Middleton Downtown Circulation Study

January 2008

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ACKNOWLEDGEMENTS

The SRF Consulting Group would like to thank the following groups and individuals for their valuable insight, review and guidance throughout the duration of the project:

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And especially, we thank the numerous downtown Middleton residents and businesses that provided timely comment and information as the Downtown Circulation Study was being completed.

PROJECT SUMMARY

The City of Middleton retained SRF Consulting Group (SRF) in August 2007 to complete a Downtown Circulation Study. The objective of the study was to identify refinements to the existing system that would enhance vehicle flow, transit service, pedestrian movement, parking utilization, and street aesthetics in the downtown area.

Recommendations were made to address the aforementioned issues and are presented in Sections 2 through 6 of this report. The study recommendations are summarized below:

Parking Needs

Hourly counts were collected for on-street and off-street parking areas located within the study area. The counts were conducted on two days from 7:00 a.m. to 7:00 p.m. The downtown currently experiences parking lot capacity issues in the Hubbard Avenue area during the lunchtime period. However, these conditions are not severe, and do not indicate a need to expand parking with a ramp. The following recommendations are made regarding downtown parking:

- Encourage employees of downtown (or nearby) businesses to utilize the municipal lot on Terrace Avenue, which is currently under-utilized. The city should continue to encourage its employees to park at that location.

- Continue enforcing limited-term parking in the downtown area. Parking stall delineations and installation of parking meters are not recommended; however, the city should be diligent in enforcing limited-term parking in the downtown area to encourage timely turnover of the available spaces in the area.

- Implement pedestrian enhancements to improve access to a new 45-space municipal lot being constructed on the north side of University Avenue near Parmenter Street. The implementation of the pedestrian enhancements and signal timing recommendations found in this report will further facilitate the safe use of this lot by downtown business patrons and employees.

- Promote development of a Park-and-Ride station in conjunction with redevelopment of the parcels west of USH 12, between USH 14 and the rail corridor. This lot would help to meet the future parking needs of the region with the implementation of a commuter rail system. This location would also serve to relieve parking conditions in the area, particularly during downtown events and festivals in the summer.

Transit Circulation

The city recently revised its Metro Transit routing and service plans. It is recommended these changes be monitored for effectiveness, but year-to-year comparisons on the downtown routes continue to show improved performance. The following recommendations are made regarding downtown transit service:

- Establish a Middleton transit service oversight committee, including system users, to review route service and performance on a quarterly basis. Transit issues such as safety, parking, lighting, snow removal and plans for future services to meet city needs should be addressed by this group.

- Continue to discuss downtown rail station locations with Transport 2020 planners. Two locations in downtown Middleton are currently being considered for a commuter rail station. A location near the USH 12 / USH 14 interchange could be phased to include a surface parking area as an initial investment, and as rail plans begin to materialize, structured parking, a station facility, and ancillary supportive land development would follow.

- Consider adding passenger amenities at bus stop locations when individual stations approach one-half the ridership levels indicated by Metro system-wide targets. Under current daily ridership volumes in the downtown area, Middleton conforms to Metro Transit's guidelines for placing stops, shelters, and benches; therefore, additions are not recommended at this time. However, based on Middleton ridership patterns, the city should begin discussing additions with Metro when the daily ridership reaches approximately one-half system-wide targets.

Bicycle and Pedestrian Circulation

The downtown area generally offers a pedestrian-friendly environment with walkable block lengths and continuous sidewalks. Intersection and mid-block pedestrian crossings are well defined. However, with growing traffic volumes, there is also an increasing sense of risk for pedestrians and bicyclists, especially at intersections. The following recommendations are made regarding bicycle and pedestrian circulation:

- Improve all downtown crossings by installing crossing signs and markings in compliance with the *Manual of Uniform Traffic Control Devices* (MUTCD), the Americans with Disabilities Act (ADA), and Middleton Public Works Department guidelines.

- Install a traffic signal at University Avenue and Bristol Street to facilitate safer crossings for pedestrians to access the Middleton High School, the athletic fields, and the community swimming pool.

- Improve the Parmenter Street and University Avenue traffic signal to improve the pedestrian safety conditions at this location. As the city adds a municipal parking lot on the north side of University Avenue, improved signal plans including adequate walk-times, pedestrian "call" buttons, and pedestrian countdown timers will facilitate a safer pedestrian environment at this busy intersection.

Streetscape Enhancements

Middleton's Comprehensive Plan (November 2006) recommends completing streetscape enhancements including installation of gateway features at the entryways to the city, landscaping, street furniture and bike racks, and implementing a new wayfinding and signage system along major corridors and destinations. In developing downtown Middleton streetscape recommendations, existing streetscape elements and building materials, the City wayfinding sign program and other City planning documents were reviewed. A hierarchy of streetscape treatment is based upon existing land use is recommended:

- Add the highest level of treatment to commercial street segments, including Cayuga Street, Aurora Street, and sections of Hubbard Avenue, University Avenue and Parmenter Street.

- Add a moderate level of treatment to mixed-use streets, including segments of University Avenue, Elmwood Avenue, Hubbard Avenue, Terrace Avenue, and Parmenter Street.

- Add the least amount of treatment to residential streets typically found at the study area fringe. These residential streets include segments of University Avenue, Elmwood Avenue, Hubbard Avenue, Aurora Street and Parmenter Street.

Traffic Analysis

The operation of seven downtown intersections were examined in detail based on traffic data and geometrics collected in October 2007. The following recommendations, particularly the signal phasing changes at University Avenue and Parmenter Street, are acknowledged to be short-term solutions to improve traffic flow without acquiring additional right-of-way. The traffic operations recommendations are listed below:

- Improve the traffic signals at the intersection of University Avenue with Parmenter Street to include a protective-permissive phase on the University Avenue approaches. Intersection and corridor analysis indicates that this improvement, coupled with signal coordination at Cayuga Street, will reduce peak hour delays and queues along University Avenue. Based on computer modeling, it is estimated that the signal phasing changes will provide satisfactory traffic operations at this location for approximately four to six years from present-day conditions. After this timeframe, more significant improvements, such as exclusive turning lanes, will be needed to provide adequate traffic flow.

- Install a traffic signal at the intersection of University Avenue with Bristol Street. A signal warrant analysis of the intersection indicates that two of eight warrants required to merit consideration were achieved. When coordinated with the Parmenter Street traffic signal, traffic flow along University Avenue will continue at a similar level of service. A signal at this location will provided additional gaps in heavy peak-hour traffic for all University Avenue cross streets in the study area.

- Improve physical characteristics at the intersection of Elmwood Avenue with Bristol Street to increase safety. Additional traffic is expected on Bristol Street with the addition of a traffic signal at University Avenue. While the expected volumes are not anticipated to warrant an all-way stop control of this intersection, other measures such as prohibiting on-street parking in close proximity of the intersection should be implemented to increase safety at this location.

1. INTRODUCTION

The City of Middleton retained SRF Consulting Group (SRF) in August 2007 to complete a Downtown Circulation Study. Generally, the objective of the study was to identify refinements to the existing system that would enhance vehicle flow, transit service, pedestrian movement, parking utilization, and street aesthetics in the downtown area.

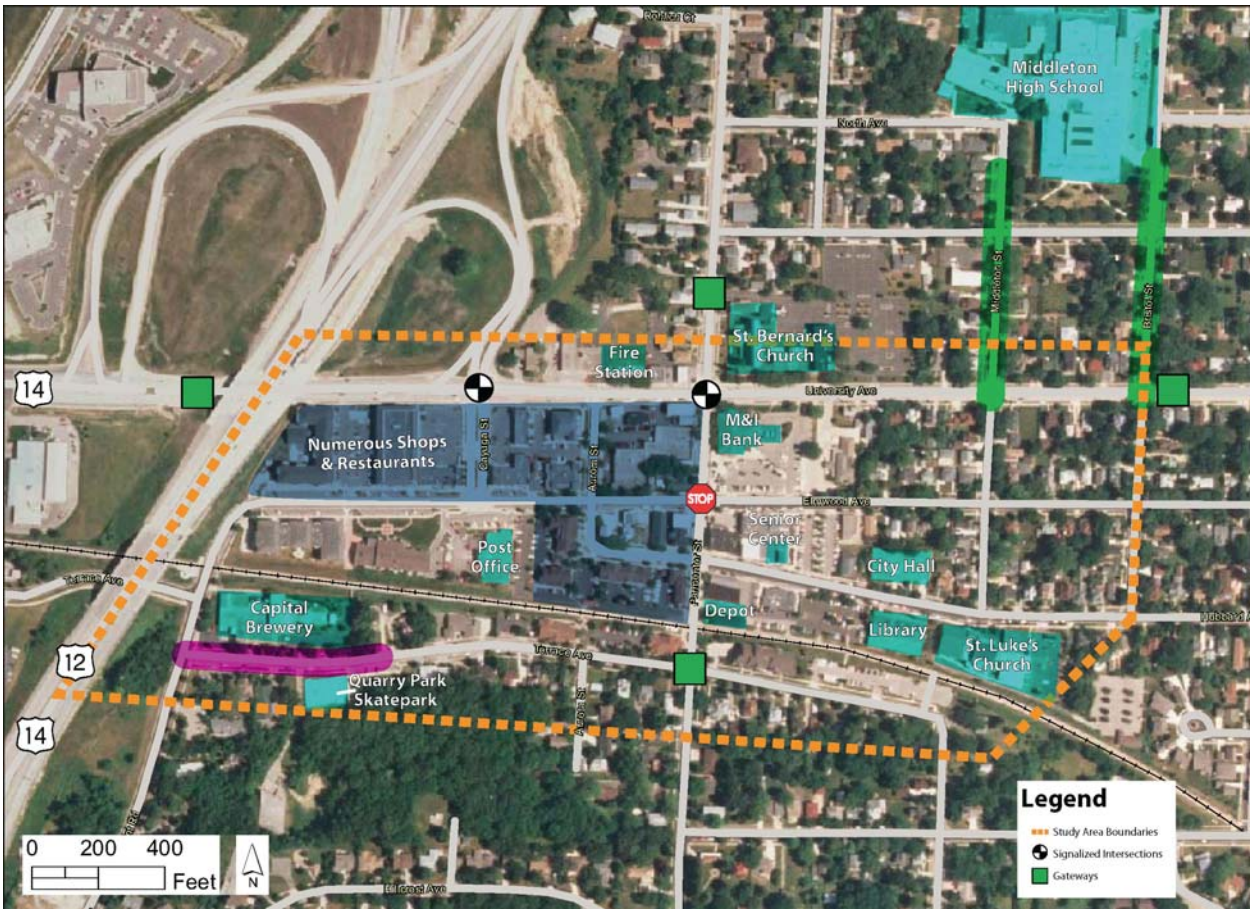
1.1 Background

A wide variety of land uses can be found within the downtown study area (Figure 1.1). The area is home to the Middleton City Hall; library, post office, St. Luke and St. Bernard's churches, the Middleton Senior Center, Quarry Skate Park, numerous service and specialty retail businesses, the Capital Brewery and Bier Garten (frequent hosts of summer and fall outdoor events), and a variety of restaurants. In addition, a wide range of housing options exist in the area as well, including condominiums, apartments, townhomes, and single-family residences. These land uses combine to make the downtown a vibrant area of activity during the day and night. This mixture generates numerous weekday and weekend vehicle trips and pedestrian movements morning, noon, and night.

The downtown roadway system is essentially configured in a grid-like pattern. University Avenue is a four-lane undivided principle arterial connecting the city to the USH 12/14 corridor (West Beltline). University Avenue also separates the downtown from other major activity centers to the north such as Kromrey Middle School, the Walter Bauman Aquatic Center, and the Middleton High School and athletic fields. Parmenter Street is a significant north-south collector roadway in the downtown area that is seeing increasing traffic volumes as a result of the reconfiguration of the West Beltline as it now bypasses the city on its west side. The third functionally classified roadway in the study area is Elmwood Avenue, an urban collector street that connects the commercial land uses on its western end to residential uses on its eastern side. The remaining study area streets provide local access to numerous homes and business establishments.

