>(See also Exhibits 12b)</i>	<ul style="list-style-type: none"> <li>Pilgrim Pkwy expected to fit within ROW if west-side trail moved west; else greater impact to east side landscape buffers</li> <li>Fewer impacts to Ace parking lot &amp; bank.</li> </ul>	<ul style="list-style-type: none"> <li>Larger intersection ROW due to diameter</li> <li>More impacts to Ace parking lot</li> <li>Greater wetland impact in NW corner</li> </ul>	<ul style="list-style-type: none"> <li>Pilgrim Pkwy expected to fit within ROW if west-side trail moved west; else greater impact to east side landscape buffers</li> <li>Longer WB approach queues may impact Ace access</li> <li>Property &amp; buildings required for Watertown Plank realignment.</li> </ul>	<ul style="list-style-type: none"> <li>Larger intersection ROW due to diameter</li> <li>Potentially better Ace access than Scenario 5A.</li> <li>Greater wetland impact in NW corner</li> <li>Property &amp; buildings required for Watertown Plank realignment.</li> </ul>
ACCESS <i>(See also Exhibits 12b)</i>	<ul style="list-style-type: none"> <li>Three-quarter access to existing Watertown Plank, half access to opposite office access</li> <li>Half access to office north of Ace.</li> </ul>	<ul style="list-style-type: none"> <li>Three-quarter access to existing Watertown Plank, half access to opposite office access</li> <li>Half access to office north of Ace.</li> </ul>	<ul style="list-style-type: none"> <li>No access to existing Watertown Plank, half access to opposite office access; partial access to existing Watertown Plank could be considered.</li> <li>Half access to office north of Ace.</li> </ul>	<ul style="list-style-type: none"> <li>No access to existing Watertown Plank, half access to opposite office access; partial access to existing Watertown Plank could be considered.</li> <li>Half access to office north of Ace.</li> </ul>
PEDESTRIANS/BICYCLES	<ul style="list-style-type: none"> <li>On-street bicycle accommodations may be accommodated through intersection.</li> <li>Easier use by visually impaired, but longer crossing distance</li> <li>Half-cycle of signals will require signal to exit coordination for pedestrian crossings.</li> </ul>	<ul style="list-style-type: none"> <li>On-street bicycle accommodations may require "ramps" to sidewalk area, which may pose ped-bike conflicts/injuries.</li> <li>Visually impaired may have difficulty, which could necessitate future installation of Pedestrian Hybrid Beacons</li> </ul>	<ul style="list-style-type: none"> <li>On-street bicycle accommodations may be accommodated through signal.</li> <li>Easier use by visually impaired, but longer crossing distance</li> </ul>	<ul style="list-style-type: none"> <li>On-street bicycle accommodations may require "ramps" to sidewalk area, which may pose ped-bike conflicts/injuries.</li> <li>Visually impaired may have difficulty, which could necessitate future installation of Pedestrian Hybrid Beacons</li> </ul>
OPERATION/ MAINTENANCE COSTS	<ul style="list-style-type: none"> <li>Lower landscape and marking costs, but potentially higher cost for controller and signal upkeep</li> </ul>	<ul style="list-style-type: none"> <li>Higher landscape and marking costs, and higher cost for illumination of approaches, island. Controller/beacon costs possible for pedestrian hybrid beacons if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Lower landscape and marking costs, but potentially higher cost for controller and signal upkeep</li> </ul>	<ul style="list-style-type: none"> <li>Higher landscape and marking costs, and higher cost for illumination of approaches, island. Controller/beacon costs possible for pedestrian hybrid beacons if necessary.</li> </ul>
CONSTRUCTION COST	<ul style="list-style-type: none"> <li>Approximately \$1,700,000 to \$2,200,000</li> </ul>	<ul style="list-style-type: none"> <li>Approximately \$2,000,000 to \$2,500,000</li> </ul>	<ul style="list-style-type: none"> <li>Approximately \$2,500,000 to \$3,000,000</li> </ul>	<ul style="list-style-type: none"> <li>Approximately \$2,200,000 to \$2,700,000</li> </ul>
PRACTICAL FEASIBILITY	<ul style="list-style-type: none"> <li>Signals are generally accepted</li> <li>Three-quarter access to Watertown Plank likely to be more desirable than constructing new Watertown Plank alignment.</li> </ul>	<ul style="list-style-type: none"> <li>Roundabouts may face initial resistance, but are typically accepted if well designed after a few months to a few years.</li> <li>Three-quarter access to Watertown Plank likely to be more desirable than constructing new Watertown Plank alignment</li> </ul>	<ul style="list-style-type: none"> <li>Signals are generally accepted</li> <li>New Watertown Plank alignment not expected to be well received due to more property acquisitions/relocations and access changes.</li> </ul>	<ul style="list-style-type: none"> <li>Roundabouts may face initial resistance, but are typically accepted if well designed after a few months to a few years.</li> <li>New Watertown Plank alignment not expected to be well received due to more property acquisitions/relocations and access changes.</li> </ul>

