UNIVERSITY OF WISCONSIN – MADISON

TRANSPORTATION SERVICES

JUNE 25, 2018

CAMPUS BUS PROGRAM EVALUATION

KA ASSOCIATES
OVERLAND PARK, KANSAS

I. INTRODUCTION AND PROJECT DESCRIPTION

KA Associates, a Kansas City region-based transit consulting firm has been retained by the Transportation Services Department of the University of Wisconsin – Madison to provide an evaluation of the Campus Bus program performance used by University students, faculty, staff, and visitors. The transit services specifically under review are Madison Metro Transit routes 80, 81, 82, and 84. The goals of the project are the following -

- Evaluation of peak demand overcrowding on Route 80
- Assess Campus Bus travel times across campus with recommendations for possible route alignments
- Evaluate opportunities with the current service provider – Metro Transit
- Explore possible late-night campus transportation demand

KA Associates staff conducted two site visits to the campus to ride the campus routes while in operation, interview passengers and bus operators, observe areas of traffic / pedestrian conflict, reactions of the passengers as they waited for the buses, and passenger conduct while on the buses. As part of the visit, notes were taken regarding the condition of the buses in use for the campus routes, conditions of bus shelters, and available access and constraints to the bus stops. While not limiting, the consultants also reviewed available technology that passengers could access to determine location and schedule adherence of the bus. KA Associates also rode route service of Metro Transit that was not part of the study work.

The sponsoring Department of this study, Transportation Services, coordinates the funding and operation of the transit services offered to the University students, faculty, and staff by Metro Transit. Besides this transit service and in keeping with the Department's mission to "provide innovative transportation solutions that serve and support the University of Wisconsin-Madison", Transportation Services offers a broad array of modal options for the University community including active transportation such as bicycle and walking programs, and promotion of ride matching and car-sharing. Transportation Services also manages the University's parking inventory and uses some of the funds generated from parking services to fund these alternative transportation programs. Other major funding partners for the Campus Bus and Metro Transit subsidies for off campus routes include the Association of Students of Madison and the University Housing Department.

II. SERVICE OVERVIEW AND CAMPUS MOBILITY CHARACTERISTICS

The University of Wisconsin has contracted with Madison Metro Transit to provide bus service on and near the Madison campus as well as purchasing fixed route bus service on the balance of the Metro route. For the campus routes that are the focus of this review – Routes 80, 81, 82, and 84 – the University pays a contracted rate per hour for the weekday, weekend, and break services provided. These campus routes are free to the passenger with funding coming from three sources:

- Association of Students of Madison (ASM) at 57.5% from student fees;
- Transportation Services at 35% from parking revenues, and;
- University Housing at 7.5%

While not part of this study, University students and employees have access to the remaining Metro routes through the use of an unlimited ride transit pass. These passes are free to students, again paid with ASG student fee. Faculty and staff pay an annual fee of $36.00 to gain their bus passes with the remaining cost of the employee transit pass paid from Transportation Services revenue. Card access is monitored at the farebox as the student or employee boards the bus and Metro charges $1.15 per trip. Using February 2017 as a base data point, students took 308,810 trips on routes other than the Campus Bus routes and employees took 156,214 trips during the same time period.

A. METRO TRANSIT SERVICE OVERVIEW

Vehicles - Metro Transit operates 40-foot heavy-duty rated transit vehicles for these routes using both conventional diesel and CNG fuel. The seating configuration for these buses typically are 38 seated and 15 standees for a total passenger capacity of 53 or an alternative configuration of 35 perimeter arranged seats with 21 standing for a total capacity of 56. During the site visit, we observed an early afternoon trip on a perimeter seating bus leaving Memorial Union in which 72 passengers were aboard. Visual observations from the street indicate many times in which the passenger load appears to exceed the suggested capacity.

The overall condition of the buses was unclean but not filthy for both interior and exterior. However, in both instances when the routes were taken, there had been snow events prior and passengers were tracking mud and sand into the bus. University staff indicates that all buses are swept and cleaned every night after their service is complete. Information racks within the buses were supplied with route brochures and schedule guides. There were significantly higher levels of mechanical noise than one would expect from normal operation.