In 2006, the city completed a citywide Transportation Network Plan, which identified and prioritized the transportation network needs anticipated to develop within the next 15 to 20 years. This plan had, as one focal point, the University Avenue corridor. As part of that work, analysis of existing conditions, consideration of planned land development within and surrounding Middleton, and traffic demand and operations modeling were completed. The Downtown Circulation Study is intended to build upon that plan's relevant findings and recommendations.

Figure 1.1: Downtown Study Area



1.2 Key Study Area Issues

The following issues were identified in the preliminary stages of the study by SRF.

- The downtown Middleton land use mix and variety of travel modes tends to produce modal conflicts. Numerous access points exist on the major roadways in the downtown area, further contributing to these conflicts.

- There is limited right-of-way available to separate conflicts or modes. This restricts the City's ability to add dedicated left-turn lanes along major downtown routes.

- The Wisconsin and Southern Railroad operates up to four trains per day (two during daylight hours) on low speed tracks located on the south side of the study area. These operations affect the traffic flow and intersection operations in the study area.

- Parking downtown is seen as a scarce resource by area businesses, and the loss of surface lot parking space or on-street parking space is cause for concern. The desire to maximize

downtown on-street parking also contributes to some problematic sight lines at downtown intersections.

- Increasing traffic volumes on University Avenue make it a difficult roadway to cross in peak travel periods. Safety concerns are increasing at downtown intersection locations where pedestrians frequently cross. One such location is the intersection of Parmenter Street and Elmwood Avenue, where the City has recently converted the traffic control from two-way stops on Elmwood Avenue to an all-way stop intersection.

The study process included a number of opportunities to update and receive input from City staff and neighborhood businesspersons and residents. A project kick-off meeting, including a presentation to the public, was held on September 3, 2007. A progress meeting before the City Plan Commission to present preliminary findings, also open to the public, was held on October 23, 2007. In addition, three meetings were held with a City staff review group to discuss the project's progress, and receive City staff input and guidance. The final report will be presented to the City Plan Commission on November 27, 2007.

The remaining sections of this report address the following downtown transportation system elements:

- Parking Needs
- Transit Circulation
- Bicycle and Pedestrian Circulation
- Streetscape Enhancements
- Traffic Analysis

2. PARKING NEEDS

Downtown Middleton has a vibrant mix of residential, commercial, and civic land uses that attract many users to the area. Parking for these users is provided via off-street public and private parking lots as well as numerous on-street parking locations. However, during certain times of the day, motorists do not have the opportunity to park in close proximity to their destination due to high parking demand. Therefore, a parking assessment was performed to examine existing parking conditions in the downtown area and make recommendations, if necessary, to provide more efficient parking for downtown workers, patrons, and visitors.

2.1 Existing Parking Supply and Demand

In cooperation with the City Planning Department and the Middleton Chamber of Commerce, a request for parking information was made to businesses within the study area. They were asked to describe their peak day(s) and time(s) for parking demand, and estimate the amount of parking needed by their business/organization during those times. Fourteen businesses/organizations responded to the request, and the results are included in Appendix A.

A field review of the study area was conducted to ascertain existing on-street and off-street parking supply. The number of parking spaces provided was documented and used to analyze existing parking conditions. The locations of on-street and off-street parking areas that were analyzed in this study are illustrated in Figure 2.1.

To determine the existing peak parking demand in the study area, parking occupancy counts were conducted. Hourly parking counts were performed on Tuesday, October 30, 2007, and Thursday, November 8, 2007, from 7:00 a.m. to 7:00 p.m. Weather conditions at the times of these counts were favorable for motorists to park without having to deal with adverse weather after they exited their vehicles. The times of the counts reflect the highest peak parking demand of the retail and office components within the downtown area. The results of these counts were used for analysis of existing parking conditions. The raw data of the parking occupancy counts can be found in Appendix B. The peak hour parking demand of the study area is illustrated in Figure 2.2 for off-street locations and Figure 2.3 for on-street locations. It should be noted that a parking area was deemed ‘full’ or at capacity when more than ninety percent of available spaces were utilized.

The results of the parking occupancy counts indicate that the peak hour for parking demand within the downtown Middleton occurs from 12:00 p.m. to 1:00 p.m. During this time, the on-street parking spaces along Hubbard Avenue, Elmwood Avenue, and Parmenter Street were highly occupied. This condition is likely due to lunchtime patrons dining at several restaurants in the vicinity. This is reinforced by the off-street parking counts, which show that many of the restaurants that do provide parking were near capacity during that time as well. Another area of significant on-street parking is along Middleton Street and Bristol Street, just south of University Avenue. With Middleton High School two blocks away, students park along these streets and walk to and from school.

Parking Figure 2.1

Parking Figure 2.2

Parking Figure 2.3

While several parking locations experienced near or at-capacity parking demands throughout the day, this demand did not last for long periods, in most cases. It should be noted, though, that several locations did experience high parking occupancy percentages for significant periods of time. One such case was the municipal parking lot along Elmwood Avenue, which experienced high parking occupancy from 9:00 a.m. to 3:00 p.m. With City Hall, the senior center, and several shops and restaurants in close proximity of this location, many commuters and visitors rely on this location for parking. When the municipal parking lot is fully occupied, the on-street parking along Elmwood Avenue and Hubbard Avenue become utilized for parking during much of the day, as can be seen from the raw data counts. Another location that experienced high parking occupancy throughout the day was the off-street parking lots along the eastern edge of the Cayuga Court development. With several mixed-use buildings and restaurants onsite, it is likely that visitors and employees utilize these spaces for much of the day.

2.2 Comparative Analysis of Off-Street Parking Requirements

Parcels that become developed, or redeveloped, within the City of Middleton must meet a minimum on-site parking requirement to ensure adequate and accessible parking will be accommodated. These requirements are based upon guidelines cited in the City's *Off-Street Parking Areas Specifications and Standards* (1986). Given changes in parking demand over time, the City's parking standards may require developers to provide too much or too little off-street parking to accommodate users. Therefore, a comparative analysis of the City's parking guidelines versus national standards was conducted. To provide this comparative analysis, parking rates published in the Institute of Transportation Engineers (ITE) *Parking Generation Manual, 3rd Edition* was utilized. Table 2.1 illustrates the City of Middleton parking requirements compared to ITE parking rates for several common land uses.

The results of this comparison show that, for the most part, the City parking requirements are comparable to the ITE peak parking demand rates. The only land use that shows a significant difference in the rates was the library land use, where the ITE rates estimate more parking would be needed than the City requirements. It should be noted that for school and industrial land uses, the parking supply required by the City is based on factors that ITE does not generate rates; therefore, a comparison of rates for these uses was not possible.

2.3 Parking Considerations

During peak periods, several locations within downtown Middleton experience parking shortages; however, these shortages do not last throughout the day. These peak-period shortages are typical of downtown areas in which the size and density of parcels are not conducive to providing vast supplies of parking for motorists to utilize. However, several concepts on how to increase the efficiency of existing parking supplies and/or amount of parking spaces were considered and are described in greater detail below.

Table 2.1: Off-Street Parking Demand — Comparative Analysis

Land Use	City of Middleton Requirements*	ITE Demand Rates #
Residential	1 space for efficiency/studio unit; 1.5 spaces for 1-bedroom unit; 2 spaces for greater than 2-bedroom unit	1.46 spaces per townhouse 1.20 spaces per apartment 1.83 spaces per single-family detached home
Retail	1 space per 300 square feet of gross floor area	1 space per 331 square feet of gross floor area
Office	1 space per 300 square feet of gross floor area	1 space per 352 square feet of gross floor area
Industrial	1 space per full-time employee during peak work shift plus 1 space for each vehicle stored onsite plus 1 visitor space per 500 square feet of office/sales floor area open to public	1 space per 787 square feet gross floor area 0.89 spaces per employee
Lodging	1 space per lodging room plus one additional space per eight units	0.91 spaces per room
Restaurant	1 space per 3 seats based on capacity OR 1 space per 35 square feet of gross floor area	1 space per 61 square feet of gross floor area
School (elementary/ middle)	1.5 spaces for each classroom plus 1 space per 100 students	1 space per 3.6 students
School (high school)	1 space per 10 students plus 1 space for every 2 classrooms	1 space per 3.8 students
Church	1 space per 5 seats in main sanctuary OR 1 space per 7 square feet of gross area usable for seating	1 space per 6.25 seats 1 space per 128 square feet gross floor area
Library	1 space per 800 square feet of gross floor area	1 space per 383 square feet gross floor area

* – Requirements based on City's *Off-Street Parking Areas Specifications and Standards*

\# – Requirements based on ITE *Parking Generation Manual, 3rd Edition*

1. ***Stripe streets to define on-street parking spaces.*** Currently, streets in the downtown area are not striped to denote parking spaces; rather, they are left unmarked, allowing motorists to park based on their comfort. Providing designated parking spaces (typically 22 to 26 feet in length) would eliminate some parking inefficiencies, such as one vehicle parking in a space that could fit two vehicles. However, based on field observations, vehicles currently park in a fairly efficient manner. Therefore, this option is not expected to yield significantly more space, but may enhance organization of parking and maintain better clearances from intersections. This benefit would likely not offset the anticipated increases in cost and maintenance time.

2. ***Implement Transportation Demand Management (TDM) measures to reduce the traffic, and parking load, in the downtown area.*** To remedy parking demand issues, the traditional reaction is to increase parking supply via additional parking lots or construction of a parking ramp. However, another methodology is to reduce the demand within an area by using techniques known as transportation demand management (TDM). By reducing the traffic, and subsequent parking demand, the existing parking supply will be better able to accommodate peak demands. The following list includes several TDM methods that could be implemented within downtown Middleton:

    - Provide transit service along Parmenter Street and Hubbard Avenue to promote bus ridership for travel along these corridors

    - Encourage use of the municipal parking lot along Terrace Avenue by employees to free up parking spaces within the Elmwood Avenue parking lot

    - Implement shared parking so that one parking lot can accommodate the parking demand of many users (St. Bernard's Church is a good example of shared parking)

    - Provide parking areas outside of the downtown area and shuttle users to their destination (this is favorable to large employers or institutions)

    - Install parking meters to increase parking turnover in high-demand areas (see below for further discussion of this point)

    - Encourage the use of non-vehicular modes of transportation (i.e., bicycle or walking) and provide covered parking areas for bicycle to further encourage their use

    - Promote carpooling to reduce parking (and subsequent traffic) demands to the downtown area

3. ***Provide parking meters in high-demand areas.*** With the exception of the municipal parking lots, much of the on-street parking within downtown Middleton is posted as two-hour parking. This condition allows higher parking turnover, enabling visitors and users of downtown businesses a greater opportunity to find on-street parking. Enforcement of these parking regulations is provided via the City's Code Compliance Manager, who periodically marks tires. However, it is conceivable that occupants of on-street parking areas are business employees or motorists that may not adhere to the two-hour guidelines.

If so, this reduces parking turnover and forces other motorists to search elsewhere for their parking needs. One way to promote higher parking turnover in high-demand areas would be to install parking meters to better enforce the two-hour parking time limit. As mentioned above, parking meters would increase parking turnover by forcing motorists to pay to park in high-demand areas or risk paying fines. The city would need to weigh benefits of this strategy with additional enforcement costs. In addition, this strategy would also require that downtown streets be striped to define spaces. Furthermore, providing parking meters may shift parking demand to the municipal lots (one of which is already at capacity), or to other streets, merely moving the parking issues instead of addressing them.

2.4 Parking Recommendations

The on-street and off-street parking areas within downtown Middleton, for the most part, appear to accommodate parking demands. Therefore, no significant improvements are required to increase the parking supply.