Pilgrim Parkway  
 Intersections with Wisconsin Avenue & Watertown Plank Road  
 City of Brookfield/Village of Elm Grove, WI

**SUMMARY OF PROPERTY & ACCESS IMPACTS**

PARCEL	SCENARIO 4A - Traffic Signal	SCENARIO 4B - Multi-Lane Roundabout	SCENARIO 5A - Traffic Signal	SCENARIO 5B - Multi-Lane Roundabout
North Shore Bank 15700 Bluemound Road BRC 1116-984-006	<ul style="list-style-type: none"> <li>Access to EB Watertown Plank Road via existing driveway location or relocated driveway location, or via Wisconsin Avenue extension only.</li> <li>Access to EB Bluemound Road via Wisconsin Avenue extension only.</li> <li>Significant acquisition anticipated</li> </ul>			
North Shore Bank No Address BRC 1113-996-002	<ul style="list-style-type: none"> <li>Acquisition of 1.66 Ac (entire parcel)</li> </ul>			
Walgreen of New Berlin 15350 Bluemound Road EGV1111-982	<ul style="list-style-type: none"> <li>WB Watertown Plank Road must make a right on Pilgrim Parkway and make a U-turn at Wisconsin Avenue to go SB on Pilgrim Parkway when leaving parcel.</li> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>WB Watertown Plank Road traffic must use relocated Watertown Plank Road to go SB on Pilgrim Parkway when leaving parcel.</li> <li>No acquisitions anticipated.</li> </ul>	
PK Leasing (Elmbrook Mobil) 15340 Bluemound Road EGV 1111-983	<ul style="list-style-type: none"> <li>WB Watertown Plank Road must make a right on Pilgrim Parkway and make a U-turn at Wisconsin Avenue to go SB on Pilgrim Parkway when leaving parcel.</li> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>WB Watertown Plank Road must exit parking lot onto relocated Watertown Plank Road to go SB on Pilgrim Parkway when leaving parcel.</li> <li>No acquisitions anticipated.</li> </ul>	
Stewart & Mary Elliott Revocable Trust 15360 Watertown Plank Road EGV 1111-013	<ul style="list-style-type: none"> <li>WB Watertown Plank Road must make a right on Pilgrim Parkway and make a U-turn at Wisconsin Avenue to go SB on Pilgrim Parkway when leaving parcel.</li> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>WB Watertown Plank Road must exit parking lot onto relocated Watertown Plank Road to go SB on Pilgrim Parkway when leaving parcel.</li> <li>No acquisitions anticipated.</li> </ul>	
Stewart & Mary Elliott Revocable Trust 15360 Watertown Plank Road EGV 1111-014	<ul style="list-style-type: none"> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>Minor acquisition anticipated</li> </ul>	
Stewart & Mary Elliott Revocable Trust 15360 Watertown Plank Road EGV 1111-016	<ul style="list-style-type: none"> <li>Minor acquisition anticipated</li> </ul>		<ul style="list-style-type: none"> <li>Significant acquisition anticipated</li> </ul>	
Williamstowne Properties EGV 1110-119-025	<ul style="list-style-type: none"> <li>Grading easements along Pilgrim Parkway.</li> <li>NB Right-in/Right-out only.</li> </ul>			
Pheasant Run Condos EGV 1110-119-026/033	<ul style="list-style-type: none"> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>Relocation Anticipated</li> </ul>	
Edward & Ann Chin EGV 1110-118-004	<ul style="list-style-type: none"> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>Relocation Anticipated</li> </ul>	
EZ Mortgage Lending Inc EGV 1110-118-004	<ul style="list-style-type: none"> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>Minor grading acquisitions anticipated.</li> </ul>	
Kellye Knueppel EGV 1111-005	<ul style="list-style-type: none"> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>Minor grading acquisitions anticipated.</li> </ul>	
William & Juleann Erbach EGV 1111-008	<ul style="list-style-type: none"> <li>No acquisitions anticipated.</li> </ul>		<ul style="list-style-type: none"> <li>Minor grading acquisitions anticipated.</li> </ul>	
Summary of Real Estate Acquisition Costs	<ul style="list-style-type: none"> <li>\$725,000 - \$1,030,000</li> </ul>	<ul style="list-style-type: none"> <li>\$1,025,000 - \$1,530,000</li> </ul>	<ul style="list-style-type: none"> <li>\$1,525,000 - \$2,530,000</li> </ul>	<ul style="list-style-type: none"> <li>\$1,525,000 - \$2,530,000</li> </ul>