Operators – While riding the Campus Routes, KA Associates took the opportunity to interview bus operators. In all instances, these drivers seemed genuinely content at their work and showed true interest in dealing with University students, employees and visitors. One indicated that he much preferred to drive the Campus Routes as it made the shift faster and he enjoyed the interaction with the students. They were professional in appearance and manner.

Shelters and Signage – Metro Transit provides the maintenance of shelters on the University campus. The most shelters are designed with unique "University of Wisconsin" markings and contained benches and route information. Most shelters were well maintained with little trash. The trash receptacles in the area were empty. Some of the shelters had glass glazing that had failed due to an improper cleaner that damaged the glass. It is our understanding that these damaged glass panels will be replaced.

All stops, including those with shelters, are clearly marked with Metro Transit bus stop signs. These standard signs include the routes that are available at the stop, phone number, and stop ID information for tracking the route online.

Bus Location Technology – The stop ID's placed on the bus stop signs are geo-coded to a Google Maps location through the Metro Transit website. This online stop information provides schedule arrival information for all routes that use that stop. However, several times when the stop ID times on the website were checked against the published timepoint arrivals, the displayed times on the website were incorrect against published times in the Metro Transit Ride Guide. Additionally, on one occasion, the map link to the stop ID placed the stop out of state in Santa Ana, CA.

The University website has an online bus locator system that provides more accurate information regarding scheduled arrival times by bus stop, predicted arrival time, and a bus icon on the route map showing the location of the bus. However, in checking this information against field observations, the location of the bus on the map did not match the bus location in real time thereby creating a false sense of anticipated bus arrival if you are not at the stop.

B. Ridership Overview

Consumer Preferences

At least every two years since 1981, Transportation Services has conducted a customer survey that asks students and employees about their behavior in getting to and around campus. The longevity of the survey allows the Department to understand not only the use of existing services sponsored by the Department but also view use trends over time. The last survey was conducted in October and November of 2016. A new survey will be taken in the fall of 2018.

The Transportation Survey provides a window into the mode uses and needs of University employees and students. Hospital employees also received an invitation to participate in the survey. The analysis below shows responses from student and employees.

Key questions in the survey differentiate between mode choice in good weather and bad weather. There was a significant shift in mode use with this as a variable. Both of KA Associates' two site visits were in what would be considered good weather (although cold) circumstances. Significant information gleaned from key data includes:

Q: How many miles is it one way from your current daily residence to campus?

Miles	< 1	1 - 2	3 - 5	6 - 10	11 – 25	≥ 26
Students	47%	30%	13%	7%	3%	1%
Faculty/Staff	2%	10%	28%	30%	20%	10%

Significance – Almost 50% of all students live within one mile of the campus and over 75% within two miles thereby making alternatives to driving to school possible. The reverse for employees where 88% live beyond 3 miles of the campus.

Q: How often, if ever, do you ride the Campus Bus (Routes 80, 81, 82, 84)? (Students Only)

	Students	Employees
Never	27.09%	48.55%
Less than once a week	31.57%	34.07%
About once a week	15.68%	8.01%
More than once a week	16.90%	7.67%
Every day	8.76%	1.70%

Q: How often, if ever, do you ride the Campus Bus AT NIGHT (Routes 80, 81, 82)? (Students Only)

	Students	Employees
Never	22.56%	74.42%
Less than once a week	35.38%	19.93%
About once a week	22.28%	2.66%
More than once a week	15.60%	2.66%
Every day	4.18%	0.33%

Significance – The percentage of students that report never riding the Campus Bus service changes for the service at night. More students will ride once a week at night. About 18% of employees will use the Campus Bus about once per week but do not use the service at night.

Q: During good (GW)/bad (BW) weather what is your most frequent way of traveling to campus?