1. ***Adopt TDM measures to increase use of available parking*** – Although approximately 45 parking spaces will be added as a new municipal parking lot between the new fire station and the existing PDQ food store, this location will likely not alleviate specific parking shortages in the identified areas. Therefore, TDM measures should be considered to reduce parking, and subsequent traffic, demands to downtown Middleton. In many cases, TDM measures do not require significant costs in terms of right-of-way or construction of buildings, which further enhance their implementation. A downtown parking map/brochure could serve to effectively promote the available downtown parking areas typically not used to capacity, and additional promotion of downtown Middleton transit services could be effective TDM measures.

2. ***Continue diligent enforcement of limited-term parking*** – While parking stall delineations and installation of parking meters are not recommended at this time, the City should be diligent in enforcing the current limited-term parking in the downtown area to encourage timely turnover of available spaces in the area.

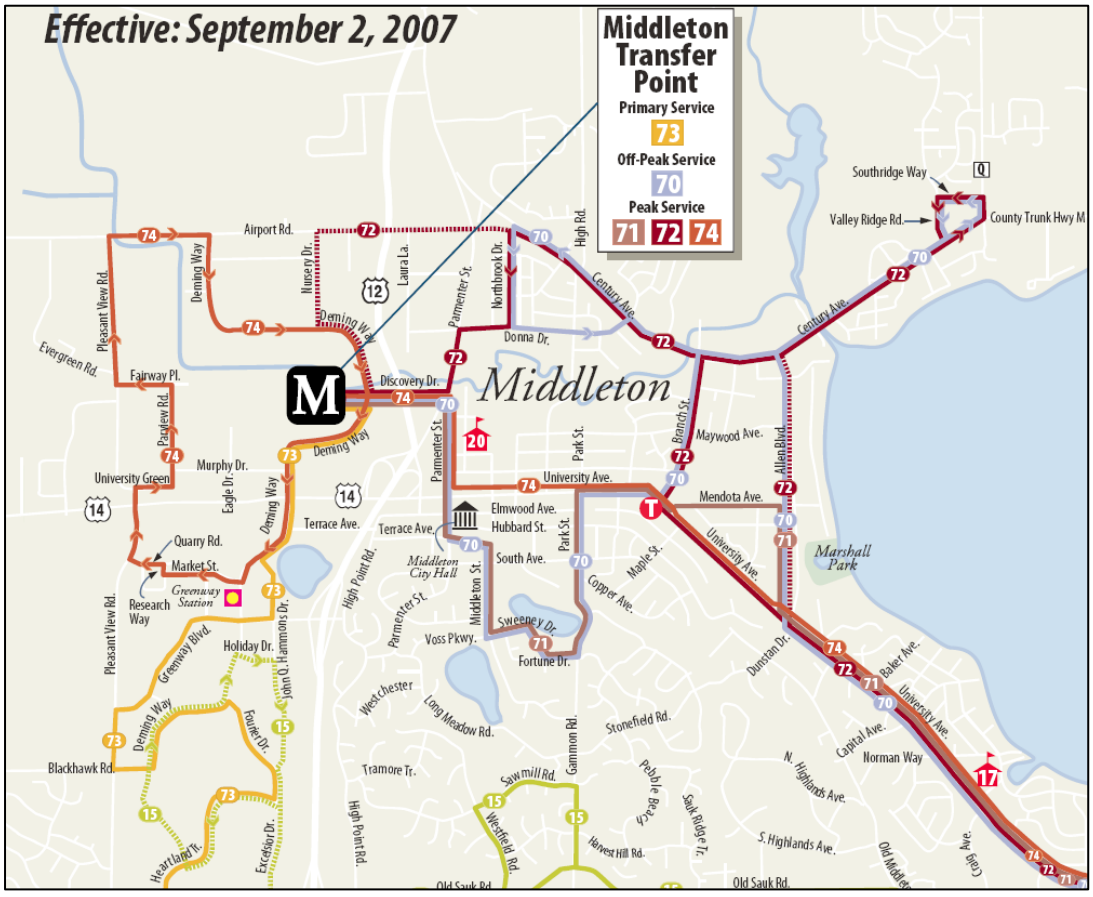
3. TRANSIT CIRCULATION

The City of Middleton has contracted with Metro Transit to provide public transit service. On weekdays, three Metro bus routes serve the downtown area. There is minimal bus service available on weekends and holidays. Middleton's downtown bus routes continue eastward on University Avenue into Madison. Additional city routes operate in a circulator fashion, connecting the employment areas west of the Beltline with residential areas to the east. There are opportunities along these routes to transfer to connecting bus routes to Madison.

3.1 Downtown Transit Service

For the Downtown Circulation Study, the transit review consisted of two elements: 1) the existing Metro Transit service, and 2) downtown locations being considered for a commuter rail station as part of the region's Transport 2020 study. Figure 3.1 shows the current Metro Transit routing structure in Middleton.

Figure 3.1: Transit Service in Middleton



Source: Metro Transit

Metro Transit provides both regular fixed-route and paratransit services within Middleton. The cash fares are $1.50 for adults, $1.00 for youth, and $0.75 for disabled or senior citizens. Transfers are free and prepaid fare cards and tickets are available at Middleton's City Hall, Copps grocery store, and other locations in the metro area. A description of the three routes operating within the downtown area is included in Table 3.1.

Table 3.1: Downtown Middleton Routes

Route	Serving	Type of Service			
		Weekday		Weekend	Holiday
		Peak	Off-Peak		
70	University Ave, Spring Harbor, Marshall Park, Century Ave, Donna Dr, Branch St, Sweeney Dr, Parmenter St, Discovery Springs and Greenway Station areas	•	•	**Saturday Only**	
71	University Ave, Spring Harbor, Marshall Park, Mendota Ave, Sweeney Dr, Parmenter St and Discovery Springs areas	•			
74	University Ave, Spring Harbor, Discovery Springs, Greenway Station, Market St, Pleasant View Rd and Airport Rd areas	•			

Source: Metro Transit

Route and operational adjustments were made to Middleton's transit service in September 2007. These changes included:

- The Middleton Transfer Point was created in Discovery Springs to provide more weekday options for timed connections between Routes 70, 71, 72, 73, and 74.
- Riders gained direct, peak-hour service along University Avenue via Route 74 to connect jobs in Greenway Center and other Middleton business parks located west of the Beltline. The bus travels westbound during the morning and eastbound during the afternoon.
- Route 70 now operates hourly on Saturdays from 6 a.m. to 10 p.m. throughout Middleton.

Metro Transit tracks average daily ridership using a sampling technique on all its routes. Average daily ridership was estimated for each bus stop based on data collected during a period from August 2006 through April 2007. Average daily boardings and alightings were determined from sample data collected on buses in the fleet equipped with automated passenger counting equipment. Table 3.2 provides information on average daily ridership for each stop located within the downtown Middleton study area.

Table 3.2: Average Day Ridership by Bus Stop

Stop	Dir	Block	On Street	Pos	Location	Riders	Routes	Trips	On/Trip	Bench/ Shelter		Route(s)
6592	WB	7420	Terrace Ave	AT	Parking Lot	9	2	16	0.1			70, 71
6785	EB	7427	Terrace Ave	OP	Parking Lot	2	2	18	0.1			70, 71
6966	WB	7498	Terrace Ave	NS	Parmenter St	12	2	16	0.2			70, 71
6441	EB	7499	Terrace Ave	FS	Parmenter St	26	2	18	1.2		Y	70, 71
6150	WB	7798	Terrace Ave	NS	High Point Rd (N)	5	2	16	0.0			70, 71
6313	EB	7799	Terrace Ave	FS	High Point Rd (N)	3	2	16	0.2			70, 71
6220	WB	6998	University Ave	NS	Park St	1	2	20	0.0			70, 71
6899	EB	6999	University Ave	FS	Park St	4	2	21	0.2			70, 71
6132	WB	7100	University Ave	FS	Park Lawn Pl	0	1	4	0.0			74
6337	EB	7101	University Ave	OP	Park Lawn Pl	0	1	3	0.0			74
6647	EB	7399	University Ave	FS	Middleton St	1	1	3	0.2			74
6156	WB	7400	University Ave	FS	Middleton St	0	1	4	0.0			74
6607	EB	7499	University Ave	FS	Parmenter St	2	1	3	0.6			74
6554	WB	7500	University Ave	FS	Parmenter St	3	1	4	0.0			74
6833	EB	7701	University Ave	FS	Cayuga St	1	1	3	0.5			74

Source: Metro Transit

Table 3.3 compares a one-week sample of rides for routes 70, 71 and 74. Transit route productivity is measured by passenger trips per revenue hour. Based on the sample data below, routes 70, 71 and 74 saw an increase in productivity over the one-year time period (note that routes 71 and 74 are up considerably).

Table 3.3: Route Productivity, 2006-2007

Average for September 25-29, 2006			
Route	**Passengers (5 days)**	**Rev. Hours**	**Passenger/Rev. Hours**
70	607	26.7	22.7
71	420	11.5	36.6
74	54	6.0	8.9
Total	1,081	44.4	24.5

Average for September 24-28, 2007			
Route	**Passengers (5 days)**	**Rev. Hours**	**Passenger/Rev. Hours**
70	608	25.7	23.7
71	410	7.7	53.2
74	87	6.5	13.4
Total	1,105	39.9	27.7

Source: Metro Transit

As noted above, Metro service is provided on University Avenue between Bristol Street and Parmenter Street on Route 74. Ridership on this two-block segment was estimated to be six passengers on an average travel day. The two bus stops on this section of University Avenue are unprotected (buses are not removed from the traffic lanes by either bus turnouts or breaks in parking). While buses are slowed by traffic congestion during peak periods and can contribute to disruptions in traffic flow as they stop for passenger boarding and alighting, given the current level of ridership generated on this route segment, this is not seen as a major impediment to existing transit or traffic operation.

Even so, consideration was given to moving the bus from University Avenue to Hubbard Avenue between Bristol Street and Parmenter Street. This would remove buses from the difficult traffic conditions on that segment of University Avenue, but such a move would rely on a signal being installed at Bristol Street and University Avenue. A Hubbard Avenue adjustment would provide better connections to more downtown destinations, potentially improving ridership and lessening parking demand in the area. The bus could return back "on-route" at Parmenter Street and continue on its current path to the Middleton Transfer Point. After some consideration, it is not recommended this option be pursued further at this time for most downtown destinations still fall within the Metro transit system service area, the move would increase service costs and route run time, and geometric issues would need to be mitigated along the Hubbard Avenue loop.

3.2 Transport 2020 Stations

Middleton has long been a key partner in the region's transit alternative analysis. A Transport 2020 Implementation Task Force is currently moving the planning process through the final step, Preliminary Engineering and Environmental Impact Studies, required before applying for federal funding. The Task Force has selected a "Locally Preferred Alternative" for commuter rail vehicles operating in the existing rail corridor that runs from USH 12/14 in Middleton, through the Isthmus, to Sun Prairie. Two general station alternative locations were proposed within Middleton: 1) a downtown station, and 2) a Highway 12/14 proximity Park-and-Ride station.

A Park-and-Ride lot at St. Bernard's Church in Middleton was eliminated in 1994 when the bus route was moved off Franklin Avenue to University Avenue. A site for a park-and-ride lot in Middleton has been desired by system planners since the completion of the USH 12/14 interchange and city bypass. Middleton's Comprehensive Plan recommended the southwest corner of the intersection of USH 12 with USH 14 as an ideal location for a parking structure for a proposed park-and-ride station.

According to the Transport 2020 *Environmental Impact Statement and New Starts Application - Transit Supportive Land Use Report* (February 2007), a downtown station is proposed near Parmenter Street in the Central Business District (CBD) of Middleton. The report cited downtown Middleton's range of commercial and employment uses and the pedestrian-friendly environment. In addition, a Park-and-Ride station is proposed at the west end of Middleton near the USH 12 / USH 14 interchange. The intent is for this station to be auto-oriented and in an area containing mostly highway commercial, office park and hotel development. While the prevalent development pattern in such an area would not be highly supportive of walk-access, it would be ideal for the addition of a large Park-and-Ride facility serving the surrounding suburban areas.