Mode	Students		Employees	
	GW	BW	GW	BW
Walk	45%	30%	3%	3%
Bicycle	24%	6%	17%	2%
Moped	3%	1%	0%	0%
Motorcycle	0%	0%	1%	0%
Drive alone	8%	10%	53%	56%
Private bus	1%	0%	0%	0%
Drop off	1%	2%	2%	4%
Carpool	0%	0%	4%	4%
Vanpool	0%	0%	1%	1%
Metro bus	14%	27%	15%	24%
Campus Bus	4%	21%	1%	1%
Other bus	1%	0%	1%	1%
Other	0%	0%	2%	2%

Significance – Not surprisingly, with over 75% of all students living within 2 miles of campus, walking and biking are the largest mode choices for students. Student use of the Metro Transit bus and Campus Bus increases two times and five times respectively between good and bad weather. For employees, driving alone is consistent in both weather conditions and bicycle use moves to Metro Transit bus in bad weather. Employee use of the Campus Bus is low (1%) but consistent.

Q: How long does it usually take you to travel to campus from your current residence?

	Students		Employees	
	GW	BW	GW	BW
10 minutes or less	37.13%	20.60%	7.35%	3.51%
11 to 20 minutes	39.55%	37.64%	30.88%	17.86%
21 to 30 minutes	16.04%	26.40%	31.55%	25.88%
31 to 45 minutes	4.66%	10.86%	20.70%	28.55%
46 to 60 minutes	1.68%	2.43%	7.35%	14.86%
More than an hour	0.93%	2.06%	2.17%	9.35%

Significance: For students, the shift to Metro and Campus Bus routes in bad weather may indicate either a perception that the buses are slower than walking or that they are fuller thereby necessitating waiting on the next bus. For employees, the increased travel time to campus may be indicative of street conditions or traffic delays.

Q: When do you usually arrive on campus for the day?

Arrival Times	Students	Employees
Before 7:00 am	3.23%	12.06%
7:00 am to 7:59 am	14.80%	32.83%
8:00 am to 8:59 am	32.26%	35.68%
9:00 am to 9:59 am	31.88%	13.07%
10:00 am to 10:59 am	10.63%	3.18%
11:00 am to 11:59 am	3.23%	0.84%
12:00 pm to 12:59 pm	1.90%	0.67%
1:00 pm to 1:59 pm	1.14%	0.17%
2:00 pm to 2:59 pm	0.00%	0.17%
3:00 pm to 3:59 pm	0.38%	0.17%
4:00 pm to 4:59 pm	0.19%	0.50%
5:00 pm to 5:59 pm	0.38%	0.00%
6:00 pm to 6:59 pm	0.00%	0.00%
After 7:00 pm	0.00%	0.67%

Significance – Emphasis should be placed in transportation resources that get students to campus in time for classes. Critical time periods for this demand are 8:00 a.m. to 11:00 a.m.

Q: When do you usually leave campus for the day?

Departure Times	Students	Employees
Before 7:00 am	0.57%	0.84%
7:00 am to 7:59 am	1.15%	0.34%
8:00 am to 8:59 am	1.53%	0.50%
9:00 am to 9:59 am	2.10%	0.17%
10:00 am to 10:59 am	0.76%	0.17%
11:00 am to 11:59 am	0.57%	0.00%
12:00 pm to 12:59 pm	2.86%	0.67%
1:00 pm to 1:59 pm	1.91%	0.84%
2:00 pm to 2:59 pm	6.68%	2.52%
3:00 pm to 3:59 pm	15.46%	10.74%
4:00 pm to 4:59 pm	20.23%	37.58%
5:00 pm to 5:59 pm	17.94%	30.70%
6:00 pm to 6:59 pm	9.73%	9.56%
After 7:00 pm	18.51%	5.37%

Significance – The distribution of student times leaving campus is not as concentrated as arrival. Student evening departures at almost 20% suggesting a need for evening transit service, especially when Metro buses have finished for the day. Employee departures follow a typical 8 a.m. to 5 p.m. work day schedule in which most Metro routes are at peak schedule.

Q: Based on your current schedule, which days of the week are you normally on campus?

Day of the Week	Students	Employees
Sunday	34.40%	9.11%
Monday	94.41%	95.62%
Tuesday	94.99%	96.12%
Wednesday	94.80%	95.62%
Thursday	93.06%	95.28%
Friday	87.09%	91.06%
Saturday	36.80%	11.97%

Significance – The consistently high on-campus schedule Monday through Friday demands the large attention to mode choices. The reduced levels of transit service on weekend is justified based on the noted access needs of student and employees.

Q: Where do you currently live (students only)?

Location	%
Eagle Heights / University Houses	5.09%
University residence hall	17.31%
Other	77.60%

Significance – The exceptionally high number of off-campus respondents may represent a greater reliance on Metro route needs over Campus Bus transit need.

Q: Does a Madison Metro bus stop within four blocks of your residence?

	Students	Employees
Yes	85.17%	55.27%
No	9.02%	41.84%
Not Sure	5.81%	2.89%

Significance: There is walking access to Metro routes for students, thereby more use of the Metro services and more than half of employees also have easy access with potential for additional employee use.

Route Performance Statistics

- ## Data Methodology

In the analysis of transit services, a key performance metric is obviously ridership, usually reported in passengers per hour or passengers per mile. Collection of ridership data is critical in developing this information.

On-board ridership data is generally developed in two methods –

- Bus Operator collection in which the driver encodes passenger information into a key pad on the farebox. Using the correct technology, this method can provide boarding data geo-coded by stop, passenger differentiation such as cash, fare

card, university ID, disability, wheel-chair, bicyclist, etc. Errors in this methodology can occur should the driver become distracted, loose count, have passengers enter the vehicle via the rear door or a multitude of other interruptions.

- The second common method of collecting ridership information is via Automated Passenger Counters (APC). This technology is relatively new to the transit industry and can come in many forms including but not limited to video data sensors, cameras, light beams at the passenger doors, or touch sensitive sensors embedded in the floor.

In riding the Campus Bus routes for this project, we observed some of the problems associated with the manual collection of ridership, specifically on Route 80. In interviewing one of the bus operators, he readily admitted that distractions cause him to not accurately track passengers as they board, especially if they board in the rear door. In other instances, we observed drivers that would forget to encode the ridership at the stop and then try to "catch-up" as they drove down the street. For this reason, the accuracy of the ridership data collected and used for analysis is suspect.

During the time of our work at the University of Wisconsin – Madison, Metro Transit planning staff was testing recently installed APC devices to assist in their data collection. This collection test occurred the week of March 4th through 10th. These APC devices should track ridership by location on each route and time of service.

Not all buses in use on the routes during this collection period were equipped with the APC equipment. The fact that all buses were not equipped with the APC technology created a problem for 100% collection and comparison of the data between driver input and ACP counts. The ridership information that was collected by APC was significantly underreporting the data compared to driver data. For this reason, the ridership data used for this study will be manually entered data reported by Metro Transit.

- **Ridership Demand**

As noted above, the collection of ridership data for the March 4th through 10th period may have been imperfect in the methodology. However, the synthesis of data provided by Metro Transit shows a clear pattern of use of the campus bus service – especially as it relates to hourly use. From the report generated by University of Wisconsin – Madison Transportation Services and shown below, there is currently a clear pattern for transit demand on Route 80 during a peak that corresponds with times of highest classroom use as well as when the highest frequency and resources are assigned to Route 80.

From the table below 93.75% of the ridership of Route 80 for the reporting period occurs Monday through Friday with weekend ridership accounting for only 6.25%. Several patterns of weekday ridership use emerge from a review of the table.

- Ridership in the morning during the reporting period shows a relative even pattern of use;
- Highest ridership during the weekday occurs during the mid-afternoon just as the frequency of service is reducing, and;
- Tuesday and Thursday use differs from Monday and Wednesday, probably due to changes in the length of class times.