3.3 Transit Recommendations

Following the review of the current routing, ridership, and bus stop locations, the following recommendations are made regarding downtown Middleton's public transit service.

1. ***Establish a Transit Services Oversight Subcommittee —*** Middleton's public transit system has grown in service hours and coverage over the past several years, and is expected to continue to grow as Transport 2020 moves forward. Since the City's Transportation Commission was disbanded in 1995, responsibility for overseeing the City's transit service has rested with the Public Works Committee, and more recently with City staff working directly with the City Council. Considering the system's increasing size and public investment, Middleton should consider assigning responsibility for service planning and review to a transit oversight committee. The transit services oversight committee should include at-large citizen representatives, who would preferably be system users. The oversight committee should be charged with reviewing, instituting, and recommending changes to the city's existing public transit service, in conjunction with available Metro Transit guidance. Currently, minor operating and schedule adjustments (those not affecting route structure or appreciably changing the level and costs of service) are considered by Metro Transit management in consultation with City annually. It is recommended the transit oversight subcommittee work with Middleton's lead transit staff person and Metro planners to review Middleton route service and performance on a quarterly basis. Transit issues such as safety, parking, lighting, snow removal, and plans for future services to meet city needs should be addressed by this group.

2. ***Transport 2020 Station Location —*** The city is currently assessing redevelopment plans for land uses in the southwest quadrant of the USH 12 / USH 14 interchange area. This location currently has 3.9 acres for sale (with an option to purchase by a local developer) and includes an existing millwork business (Prefinished Millwork Corporation). The site is located next to the Lycon concrete mixing business. With this general area already identified as a prime location for a system Park-and-Ride station, given its proximity to the rail corridor and accessibility by automobile, any redevelopment discussion should include consideration of a Transport 2020 station. Phased development of a station at that site could include a surface parking area as an initial investment, which would benefit the downtown area as longer-term parking continues to be a concern for a growing number of businesses located there. In time, as rail plans begin to materialize, structured parking, a station facility, and ancillary supportive land development could occur.

3. ***Additional Bus Stop, Shelter, and Bench Locations —*** With current daily ridership volumes in the downtown area, Middleton conforms to Metro Transit's guidelines for placing stops, shelters, and benches. Therefore, additions are not recommended at this time. Metro's guidelines are:

Bus Stop Location – The specific location of bus stops is influenced by convenience for patrons and traffic conditions:

- Far-side stops (after the intersection) are preferable where buses can pull out of the main traffic lane and maneuver to the curb. Far-side stops typically require 65 feet in length.

- Near-side stops (before the intersection) are preferable where traffic is heavier on the leaving side than on the approach side of the intersection. Near-side bus stops are typically 85 feet in length from the downstream end of the bus stop to the downstream stop bar.

- Mid-block stops should be avoided unless block-faces are long or unless stops serve a major trip generator. Mid-block bus stops are generally 110 feet in length.

Shelter Location – Shelters are a passenger amenity and are placed where they will have the greatest benefit:

- A minimum of 50 daily boarding passengers;
- Proximity to housing for elderly and/or disabled persons; and
- At major generators served by multiple routes.

Benches – Benches should be placed in shelters and at stop locations when ridership increases:

- Add benches at stops that serve a minimum of 25 daily boarding passengers.

The only bus stop to include a shelter in the study area is located at Terrace Avenue and Parmenter Street (serving eastbound Routes 70 and 71). This location generates 26 riders on an average day, which is below Metro's target of 50. However, maintaining this shelter is reasonable considering it clearly serves the largest number of boardings in the downtown area. Based on this measure, Middleton should consider the addition of downtown passenger stop amenities as ridership approaches one-half of Metro's system-wide thresholds.

There are no patron benches provided by Metro Transit at Middleton downtown bus stops. Ridership should be reviewed regularly, and as the number of boardings increase, locations serving 15 to 25 patrons should be considered for benches at downtown stops. Any new benches provided by the City should conform to the streetscape amenity guidelines provided in Section 5 of this report.

4. BICYCLE AND PEDESTRIAN CIRCULATION

The downtown area offers a pedestrian-friendly environment with walkable block lengths and continuous sidewalks. Intersection and mid-block pedestrian crossings are well defined. The downtown residential areas generally have quiet, narrow, pedestrian-friendly streets. However, as noted earlier, growing traffic volumes are likely to negatively influence pedestrian and bicyclist perceptions of safety as they travel within and through the downtown area. This is likely due to intersections presenting numerous traffic conflicts for pedestrians and bicyclists, which are listed below:

- Right and left turns at stop-sign and signalized intersections
- Vehicular speeds, notably along University Avenue
- Driver conformance with traffic controls
- Pedestrian visibility
- Crossing distance for pedestrians
- Signal timings
- Sidewalk continuity
- Ramp design for persons with disabilities
- Crosswalk marking/signing for the visually-impaired

4.1 Pedestrian and Bicycle Intersection Analysis

The following intersections were analyzed to improve both pedestrian and bicyclist comfort and safety in downtown Middleton:

- University Avenue at
  - Cayuga Street
  - Aurora Street
  - Parmenter Street
  - Middleton Street
  - Bristol Street

- Parmenter Street at
  - Hubbard Avenue
  - Elmwood Avenue

There are two general approaches available to assess pedestrian and bicyclist comfort and safety crossings at street intersections. The first approach is a technical calculation of pedestrian and bicyclist safety indices and crossing level of service (LOS). The second approach involves field observations of existing intersection conditions. Pedestrian and bicyclist crossing enhancements can be identified with field checks, which have an ability to improve pedestrian and bicyclist

crossing safety and comfort. In many cases, these enhancements will not directly affect the calculated Intersection Safety Index (ISI) of an intersection, but will improve existing conditions.

The pedestrian ISI is a model developed by the Federal Highway Administration (FHWA) that identifies intersection crossings that could be enhanced for pedestrian safety. The index is based on traffic control (signal, stop-sign, or uncontrolled), number of through traffic lanes, traffic speed, traffic volume, and adjacent land use (commercial).

The ISI tool produces a safety index score (ranging from one to six) with higher scores indicating higher priority for an in-depth safety assessment. While the scoring system is relative, with no threshold of action developed, it is an accepted method to compare pedestrian safety at intersections to create a priority ranking of locations for improvement. The bicyclist ISI is also a model developed by FHWA that identifies intersection crossings by approach leg that could be enhanced for bicyclist safety. The index is based on traffic control, existing bike lanes, presence of exclusive turn lanes, on-street parking, traffic speed, and traffic volumes. Table 4.1 summarizes the pedestrian ISI for each approach of the study intersections while Table 4.2 summarizes the bicycle ISI for each approach of the study intersections.

Table 4.1: Pedestrian Intersection Safety Indices Results

Intersection	Evaluated ISI Score*			
	***South* Approach**	***North* Approach**	***East* Approach**	***West* Approach**
University Avenue and Cayuga Street	2.6	1.9	2.8	2.8
University Avenue and Aurora Street	1.9	--	4.6	4.6
University Avenue and Parmenter Street	2.2	2.2	2.8	2.8
University Avenue and Middleton Street	1.7	1.7	4.6	4.6
University Avenue and Bristol Street	1.7	1.7	4.6	4.6
Elmwood Avenue and Parmenter Street	1.9	1.9	1.7	1.7
Hubbard Avenue and Parmenter Street	3.7	3.7	1.7	1.7

ISI – Intersection Safety Index

* Scores range from 1.0 ~ 6.0; higher scores mean a higher priority for safety improvements

As shown above, the east and west approaches of University Avenue at the intersections with Aurora Street, Middleton Street, and Bristol Street scored highest on the ISI values. This is attributed to the lack of traffic control and higher traffic speed and volume on University Avenue. Likewise, the Hubbard Avenue intersection with Parmenter Street scored high due to the lack of traffic signal or stop-sign control for pedestrians crossing Parmenter Street.

The University Avenue intersections with Cayuga Street and Parmenter Street are controlled with traffic signals. These intersections were also analyzed for pedestrian level of service (LOS), based on the City of Charlotte methodology adopted by the City of Middleton for traffic impact study analysis. Both intersections were determined to be operating at LOS 'C' or better for pedestrians on all approaches, which are acceptable within the City of Middleton guidelines for pedestrian levels of service (LOS 'C' or better).

Table 4.2: Bicycle Intersection Safety Indices Results

Intersection	Direction	Evaluated ISI Score			
		South Approach	*North Approach*	*East Approach*	*West Approach*
University Avenue & Cayuga Street	Through	3.7	3.8	4.2	4.2
	Right	1.6	1.7	1.9	1.9
	Left	2.1	2.2	3.2	3.3
University Avenue & Aurora Street^	Through	1.9	--	3.2	3.9
	Right	2.1	--	1.6	1.8
	Left	2.0	--	2.8	3.0
University Avenue & Parmenter Street	Through	3.8	3.8	4.2	4.2
	Right	1.8	1.8	1.9	1.9
	Left	2.5	2.5	3.3	3.3
University Avenue & Middleton Street	Through	4.0	3.9	3.5	3.5
	Right	1.9	1.8	1.8	1.8
	Left	2.2	2.2	2.1	2.0
University Avenue & Bristol Street	Through	3.9	4.0	3.6	3.6
	Right	1.8	1.9	1.9	1.9
	Left	2.2	2.2	2.8	2.8
Elmwood Avenue & Parmenter Street	Through	2.7	2.7	2.8	2.8
	Right	1.7	1.7	1.6	1.6
	Left	2.3	2.3	2.2	2.2
Hubbard Avenue & Parmenter Street	Through	2.1	2.1	2.7	2.7
	Right	2.2	2.2	2.1	2.1
	Left	1.8	1.8	2.2	2.2

ISI – Intersection Safety Index

* Scores range from 1.0 ~ 6.0; higher scores mean a higher priority for safety improvements

^ Values are unavailable due to intersection operating as a 'T'-shaped intersection

The signalized intersections were also analyzed for bicycle LOS, based on the City of Charlotte methodology adopted by the City of Middleton for traffic impact study analysis. Bicycle LOS at the Parmenter Street and University Avenue intersection legs ranged between LOS 'D' and 'F'. At University Avenue and Cayuga Street, bicycle LOS were at LOS 'E' and 'F'. These levels of service do not meet City of Middleton guidelines for bicycle LOS (LOS 'C' or better). It is noted that without on-street bike lanes, it is difficult to greatly enhance bicyclist conditions at the study intersections. At both the University Avenue intersections with Cayuga Street and Parmenter Street, bike detection loops could improve bicyclist crossings.

4.2 Pedestrian and Bicycle Intersection Considerations

Based on the intersection safety index calculation and field observations, the following intersection enhancements should be considered to improve pedestrian and bicyclist safety. Note that any pedestrian crossing improvement should be reviewed for compliance with current City policy, per the following Public Works Department and Public Works Committee approved guidelines:

- Placement of In-Street Pedestrian Crossing Signs (approved by the Public Works Committee 11/13/2006).
- Proposed Policy for Location and Marking of Crosswalks (approved by the Public Works Committee August 14, 2006).
- Countdown Signals (currently in Draft format).

University Avenue and Cayuga Street

- Move the traffic control stop bar further away from the crosswalk. 'Advanced' type stop bars increase separation between vehicles and crosswalk markings and should be located at least 4 feet from the crosswalk (maximum 30 feet).
- Enhance pedestrian crossings with installation of new ADA ramps with truncated domes (See Figure 4.1 on Page 34).
- As pedestrian volumes increase, improve the traffic signals to include pedestrian countdown timers, "No Right Turn On Red When Pedestrians Are Present" signs, and/or advance walk phase for pedestrians (approximately one to two seconds).

- Extend median refuge protection from its current locations (see above photo) to north side of crosswalk.
- Add north-south crosswalk to fire station and new municipal parking lot. Although minimal pedestrian activity was recorded during the traffic data collection phase of the project, it is noted that Middleton is considering a new bicycle / pedestrian trail that would run along the eastern side of USH 12, connecting the existing Pheasant Branch Trail system to downtown Middleton via the intersection of University Avenue with Cayuga Street. Consideration should be taken to providing an adequate crosswalk along the east approach of the intersection and implement the aforementioned recommendations to the new crosswalk to improve safety at this location.

University Avenue and Aurora Street

- Enhance pedestrian crossings with new ADA ramps with installation of truncated domes
- Enhance crosswalk pavement markings to continental style (longitudinal lines parallel to the traffic flow) for improved visibility by motorists (see Figure 4.2 on Page 34).
- Construct curb bump-out on southwest corner to reduce eastbound-to-southbound, right-turning speeds and improve through traffic alignment with narrower section of University Avenue on the east side of the intersection.
- Install flexible in-street 'Yield for Pedestrians in Crosswalk' signs on University Avenue centerline as pedestrian crossings increase at this location (see Figure 4.3 on Page 35).
- In the event that University Avenue is reconstructed (recognized as a potential long-term improvement), construct street curb setbacks with 6-foot pedestrian refuge islands on University Avenue.

University Avenue and Parmenter Street

- Move the traffic control stop bar further away from the crosswalk (minimum 4 feet, maximum 30 feet) to increase separation between stopped vehicles and crosswalk markings.
- Install pedestrian countdown timers to alert pedestrians of time remaining to safety cross (see Figure 4.4 on Page 35).
- Provide pedestrian buttons that are ADA compliant and located a comfortable distance away from the roadway (a separate pedestal may be needed to accommodate this improvement).
- Change signal timing to give pedestrians and bikes with a one to two second lead before traffic green and/or an extended pedestrian walk time during signal phases.
- Install 'No Right Turns On Red When Pedestrians Are Present' signs to reduce pedestrian/vehicle conflicts.
- Install flexible in-street 'Yield for Pedestrians in Crosswalk' signs on University Avenue centerline to alert motorists of the upcoming crosswalk location.
- In the event that University Avenue becomes reconstructed (realized as a long-term improvement), construct street curb setbacks with 6-foot pedestrian refuge islands on University Avenue.

University Avenue and Middleton Street

- Install pedestrian crossing signage in conformance with MUTCD (See Figure 4.5 on Page 35).
- Enhance pedestrian crossings with new ADA ramps without sidewalk alignment break.
- Increase sidewalk width to 5-foot minimum.
- Install speed feedback signs on University Avenue to slow vehicular traffic.
- Install flexible in-street 'Yield for Pedestrians in Crosswalk' signs on University Avenue centerline to alert motorists of upcoming crosswalk location.
- In the event that University Avenue is reconstructed (recognized as a potential long-term improvement), construct street curb setbacks with 6-foot pedestrian refuge islands on University Avenue.

University Avenue and Bristol Street

- Install pedestrian crossing signage in conformance with MUTCD.
- Enhance pedestrian crossings with new ADA ramps without sidewalk alignment break.
- Increase sidewalk width to 5-foot minimum.
- Install speed feedback signs on University Avenue to slow vehicular traffic.
- Install flexible in-street 'Yield for Pedestrians in Crosswalk' signs on University Avenue centerline to alert motorists of upcoming crosswalk location.
- In the event that University Avenue is reconstructed (realized as a long-term improvement), construct street curb setbacks with 6-foot pedestrian refuge islands on University Avenue.

Parmenter Street and Elmwood Avenue

- Move the traffic control stop bar further away from the crosswalk (minimum 4 feet, maximum 30 feet) to increase separation between stopped vehicles and crosswalk markings.
- Construct curb bump outs to narrow pedestrian crossing distance as motorist may not be able to see pedestrians behind parked cars.
- Consider use of flexible 'Yield for Pedestrians in Crosswalk' signs on street centerline.
- Install truncated dome treatment on all ADA ramps. Currently not in conformance with concrete surface scoring and no color definition.
- Maintain Red Flag program at intersection.

Parmenter Street and Hubbard Avenue

- Construct curb bump outs to narrow pedestrian crossing distance as motorist may not be able to see pedestrians behind parked cars.
- Consider use of flexible 'Yield for Pedestrians in Crosswalk' signs on street centerline.
- Install truncated dome treatment on all ADA ramps. Currently not in conformance with concrete surface scoring and no color definition.
- Maintain Red Flag program at intersection.

Figure 4.1: ADA Ramp with Truncated Domes

Figure 4.2: Bump-out with Continental pavement markings

Figure 4.3: Yield for Pedestrians in Crosswalk Sign

Figure 4.4: Pedestrian Countdown Timer

Figure 4.5: Crosswalk Signing

5. STREETSCAPE ENHANCEMENTS

Middleton's Comprehensive Plan (November 2006) recommends completing streetscape enhancements including installation of gateway features at the entryways to the City, landscaping, street furniture and bike racks, and implementing a new wayfinding and signage system along major business corridors and community destinations.

5.1 Streetscape Guideline Elements

In developing downtown Middleton streetscape recommendations, SRF reviewed existing streetscape elements and building materials, City wayfinding sign program, and other City planning documents. The guideline elements take cues from the City logo colors used in the wayfinding program and look at traditional materials and styles that complement existing streetscape elements and signage.

Hierarchy of streetscape treatment is based upon existing land use, as shown in Figure 5.1. The highest level of treatment is given to commercial street segments, including Cayuga Street, Aurora Street, and sections of Hubbard Avenue, University Avenue and Parmenter Street. Secondly, a moderate level of treatment is given to mixed-use streets, including segments of University Avenue, Elmwood Avenue, Hubbard Avenue, Terrace Avenue, and Parmenter Street. Finally, the least amount of treatment is given to residential streets typically found at the study area fringe. These residential streets include segments of University Avenue, Elmwood Avenue, Hubbard Avenue, Aurora Street and Parmenter Street.

The following are general descriptions of the various streetscape elements that may be considered in the project. Figures 5.2 and 5.3 provide representative images, placement information, and descriptions to connect and unify the entire study area.

5.2 Streetscape Recommendations

1. ***Paving Treatment*** — Pavement treatments should consist of standard concrete with enhanced scoring in most instances. In commercial and mixed-use areas, boulevard areas should be accented with colored concrete at select locations, such as intersections. Currently the City has red brick or red-stamped concrete in a brick pattern for these areas. Concrete with red color typically does not hold up well to sunlight, salt, etc. and turns pink after a year or two. Therefore, our recommendation in the matrix is to use neutral earth tones such as browns or tans for colored concrete areas.

2. ***Street furnishings*** — Street furnishings such as benches, trash receptacles, newspaper kiosks, planters, tree grates, fencing, and bollards should be selected for simple classic forms and colors. Bollards, fence posts, and other structural elements should include natural stone elements to the extent possible.

3. ***Lighting*** — Traditional fixtures and poles should be consistent with the poles already purchased for the City pedestrian lighting and wayfinding programs. Light poles are also an opportunity to provide additional visual interest by including hanging flower baskets and banners on the poles. In addition, banners provide an easy and cost efficient way of adding a public art element to the project by having artists contribute to their design.

4. ***Wayfinding Signage*** — The streetscape recommendations seek to incorporate and complement the ongoing implementation of the City wayfinding program, as signage is integral to the overall character for the downtown area streetscape. See Figure 5.1 for decorative signage locations as depicted in the wayfinding sign program.

5. ***Gateway Features*** — Gateways, located in key areas as shown in Figure 5.1, are an excellent opportunity to announce and highlight the downtown area. Potential gateway features should incorporate the City seal and logo, natural stone materials, decorative lighting and plantings to unify and complement the streetscape recommendation components.

6. ***Street "Nuisances"*** — Public and private utilities should be located at the outer extents of the public right-of-way or within the roadway to limit constraints to streetscape development. Above ground utility elements such as signal control boxes, power poles, and hydrants should be relocated to these locations when implementing roadway or streetscape projects. In addition, screening utility elements with landscaping or fencing should be considered.

Streetscape Figure 5.1

Streetscape Figure 5.2

Streetscape Figure 5.3

6. TRAFFIC ANALYSIS

Vehicular access to downtown Middleton is primarily supplied by University Avenue and Parmenter Street. University Avenue serves as the primary east-west roadway corridor, not only for local traffic in the Middleton area, but also for commuters to and from downtown Madison. Parmenter Street is the primary north-south roadway through downtown Middleton and also serves as a major collector roadway for traffic to access University Avenue. Due to the anticipated increase of traffic volumes along both roadways, congestion issues along both roadways will likely increase.

Thus, one of the primary goals of the Downtown Circulation Study was to examine and evaluate alternatives to provide more efficient traffic flow through downtown Middleton. As with the pedestrian and bicycle analysis, seven intersections were included in the analysis:

- University Avenue at
  - Cayuga Street
  - Aurora Street
  - Parmenter Street
  - Middleton Street
  - Bristol Street

- Parmenter Street at
  - Hubbard Avenue
  - Elmwood Avenue

6.1 Existing Operational and Safety Issues

As previously mentioned, University Avenue (also known as Dane County Trunk Highway 'MS') serves as a primary commuter route connecting downtown Madison with Middleton and other communities to the west. University Avenue is classified as a principal arterial, with the efficient movement of traffic (mobility) a key function of the roadway. However, through the study area, the cross-section of University Avenue does not promote efficient traffic flow as it consists of four through lanes with no exclusive turning lanes. The inside through lane, therefore, serves as a de facto left-turn lane at the intersections with Aurora Street, Parmenter Street, Middleton Street, and Bristol Street. This condition either forces through-traveling motorists to move to the outside lane or forces them to wait in the inside lane (frequently for the remainder of the through green time) for left-turning vehicles to perform their movement before proceeding.

This intersection geometry and increasing volumes creates significant queues along University Avenue at the signalized Parmenter Street intersection as well as slow-moving traffic through the corridor during peak periods. The vehicle queues and delays, along with unprotected turning movements and pedestrian crossings, provide an environment that is suitable for safety problems such as motorists getting frustrated with delays, vehicles turning left on red signal phases, and

pedestrians scurrying to beat the signals or traffic. In addition, more frequent lane changes occur as through movements on the inside lane will move to the outside lane to avoid left-turning vehicles, increasing crash rates along University Avenue. These operational and safety issues would likely be improved with exclusive left-turn lanes and/or a two-way, left-turn lane (TWLTL) along University Avenue. However, structures built close to the roadway currently limit its widening without first acquiring numerous properties.

The volume of traffic on University Avenue also creates a physical barrier for pedestrians and bicyclists wanting to cross the roadway. With Middleton High School two blocks north of University Avenue, a significant number of students currently cross University Avenue as they travel to and from school. Given its cross-section (four through lanes) and right-of-way constraints, a median is not available to provide a pedestrian refuge, forcing pedestrians to cross all four lanes of traffic at once. This, coupled with the significant traffic volumes along the roadway, creates an extremely difficult environment for pedestrians and bicyclists to negotiate, especially during peak traffic periods.

6.2 Existing Traffic Conditions

Turning movement counts were conducted at the seven study area intersection locations. The counts were performed during the traditional commuter peak morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) periods. The counts were performed in September and October 2007 during school days with weather conditions that promoted pedestrian travel. The results of the counts indicate that the weekday morning peak hour of traffic occurs from 7:15 to 8:15 a.m. while the weekday evening peak hour occurs from 4:45 to 5:45 p.m. The weekday morning and evening peak hour traffic volumes are illustrated in Figure 6.1. Pedestrian counts were also performed at the same time to capture pedestrian activity during peak traffic periods. The results of the pedestrian counts are shown in Figure 6.2.

Additional counts were made at the intersections of University Avenue with Middleton Street and Bristol Street. The weekday afternoon count at University Avenue and Middleton Street began at 3:00 p.m. to coincide with the release time of the high school. Counts at University Avenue and Bristol Street were performed from 6:00 a.m. to 8:00 p.m. to not only observe conditions during school release time, but to determine if a traffic signal is warranted at this location (this will be discussed in greater detail later in the study).