CAMPUS BUS SERVICE ROUTE RIDERSHIP BY HOUR March 4th through 10th Source: Metro Transit and UWM Transportation Services														
	Sunday, March 4, 2018		Monday, March 5, 2018		Tuesday, March 6, 2018		Wednesday, March 7, 2018		Thursday, March 8, 2018		Friday, March 9, 2018		Saturday, March 10, 2018	
Grand Total	1644	2.53%	12607	19.37%	12991	19.96%	12639	19.42%	11764	18.07%	11033	16.95%	2419	3.72%
12 AM	87	5.29%	20	0.16%	23	0.18%	21	0.17%	25	0.21%	39	0.35%	54	2.23%
1 AM	4	0.24%	7	0.06%	6	0.05%	7	0.06%	11	0.09%	35	0.32%	37	1.53%
2 AM		0.00%		0.00%		0.00%		0.00%		0.00%	17	48.57%	30	81.08%
5 AM														
6 AM			72	0.17%	83	0.19%	81	0.19%	65	0.15%	64	0.15%		
7 AM	14	0.85%	320	2.54%	402	3.09%	381	3.01%	408	3.47%	277	2.51%	11	0.45%
8 AM	28	1.70%	998	7.92%	742	5.71%	746	5.90%	541	4.60%	532	4.82%	52	2.15%
9 AM	53	3.22%	1025	8.13%	1079	8.31%	918	7.26%	972	8.26%	553	5.01%	62	2.56%
10 AM	80	4.87%	863	6.85%	965	7.43%	1069	8.46%	1124	9.55%	824	7.47%	113	4.67%
11 AM	72	4.38%	972	7.71%	674	5.19%	615	4.87%	606	5.15%	715	6.48%	139	5.75%
12 PM	75	4.56%	956	7.58%	1234	9.50%	684	5.41%	1060	9.01%	966	8.76%	154	6.37%
1 PM	74	4.50%	1107	8.78%	914	7.04%	889	7.03%	668	5.68%	738	6.69%	345	14.26%
2 PM	62	3.77%	1201	9.53%	1159	8.92%	1052	8.32%	1798	15.28%	990	8.97%	218	9.01%
3 PM	107	6.51%	1427	11.32%	1380	10.62%	1136	8.99%	1515	12.88%	1009	9.15%	249	10.29%
4 PM	104	6.33%	1385	10.99%	1837	14.14%	1805	14.28%	838	7.12%	1227	11.12%	94	3.89%
5 PM	170	10.34%	867	6.88%	996	7.67%	1102	8.72%	600	5.10%	733	6.64%	163	6.74%
6 PM	138	8.39%	595	4.72%	448	3.45%	901	7.13%	443	3.77%	1023	9.27%	113	4.67%
7 PM	160	9.73%	298	2.36%	405	3.12%	549	4.34%	361	3.07%	567	5.14%	168	6.95%
8 PM	172	10.46%	267	2.12%	329	2.53%	321	2.54%	399	3.39%	411	3.73%	115	4.75%
9 PM	77	4.68%	89	0.71%	180	1.39%	193	1.53%	196	1.67%	119	1.08%	153	6.32%
10 PM	131	7.97%	88	0.70%	86	0.66%	94	0.74%	70	0.60%	120	1.09%	97	4.01%
11 PM	36	2.19%	50	0.40%	49	0.38%	75	0.59%	64	0.54%	74	0.67%	52	2.15%

Significance: Delivery of students and employees to class and work is the essential function of the Campus Bus routes. This trip specific ridership data is critical in order to fully understand the impact of ridership loading, trip time, and location. While errors have been noted above in the collection methods used to determine ridership statistics that are dependable for planning purposes, the report from Metro Transit provides a clear appreciation of when demand occurs during service times. What is not reflected in the data from Metro Transit is what unmet demand exists by hour and day. Based on information gleaned from staff, passengers, and drivers, several times during the peak periods stops are by-passed due to the bus overcrowding at that time. A greater understanding of this demand not served would be helpful in developing firm recommendations for additional service.