Intersection capacity analyses were conducted at all count locations to evaluate conditions during the peak period of traffic. The traffic analysis package, Synchro, and its traffic simulation component, SimTraffic, were utilized for this portion of the study. Intersections are evaluated based on level of service, as derived and published in the Transportation Research Board (TRB) *Highway Capacity Manual.* Level of service (LOS) is a measure that describes traffic flow characteristics along a roadway or at an intersection based upon speed, travel time, delay, and driver comfort. Six levels of service exist, ranging from LOS ‘A’ (free-flow conditions) to LOS ‘F’ (over-capacity).

Traffic Figure 6.1

Traffic Figure 6.2

Table 6.1 illustrates the study area intersection levels of service, as a whole, as well as the delay experienced along minor streets at unsignalized intersections. To further examine traffic conditions at the intersection of University Avenue with Parmenter Street, the levels of service and queue lengths experienced along these approaches were also derived. These queue lengths are shown in Table 6.2. To provide a comprehensive evaluation of University Avenue conditions, an arterial level of service analysis was also performed to evaluate east-west traffic flow. The results of this analysis are illustrated in Table 6.3.

The results of the intersection capacity analysis indicate that movements from minor streets intersecting University Avenue experience significant delays due to inadequate gaps in the traffic stream. This is not an uncommon situation, especially when minor streets intersect major arterials under stop-sign control.

As can be seen in Table 6.2, while all approaches operate satisfactorily in terms of delay, long queues are experienced along University Avenue due to left-turning vehicles blocking through movements behind them on the inside lanes. This condition is also indicated in the arterial LOS analysis (shown in Table 6.3), as westbound University Avenue operates at LOS D during the weekday evening peak hour.

Table 6.1: 2007 Conditions — Intersection LOS Results

Intersection	Weekday Morning Peak Hour		Weekday Evening Peak Hour	
	LOS	Side-Street Delay	LOS	Side- Street Delay
University Avenue/Cayuga Street	B	---	B	---
University Avenue/Aurora Street *	A / A	10 seconds	A / **E**	46 seconds
University Avenue/Parmenter Street	B	---	D	---
University Avenue/Middleton Street *	A / D	32 seconds	A / **E**	35 seconds
University Avenue/Bristol Street *	A / **F**	180 seconds	A / **F**	120 seconds
Parmenter Street/Hubbard Avenue *	A / A	9 seconds	A / A	9 seconds
Parmenter Street/Elmwood Avenue *	A / A	8 seconds	B / B	12 seconds
* – Unsignalized intersection; the overall LOS is shown followed by the worst approach LOS LOS – Level of Service				

Table 6.2: 2007 Conditions – University Ave./Parmenter St. LOS & Queue Results

Intersection Approach	Weekday Morning Peak Hour		Weekday Evening Peak Hour	
	LOS	Queue	LOS	Queue
North Approach (SB Parmenter Street)	C	210 feet	C	260 feet
East Approach (WB University Avenue)	B	240 feet	D	560 feet
South Approach (NB Parmenter Street)	C	200 feet	C	210 feet
West Approach (EB University Avenue)	B	270 feet	C	310 feet
LOS – Level of Service Queue – Based upon SimTraffic 95th Percentile queue				

Table 6.3: Year 2007 Conditions – Arterial LOS Results

Roadway Segment	Weekday Morning Peak Hour LOS	Weekday Evening Peak Hour LOS
Eastbound University Avenue	C	C
Westbound University Avenue	C	D
LOS – Level of Service		

6.3 Alternatives Methodology

Based on analysis of existing conditions, coupled with field observations of the downtown area and discussions with City staff, the following issues became the focus of the study to improve traffic and pedestrian conditions in the downtown area:

- Reduce the delay at University Avenue with Parmenter Street
- Provide more efficient traffic flow along University Avenue
- Provide a safe vehicle and/or pedestrian crossing location along University Avenue, between Parmenter Street and Park Street
- Reduce intersection crashes along University Avenue

Numerous (and very costly) improvement measures could be implemented to reduce operational problems and improve flows if the City was to purchase a significant amount of right-of-way. However, given available resources and the extreme level of impact of this option, other options that could improve the current situation were investigated. These alternatives involved adjusting signal timings and phasing at the intersection of University Avenue with Parmenter Street without significant roadway geometric alterations. The alternatives are described below:

- ***Optimize signal timings*** — This alternative consisted of optimizing the signal timings at the intersections of University Avenue with Parmenter Street and Cayuga Street. In addition, signal coordination between the two intersections would be implemented to provide more efficient east-west traffic progression between these locations.

- ***Provide protected-permitted phases*** — By providing protected-permitted phases on University Avenue at Parmenter Street, left-turning vehicles would be given green time to perform their movement unopposed (protected), reducing delays experienced by through traffic on that approach. Due to the lack of exclusive left-turn lanes along University Avenue, only one approach could be granted the protected-permitted phase for each signal cycle. Timings at this intersection, and the University Avenue/Cayuga Street intersection, would be optimized and coordinated as well.

- ***Provide split-phase signal operation*** — A split phase operation allows movements from a single approach direction to occur at one time. This type of operation eliminates interference with left-turning traffic, promotes better lane balance, and minimizes lane changes. While those are benefits to this operation, it generally is less efficient overall. For the purposes of this study, this alternative evaluated the University Avenue approaches as a split phase with the Parmenter Street approaches operating under current signal phasing. Like the previous alternatives, signal coordination and optimization at the University Avenue/Cayuga Street intersection would also occur as part of this alternative.

It should be noted that these alternatives only address existing traffic volumes based on counts conducted in Year 2007. This analysis does **not** take into consideration future land use changes and development, increasing local and regional traffic volumes, and planned/proposed roadway improvements. Based on the Wisconsin Department of Transportation (WisDOT) Year 2006 traffic data maps, University Avenue experiences approximately 20,600 daily vehicles through downtown Middleton. These volumes are anticipated to increase to approximately 41,000 vehicles per day by the Year 2025, based on the City's Transportation Network Plan (2006). With the existing cross-section of University Avenue, these future volumes significantly exceed the facility's capacity, resulting in extreme congestion and likely much more intense safety issues.

Therefore, other improvement alternatives were considered that could accommodate more volume, but not to the level is forecast (41,000 vehicles per day for Year 2025). These alternatives are described below:

- ***Left-turn lanes*** — University Avenue would be improved to provide exclusive left-turn lanes on both approaches at the Parmenter Street intersection. This would allow left-turning vehicles to exit the University Avenue traffic stream and queue in their respective turn storage lane, waiting to perform their movement. University Avenue would be maintained in its existing cross-section at all other locations.

- ***Five-lane University Avenue*** — To accommodate left-turning vehicles at Parmenter Street and minor cross streets and access points, University Avenue would be widened to provide a two-way, left-turn lane (TWLTL) in the median. This would allow left-turning vehicles along University Avenue to exit the through traffic stream to perform their movement. Also, the TWLTL allows left-turning vehicles from the minor streets room to travel along the TWLTL before merging into through traffic, reducing delays on the minor street approaches.

6.4 Alternative Analysis

To mitigate existing operational deficiencies within the downtown Middleton area, five alternatives were created and tested to determine the effects of their respective improvements on the transportation network. Like the analysis of existing conditions, intersection LOS and delay, approach delay and queuing at University Avenue with Parmenter Street, and arterial LOS were calculated to complete a comparative analysis of the alternatives. Table 6.4 illustrates the intersection LOS and delay, the approach delays and projected queue lengths at the University Avenue and Parmenter Street intersection, and the University Avenue arterial LOS for the weekday morning peak hour while Table 6.5 illustrates the aforementioned information for the weekday evening peak hour.

The results of the capacity analysis indicate a decrease in delay and queuing along University Avenue when modifications to the signal system along this roadway are implemented. While more efficient traffic flow occurs along University Avenue, the approaches of Aurora Street, Middleton Street, and Bristol Street will still experience undesirable delays due to the continuation of inadequate gaps in the University Avenue traffic stream. It should be noted, though, that when University Avenue is analyzed as a five-lane cross-section, delays on these minor streets decrease significantly. This is due to the fact that movements from the minor streets can utilize the TWLTL for storage and acceleration into the University Avenue traffic stream instead of having to find gaps in eastbound and westbound traffic to perform their movement.

Table 6.4: Year 2007 Conditions, Weekday Morning Peak Hour — LOS and Queue Results

	No Improvements			Optimize Timings			Protect-Permit Phase			Split Phase			Left-Turn Lane			5-lane University#		
Analysis Feature	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue
Intersection																		
University Ave/Cayuga Street	B	---	---	B	---	---	B	---	---	B	---	---	B	---	---	B	---	---
University Ave/Aurora Street *	A / A	10 sec	---	A / C	17 sec	---	A / B	14 sec	---	A / F	120 sec	---	A / F	74 sec	---	A / B	11 sec	---
University Ave/Parmenter St	B	---	---	B	---	---	B	---	---	E	---	---	B	---	---	B		---
University Ave/Middleton St *	A / D	32 sec	---	A / F	89 sec	---	A / E	36 sec	---	A / D	35 sec	---	A / F	74 sec	---	A / B	14 sec	---
University Ave/Bristol Street *	A / F	180 sec	---	A / F	61 sec	---	A / F	54 sec	---	A / F	76 sec	---	A / F	52 sec	---	A / C	22 sec	---
Parmenter St/Hubbard Ave *	A / A	9 sec	---	A / B	12 sec	---	A / A	9 sec	---	A / C	25 sec	---	A / B	11 sec	---	A / A	8 sec	---
Parmenter St/Elmwood Ave *	A / A	8 sec	---	A / A	8 sec	---	A / A	8 sec	---	A / B	12 sec	---	A / A	8 sec	---	A / A	8 sec	---
University Ave/Parmenter St Approaches																		
North (SB Parmenter Street)	C	---	210 ft	C	---	220 ft	C	---	230 ft	E	---	400 ft	C	---	230 ft	C	---	210 ft
East (WB University Avenue)	B	---	240 ft	B	---	220 ft	B	---	230 ft	E	---	620 ft	B	---	230 ft	B	---	210 ft
South (NB Parmenter Street)	C	---	200 ft	C	---	220 ft	C	---	220 ft	E	---	280 ft	C	---	200 ft	C	---	230 ft
West (EB University Avenue)	B	---	270 ft	B	---	230 ft	B	---	230 ft	D	---	330 ft	B	---	200 ft	B	---	240 ft
Arterial																		
Eastbound University Avenue	C	---	---	C	---	---	C	---	---	D	---	---	C	---	---	C	---	---
Westbound University Avenue	C	---	---	C	---	---	C	---	---	E	---	---	C	---	---	C	---	---

* – Unsignalized intersection; the overall LOS is shown followed by the worst movement LOS
^ – Side-street delay for unsignalized intersections
# – LOS and side-street delay for unsignalized intersections under this alternative are derived from HCM calculations
LOS – Level of Service

Table 6.5: Year 2007 Conditions, Weekday Evening Peak Hour — LOS and Queue Results