Ridership Reporting

Campus Bus Service Monthly Ridership Comparison

Route	September 2016	September 2017	% Difference	Weekday Ridership Est[1]
80	200,600	182,034	-9.3%	10,213
81	4,508	4,176	-7.4%	372
82	4,652	4,574	-1.7%	214
84	1,198	1,658	38.4%	115
System Wide Metro	1,257,821	1,116,085	-11.3%	
System Wide Metro w/o Campus Bus Routes	1,046,863	923,643	-11.8%	

Campus Bus Service Passengers Per Revenue Hour (September 2016/2017)

Route	September 2016	September 2017	% Difference	Metro Transit System Rank
80	76.97	80.90	5.1%	1st
81/82	27.37	27.99	2.3%	19th
84	38.00	34.76	-8.5%	10th
System Wide Metro	32.43	31.19	-3.8%	
System Wide Metro w/o Campus Bus Routes	30.04	28.53	-5.0%	

Significance: There are 62 routes in the Metro Transit route system.[2] From a performance perspective, the Campus Bus routes rank within the top 20 including the number one route for passengers per hour of service. As discussed later, other routes within the Metro system that have high student or employee use are also top performers. The University has a significant impact on ridership with the Metro system. As such, the relationship between Metro as a solution to mobility needs of the University and the University as a major consumer (and funding source) for Metro is linked.

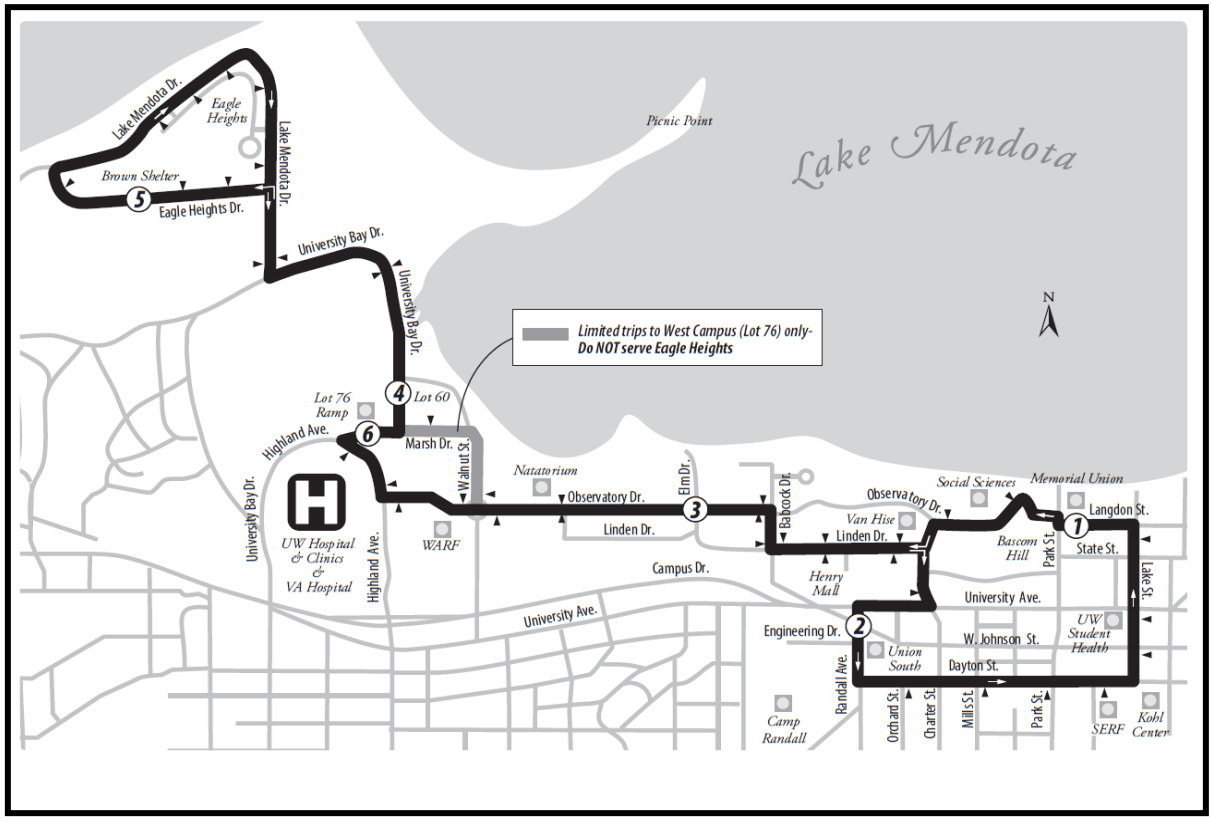
[1] Metro Transit Weekday Estimate by Stop, March 2016. See Attachment I
[2] Includes supplemental school, commuter, and weekend service

C. Campus Bus Routes Overview

Route 80 – UW Memorial Union / Eagle Heights

Route 80 is by far the highest ridership of the four campus routes. It is also the route that experiences the greatest operating challenges, specifically over-crowding and schedule adherence due to traffic and pedestrian crossing conflicts that occur at multiple locations during class changes.

Service Area: University campus route to academic, recreational, entertainment, athletic, parking, and housing areas.



Map 1. Route 80[3]

General Description of Service: This route operates both weekday and weekend throughout the year. Schedule service is reduced during University breaks and the summer semester. During peak weekday service, there are seven buses assigned to this route. The large number of buses is indicative of the demand placed on this route to provide access to and from campus housing areas and employee parking to academics, recreation, and entertainment destinations.

[3] From Metro Transit Ride Guide

Campus Route 80	Service Times	Buses	Headway
Weekday During Fall and Spring Academic Calendar	6:10 a.m. to 7:02 a.m.	3	20 minutes
	7:02 a.m. to 9:34 a.m.	7	7 minutes
	9:34 a.m. to 2:54 p.m.	7	6 minutes
	2:54 p.m. to 5:27 p.m.	7 to 5	7 minutes
	5:27 p.m. to 8:29 p.m.	4	12 minutes
	8:29 p.m. to 9:20 p.m.	3	17 minutes
	9:20 p.m. to 9:50 p.m.	1	30 minutes
	9:50 p.m. to 12:20 p.m.	1	50 minutes
	12:20 p.m. to 2:59 p.m.	1	45 minutes[4]
Weekday During Summer and Other Recess	6:15 a.m. to 7:00 a.m.	2	20 minutes
	7:00 a.m. to 5:24 p.m.	4	12 minutes
	5:48 p.m. to 12:44 a.m.	1	~50 minutes
Weekend During Academic and Recess	7:45 a.m. to 2:59 a.m.	1	50 minutes

Major Destinations:

- Campus Academic Buildings
- West Campus Housing/Eagle Heights
- State Street Entertainment/East Off-Campus Housing
- South Campus Housing
- Memorial Union

Major Boardings By Location[5]

Location	Est. Weekday Boardings	Attraction
Obser. @ Elm EB	984	West Campus Res Halls
Eagle Heights Loop	953	Univ. Apts
Memorial Union	750	Area Academics / Entertainment
Lake @Langdon	690	East Off-Campus / State St Enter
Lake @ Johnson	629	South Campus Housing / Metro Transfers / Entertainment
Linden @ Charter WB	607	Academic
Hospital EB	561	Academic / Medical
Randall @Engineering	528	Academic / Union South
Obser. @ Natatorium EB	455	Academic / Recreation
Linden @ Charter EB	451	Academic
Total Est. Weekday Ridership	10,213	

Observations: At class changes the buses can get off schedule due to pedestrian crossing, especially at the intersection of Linden and Charter. KA Associates conducted pedestrian crossing counts at 10:48 a.m. before a Thursday class start of 11:00 a.m. During these counts, there was a peak of 194 crossings per minute within the intersection and complete vehicular gridlock. Minimal vehicular flow occurred at 10:54 a.m. with crossings down to 91 per minute and free flow in the intersection at 10:57 a.m. when the crossings were at 37 per minute. At that time pedestrian had to be

[4] Last two trips Friday through Sunday only

[5] Estimated Weekday Boardings from Metro Transit. These 10 Boarding Locations Represent 65% of Route 80 Total 10,213 Weekday Boardings

mindful of vehicles pulling into the intersection. Prior to that time, pedestrians routinely failed to check on vehicles in the intersection when crossing.