	No Improvements			Optimize Timings			Protect-Permit Phase			Split Phase			Left-Turn Lane			5-lane University#		
Analysis Feature	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue
Intersection																		
University Ave/Cayuga Street	B	---	---	B	---	---	B	---	---	B	---	---	B	---	---	B	---	---
University Ave/Aurora Street *	A / E	46 sec	---	A / D	31 sec	---	A / D	26 sec	---	C / F	240 sec	---	A / B	12 sec	---	A / B	12 sec	---
University Ave/Parmenter St	D	---	---	C	---	---	C	---	---	F	---	---	B	---	---	B		---
University Ave/Middleton St *	A / E	35 sec	---	A / F	120 sec	---	A / D	30 sec	---	A / D	26 sec	---	A / F	52 sec	---	A / C	18 sec	---
University Ave/Bristol Street *	A / F	120 sec	---	A / F	81 sec	---	A / F	87 sec	---	A / F	89 sec	---	A / F	66 sec	---	A / C	22 sec	---
Parmenter St/Hubbard Ave *	A / A	9 sec	---	A / B	13 sec	---	A / B	12 sec	---	C / F	65 sec	---	A / A	9 sec	---	A / B	12 sec	---
Parmenter St/Elmwood Ave *	B / B	12 sec	---	B / B	13 sec	---	B / B	13 sec	---	C / E	39 sec	---	A / A	8 sec	---	B / B	12 sec	---
University Ave/Parmenter St Approaches																		
North (SB Parmenter Street)	C	---	260 ft	D	---	270 ft	D	---	280 ft	F	---	490 ft	C	---	230 ft	C	---	230 ft
East (WB University Avenue)	D	---	560 ft	D	---	550 ft	C	---	450 ft	F	---	880 ft	B	---	230 ft	B	---	220 ft
South (NB Parmenter Street)	C	---	210 ft	C	---	230 ft	C	---	210 ft	E	---	330 ft	C	---	200 ft	C	---	210 ft
West (EB University Avenue)	C	---	310 ft	C	---	270 ft	B	---	270 ft	D	---	320 ft	B	---	210 ft	B	---	280 ft
Arterial																		
Eastbound University Avenue	C	---	---	C	---	---	C	---	---	E	---	---	C	---	---	C	---	---
Westbound University Avenue	D	---	---	D	---	---	D	---	---	E	---	---	C	---	---	C	---	---

* – Unsignalized intersection; the overall LOS is shown followed by the worst movement LOS
^ – Side-street delay for unsignalized intersections
# – LOS and side-street delay for unsignalized intersections under this alternative are derived from HCM calculations
LOS – Level of Service

6.5 University Avenue at Bristol Street Signal Warrant Analysis

Currently, Bristol Street serves as a primary travel path from University Avenue to Middleton High School. Bristol Street is used for drop-off and pick-up facilities, staff and student parking, and access to the athletic fields. Bristol Street experiences significant traffic volumes during school arrival and release times, as well as other events occurring at the school. A significant number of pedestrians cross University Avenue for travel to and from school. With the lack of a refuge median along University Avenue, pedestrians either have to wait long periods of time for adequate gaps or assume vehicles will stop for them. In either case, pedestrians are uncomfortable crossing University Avenue. Considering the intersection's high traffic volumes and safety concerns, a signal warrant analysis was performed at the intersection to determine whether the addition of a traffic signal would be justified.

To help determine whether a traffic signal should be installed at a particular location, minimum thresholds, or warrants, need to be achieved. The *Manual on Uniform Traffic Control Devices* (MUTCD) has established eight warrants for analysis purposes, which include minimum traffic and pedestrian volumes, crash experience, and roadway and intersection characteristics in the vicinity of the analyzed intersection.

Intersection turning movement counts were conducted at the intersection of University Avenue with Bristol Street on Thursday, October 4, 2007 from 6:00 a.m. to 8:00 p.m. It should be noted that classes at Middleton High School were in session and the weather conditions at the time of the counts were favorable for pedestrian activity. Data collected from these counts were then utilized with the signal warrant criteria cited in the MUTCD to determine if warrants have been met. The analysis focused on three of the eight warrants (Eight-Hour Vehicular Volume, Four-Hour Vehicular Volume, and Peak Hour). These warrants generally carry the most influence in determining the validity of installing a new traffic signal. Each of these three warrants are based on existing traffic volumes experienced at an intersection for a particular period of time. The amount of traffic required to meet minimum thresholds varies for each warrant. For example, the Eight-Hour Vehicular Volume warrant requires less traffic, but requires these volumes be met for eight hours of a day. The Peak Hour warrant requires higher vehicular volumes, but for only one hour of the day. The comparison of the traffic counts and the MUTCD warrant requirements can be found in Appendix C of this study.

The results of the signal warrant analysis indicate that the intersection of University Avenue with Bristol Street meets two of the minimum volume warrants: Warrant 2 (Four-Hour Vehicular Volume) and Warrant 3 (Peak Hour). However, Warrant 1 (Eight-Hour Vehicular Volume) was only achieved during five of the eight required hours. It is important to note that while two warrants were met, the MUTCD warrants act only as a guide in determining the validity of a traffic signal at a location. Other factors, such as physical limitations (adequate right-of-way and vision for signal masts and heads), environmental concerns (noise and emissions in close proximity of the intersection), and governmental policies also play a key role in determining the feasibility of adding a traffic signal at an intersection.

6.6 Comparative Analysis with Bristol Signal

From the signal warrant analysis at the intersection of University Avenue and Bristol Street, it was found that two warrants were met. Therefore, a comparative analysis was performed to determine the impacts of this traffic signal on the adjacent street network. Similar to previous analyses performed, intersection and arterial LOS, approach LOS and queues at the University Avenue and Parmenter Street intersection were conducted to assess the performance of the new traffic signal within the study area. Table 6.6 illustrates the results of this analysis for the weekday morning peak hour while Table 6.7 illustrates the weekday evening peak hour results.

The results of the operations analysis show that traffic operations in the study area can be improved, even with the provision of a traffic signal at University Avenue with Bristol Street. As indicated in previous analysis, traffic operations along the Middleton Street and Aurora Street approaches with University will still continue to operate poorly; however, these conditions would be anticipated to improve with the provision of a two-way, left-turn lane.

6.7 All-Way Stop-Sign Control Analysis at Bristol and Elmwood

With the potential addition of a traffic signal at the University Avenue and Bristol Street intersection, the functional role of Bristol Street will increase significantly. Because the traffic signal at University Avenue would enable motorists to enter the University Avenue traffic stream via traffic signals, pedestrian and traffic volumes would likely increase along Bristol Street. Elmwood Avenue serves as an east-west collector street, parallel to University Avenue, with few interruptions (stop-signs) to slow traffic. Given these conditions, concern was expressed by residents about increased traffic volumes at this location and the safety risks that might increase as a result. An analysis was performed at the intersection of Elmwood Avenue with Bristol Street to determine whether the intersection, currently configured with movements from Bristol Street under two-way stop-sign control, should be modified to provide all-way stop-sign control.

Similar to the signal warrant analysis, the *Manual on Uniform Traffic Control Devices* (MUTCD) provides guidance that should be considered for installation of all-way stop control. This analysis will focus on two primary criteria, which are listed below:

- Vehicular volumes entering the intersection from the major street approaches (Elmwood Avenue) averages at least 300 vehicles per hour for eight hours of a day and the vehicular and pedestrian volumes from the minor street approaches (Bristol Street) averages at least 200 units per hour for the same eight hours.

- Five or more reported crashes in 12-month periods that could be remedied by all-way stop control. These crashes include right-turn, left-turn, and right-angle collisions.

Table 6.6: Year 2007 Conditions, Weekday Morning Peak Hour, Signal at University/Bristol — LOS and Queue Results

	No Improvements			Optimize Timings			Protect-Permit Phase			Left-Turn Lane			5-lane University#		
Analysis Feature	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue
Intersection															
University Ave/Cayuga Street	B	---	---	B	---	---	B	---	---	B	---	---	B	---	---
University Ave/Aurora Street *	A / B	14 sec	---	A / B	12 sec	---	A / C	18 sec	---	A / B	12 sec	---	A / B	11 sec	---
University Ave/Parmenter St	B	---	---	B	---	---	B	---	---	B	---	---	B		---
University Ave/Middleton St *	A / E	39 sec	---	A / E	38 sec	---	A / D	26 sec	---	A / E	38 sec	---	A / B	12 sec	---
University Ave/Bristol Street	A	---	---	A	---	---	A	---	---	A	---	---	A	---	---
Parmenter St/Hubbard Ave *	A / A	7 sec	---	A / A	9 sec	---	A / B	13 sec	---	A / A	8 sec	---	A / A	8 sec	---
Parmenter St/Elmwood Ave *	A / A	8 sec	---	A / A	8 sec	---	A / A	8 sec	---	A / A	8 sec	---	A / A	7 sec	---
University Ave/Parmenter St Approaches															
North (SB Parmenter Street)	C	---	210 ft	C	---	250 ft	C	---	230 ft	C	---	210 ft	C	---	210 ft
East (WB University Avenue)	B	---	270 ft	B	---	240 ft	B	---	240 ft	B	---	230 ft	A	---	200 ft
South (NB Parmenter Street)	C	---	190 ft	C	---	210 ft	C	---	210 ft	C	---	210 ft	C	---	210 ft
West (EB University Avenue)	B	---	280 ft	B	---	230 ft	B	---	210 ft	A	---	180 ft	B	---	220 ft
Arterial															
Eastbound University Avenue	C	---	---	C	---	---	C	---	---	C	---	---	C	---	---
Westbound University Avenue	C	---	---	C	---	---	C	---	---	C	---	---	C	---	---

* – Unsignalized intersection; the overall LOS is shown followed by the worst movement LOS
^ – Side-street delay for unsignalized intersections
# – LOS and side-street delay for unsignalized intersections under this alternative are derived from HCM calculations
LOS – Level of Service

Table 6.7: Year 2007 Conditions, Weekday Evening Peak Hour, Signal at University/Bristol — LOS and Queue Results

	No Improvements			Optimize Timings			Protect-Permit Phase			Left-Turn Lane			5-lane University#		
Analysis Feature	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue	LOS	Delay^	Queue
Intersection															
University Ave/Cayuga Street	B	---	---	B	---	---	B	---	---	B	---	---	B	---	---
University Ave/Aurora Street *	A / D	31 sec	---	A / D	29 sec	---	A / D	33 sec	---	A / C	22 sec	---	A / B	12 sec	---
University Ave/Parmenter St	D	---	---	C	---	---	C	---	---	B	---	---	B		---
University Ave/Middleton St *	A / D	34 sec	---	A / B	12 sec	---	A / E	41 sec	---	A / C	24 sec	---	A / B	13 sec	---
University Ave/Bristol Street	A	---	---	A	---	---	A	---	---	A	---	---	A	---	---
Parmenter St/Hubbard Ave *	A / A	9 sec	---	A / A	10 sec	---	A / B	11 sec	---	A / A	9 sec	---	A / A	9 sec	---
Parmenter St/Elmwood Ave *	A / B	11 sec	---	B / B	13 sec	---	B / B	13 sec	---	A / B	12 sec	---	A / B	10 sec	---
University Ave/Parmenter St Approaches															
North (SB Parmenter Street)	C	---	280 ft	C	---	250 ft	D	---	280 ft	C	---	250 ft	C	---	250 ft
East (WB University Avenue)	B	---	600 ft	C	---	510 ft	C	---	420 ft	B	---	270 ft	B	---	220 ft
South (NB Parmenter Street)	C	---	230 ft	C	---	230 ft	C	---	240 ft	C	---	220 ft	C	---	300 ft
West (EB University Avenue)	C	---	310 ft	B	---	240 ft	B	---	260 ft	B	---	200 ft	B	---	230 ft
Arterial															
Eastbound University Avenue	D	---	---	C	---	---	C	---	---	C	---	---	C	---	---
Westbound University Avenue	D	---	---	D	---	---	D	---	---	C	---	---	D	---	---

* – Unsignalized intersection; the overall LOS is shown followed by the worst movement LOS
^ – Side-street delay for unsignalized intersections
# – LOS and side-street delay for unsignalized intersections under this alternative are derived from HCM calculations
LOS – Level of Service

Counts were conducted at the intersection of Elmwood Avenue with Bristol Street on Tuesday, October 30, 2007 during the peak commuter periods of traffic (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.). It should be noted that weather conditions at the time of the counts were favorable for pedestrian activity. The results of the counts are shown below in Table 6.8.

Table 6.8: All-Way Stop Control Warrant Analysis, Elmwood Ave. & Bristol Street

Time Period	EB Elmwood	WB Elmwood	Total of EB & WB	NB Bristol*	SB Bristol*	Total of NB & SB
7:00 – 8:00 a.m.	45	81	126	29	30	59
8:00 – 9:00 a.m.	33	70	103	13	32	45
4:00 – 5:00 p.m.	77	94	171	22	41	63
5:00 – 6:00 p.m.	82	63	145	31	44	75
* -- Data combines vehicles and pedestrians, per MUTCD requirements Minimum volume requirements – 300 vehicles EB & WB; 200 units NB & SB						

Based on the count results, minimum vehicular requirements are not met on either street during any of the observed time periods; therefore, an all-way stop control at this location is not warranted based on vehicular volume. It is further noted that if all of the traffic currently experienced on Middleton Street, south of University Avenue, would re-route to Bristol Street, the resulting traffic increases at this location would still not meet minimum volume warrants.

To evaluate the crash criteria, the City of Middleton provided crash data at this location. Four crash reports were generated for this intersection for the Years 2005 and 2006. Of these, three crash reports indicated a right-angle collision occurred between motorists attempting to cross Elmwood Avenue and motorists traveling on Elmwood Avenue. Given the MUTCD a requirement of at least five crashes reported in a 12-month period to merit consideration, the intersection does not meet minimum crash requirements.

6.8 Short-term Traffic Recommendations

From the results of the intersection and corridor analysis, recommendations were made in an effort to improve traffic flow and safety within the study area under existing volumes with no projection of traffic volumes to depict future traffic conditions. Because of this, the improvements cited below will likely not be as effective if volumes increase. Strong consideration should be given to performing additional detailed analysis to look at future conditions and traffic volume levels, especially if there is consideration to make major improvements with right-of-way impacts. This should ensure that these expenditures would operate sufficiently under future traffic conditions (one would not want to build a five-lane section or make other major improvements only to not have it operate as desired).

1. ***Improve the traffic signals at the intersection of University Avenue with Parmenter Street to include a protective-permissive phase on the University Avenue approaches.*** Intersection and corridor analysis indicates that this improvement, coupled with signal coordination at Cayuga Street, will reduce delays and queues along University Avenue. However, this change may be imperceptible to the motorist as the levels of service differences are not great and the queue differences are approximately five cars at the maximum queue. While delays and queues on the Parmenter Street approaches are projected to increase slightly, they do not impede traffic operations at upstream intersections.

2. ***Install a traffic signal at the intersection of University Avenue with Bristol Street.*** A signal warrant analysis of the intersection indicates that two of eight warrants required to merit consideration were achieved. When coordinated with the Parmenter Street traffic signal, traffic flow along University Avenue will continue at a similar level of service. We recommend that if this signal were to move forward that it be interconnected to the Parmenter signal to make sure that mainline flows are coordinated. This improvement will also greatly benefit pedestrians, as they will be provided gaps in east-west traffic to cross University Avenue safely.

3. ***Improve physical characteristics at the intersection of Elmwood Avenue with Bristol Street to increase safety.*** While all-way stop control of this intersection is not warranted, other measures could be implemented to increase safety at this location. Enhancements such as restricting parking in close proximity to the intersection as well as removing or trimming trees and shrubbery will increase vision triangles for motorists, giving them greater reaction time.

It should be reiterated that the previous recommendations, especially the signal phasing changes at University Avenue and Parmenter Street, are short-term solutions. It is estimated that the signal phasing changes will provide satisfactory traffic operations at this location for approximately four to six years from present-day conditions while the existing signal phasing will provide the same operations for approximately one to two years. After this timeframe, more significant improvements, such as exclusive turning lanes, will be needed to provide adequate traffic flow. The traffic control equipment required to add a protected/permitted left turn phase at University and Parmenter is the same equipment that would be required in the event the city acquires the additional right-of-way to expand the intersection to include dedicated left turn lanes on University Avenue and provide a longer-term solution to the increasing traffic congestion anticipated at this location.

6.9 Considerations for Long-term University Avenue Improvement

Improve University Avenue to provide a five-lane cross-section throughout the study area. From the City's Transportation Network Plan, traffic volumes along University Avenue are expected to increase significantly in the future. At the time of this study, numerous parcels are being developed or planned west of USH 12. It is likely that as those businesses open, additional traffic will want to utilize University Avenue as their primary travel path. This increased traffic will further strain intersection operations due to the lack of adequate left-turn storage. While the five-lane section would be expected to significantly improve current operations at key intersections, the two-way, left-turn lane (TWLTL) does not provide for pedestrian storage or control of other mid-block access points. In addition, with future volumes approaching 41,000 vehicles per day, this improved cross-section may not function adequately.

The city is strongly encouraged to pursue a more detailed future traffic condition operational analysis for this corridor. This would further identify probable operational issues for this type of cross-section. For example, while a TWLTL will provide some immediate relief and some opportunity for left-turning vehicles to sit in the median (a two-stage crossing), it is unlikely that as volumes grow, unprotected crossings and local access points will be able to find gaps to safely move across this corridor during peak periods.

APPENDIX A:

Downtown Agency and Business Comments on Parking Conditions

Downtown Agency and Business Comments on Parking Conditions

In cooperation with the City Planning Department and the Middleton Chamber of Commerce, a request for parking information was made to businesses within the study area. They were asked to describe their peak day(s) and time(s) for parking demand, and an estimate of the amount of parking needed by their business/organization during those times. Fourteen businesses/ organizations provided responses to the request, and the results are summarized below.

TDS Telecom

TDS Telecom has 29 in-house spots and leases 12 additional spaces. They have a few people that still park on the street, so during the peak, they need about 45 parking spots.

TDS's peak demand for parking is from 8 a.m. to 5 p.m. Monday thru Friday

Valencia Condominiums

Relative to the diagonal parking in the front of Valencia Condos, the peak parking is Monday through Friday from 7:30-5:00 for the businesses across the street and on weekend evenings, particularly on Friday and Saturday when the Brewery has entertainment.

Old Middleton Centre

The Old Middleton Centre property addresses include: 1800 and 1818 Parmenter, 7600 Terrace, 7611 Elmwood, and 7507 Hubbard. Regarding the parking lots there seems to be no set times that the lots are either rushed or vacant. Low occupancy rates at times may make them look empty. Over the years the tenants and landlord have policed them to deter others from using the lots during daytime business hours, evenings or weekends. The parking lots are used by the adjoining businesses with no objection by the landlord or tenants, which will likely continue to be true until leased to tenants requiring evening or weekend parking. Regarding street side parking, the landlord has observed that it's used quite often by the tenants accessing primarily their first floor suites (for example, Stark Realty and Happy Pastime).

St. Bernard's Church

Mondays-Fridays:

Twenty-four (24) spots are used by registered members of the parish who have students at Middleton High School. One-third of the parking lot near Franklin Avenue is used by teachers and aides from Middleton High School. The balance of the lot is used for church events (daily mass, funerals, classes, meetings, visitors, staff, etc.) throughout the day.

Saturdays and Sundays

The parking lot is used for masses, weddings and funerals. St. Bernard's also has an agreement with M&I Bank to use their lot for weekend masses and parishioners use the Parmenter Street area for parking.

Little Red Preschool

School staff has 4 parking spaces, parents drive-by for drop-offs and pick-ups. The preschool uses temporary "no parking" signs during Friday afternoon Brewery events to avoid parking in the drop-off area.

Police Department

Monday through Friday the Police Department uses parking for 11 employees for most of the business day, but peaks at 17 employees during shift change at 3 p.m., then drops to 10 to 4:30 p.m., to 7 from 4:30 to 11 p.m., 13 at the 11 p.m. shift change, 6 overnight, and 13 at the 7 a.m. shift change. (These numbers do not include police vehicles.)

They will typically have 0-3 patrons at any one time, except on Thursdays when the number increases to 0 - 6 from 9A - 11A. Also, Thursday at 6:30 p.m., Municipal Court.

Arraignments will bring in another 60-100 patrons.

On the Weekends and Holidays, the Police Department uses parking for 6 employees, peaking at 12 employees at shift changes at 7A, 3P, and 11P. They assume 0 - 3 patrons at any time on a weekend.

Middleton Outreach Ministry

Differences from day-to-day are not noticed at MOM, but they suspect that the peak is between 10:00 - 1:00 p.m. on any given day, and that MOM staff generates 8 cars in the mornings of Tuesday, Wednesday, Thursday, and Friday. Seven staff cars are generated on Monday mornings. There is one less car after 10 am and one less car after 3 p.m. on each of those days. Added to that are about two different cars per hour throughout the day, 9 - 4, M-F, for MOM clients.

M& I Bank

The bank has a total of 77 parking stalls. While they have not gone to assigned parking, the tenants and employees have been made aware of their parking areas. Those areas are:

11 stalls for customer parking
62 stalls for tenants and employees
4 handicapped stalls

If non-tenants, employees or customers did not use the bank parking lot, they believe they have enough parking to accommodate their building. The issue is that people park where they see an open space regardless of signage or notes placed on their windshield. It is an on going problem with 4 to 10 stalls taken up in the morning and again over the lunch hour by people using the bank lot to patronize other downtown merchants or who are renters in downtown who only have on-street parking.

Fire District

Their peak parking demand during the day is unknown due to the fact that people don't generally schedule their emergencies. Monday-Friday the full-time staff uses 7 - 9 parking stalls. Depending on the type of emergency they are paged to, their demand jumps to 15 - 30 vehicles. During Sunday morning and evening trainings the peak demand is in the area of 40 - 45 vehicles. During special events the demand jumps to 50 - 80+ vehicles.

Middleton Antiques Mall

Generally the highest traffic/parking use tends to be from noon to about 5:30 on weekdays and Saturdays from about 11:00 a.m. to 5:00 p.m. and from 11:30 a.m. to 4:00 p.m. on Sunday.

They have their own lot that accommodates 18 vehicles (signed to Middleton Antiques Only during business hours) and 9 on-street spots. They estimate that during their peak time their customers/venders use 15 parking stalls. There are times during sales etc. that they use more.

Capital Brewery

The Brewery's customers vary in familiarity with the facility pending the event. Where this comes into play is how they enter into the community and look for a parking space.

The range of parking needs is:

- Bockfest (last Saturday in February) 3,000 attendees from 11 a.m. to 5 p.m.
- Summer Bier Garten season (Memorial Day – Labor Day) – Wednesday – 100, Thursday – 300, Friday – 1,500 & Saturday – 500. All times range from 4 p.m. - 9 p.m.
- Summer Saturdays special event (e.g., Fireman's event) 2,000+ 1 p.m. – 9 p.m.
- Remainder of the year – is not really an issue, as they seldom require more than 100 spaces.

Middleton Public Library

The library's peak times vary with the time of year.

September through April

Tuesday, Wednesday and Thursday mornings from 9:15 a.m. to 12:00 noon

Storytimes. Parents and children attending these programs probably will use a parking space for up to an hour. On Tuesdays and Wednesdays they have three storytimes each morning. Total attendance averages 80 kids + parents & siblings.

Monday through Friday from 3:30 to 6:00 p.m. (after-school, after-work visits)

Visits to the library at this time of the day are shorter — the majority of parking space probably being occupied for less than 30 minutes.

Tuesday evenings

Finding a parking space can be a challenge if a "hot topic" is on the Plan Commission or Common Council agenda.

With one exception, Saturdays and Sundays generally aren't a problem with City Hall closed. The exception is the 2nd Saturday of each month when the Friends of the Library have their book sale (10 a.m. to 1 p.m.). Parking is usually at a premium from 9:45 until 11:00.

June, July and August

Monday through Friday from 9:30 am to 1:00 pm and 3:00 pm to 6:00 pm. Evenings tend to be quieter than during the school year. Overall, the Library has heavier patterns of use during the summer months.

New Attitudes Beauty Salon

The business at Wayside Place, New Attitudes Beauty Salon, experiences parking issues from 11:00 a.m. to 2:00 p.m. Tuesdays thru Friday because of the noon lunches at the local eating establishments. They are closed Saturday thru Monday. It effects probably six to eight customers daily with many being elderly women.

Village Green

The Village Green's parking demand is as follows:

Monday – Friday 11:30 am to 1:30 pm	40 cars
Saturday – 11:00 a.m. to 5:00 pm	30 cars
Saturday – 5:00 pm to 9:00 pm	40 cars

APPENDIX B:

Parking Data

APPENDIX C:

Warrant Analysis Sheets