As a result of this delay, two eastbound Route 80 buses were stopped at the intersection with one westbound bus stopped. These delays resulted in serious gaps in the frequency of the buses. While the scheduled headway is 6 minutes during this portion of the schedule, the time gaps between westbound buses ranged from 1 minute to 13 minutes. Gaps in the headways of eastbound buses ranged from 1 minute to 10 minutes. To the credit of the bus operators, the frequency did return to normal during free flow by 11:20 a.m. when buses were not as burdened with dwell times at stops for boarding and alighting nor pedestrian crossings.

Pros:

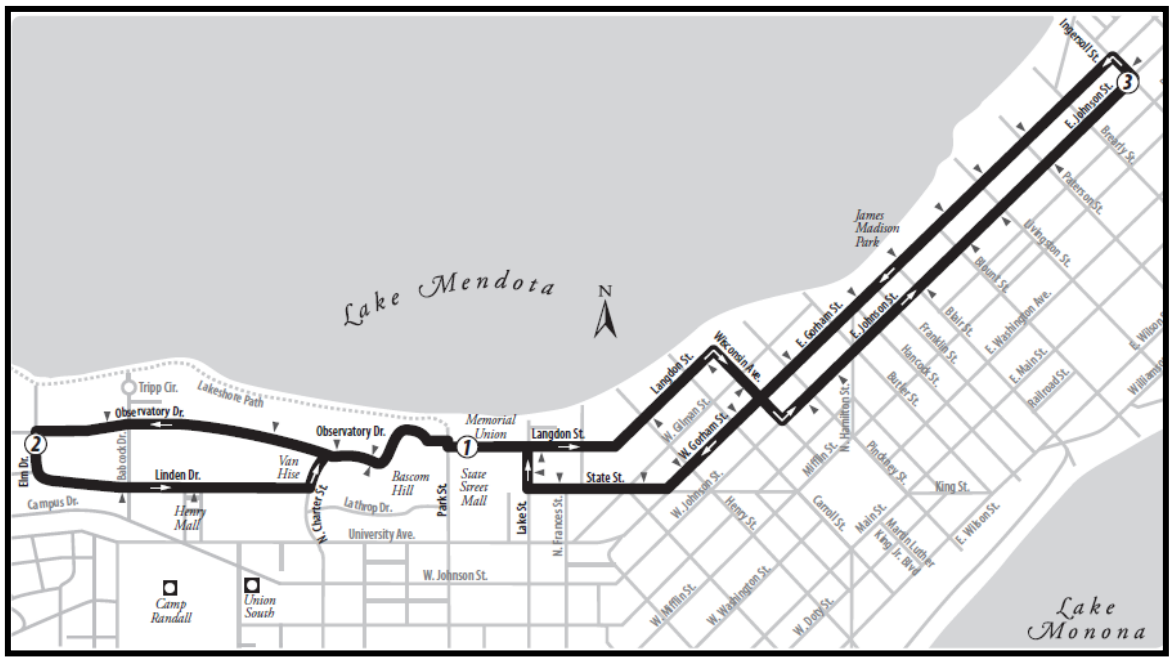
- This route is the most productive of the routes within the Metro system
- It provides connection between the major academic and on-campus housing areas of the University
- Scheduled 6-minute frequency of service during weekday peak

Cons:

- Frequently crowded, especially prior to class change times.
- The route splits during peak between a "short" route with a west terminus at Lot 76 and a "long" route that ends at Eagle Heights. This can be confusing for passengers going to Eagle Heights should they get on the "short" route.
- Vehicle/pedestrian conflicts along the route due to class changes can cause the buses to bunch and get significantly off schedule.

Route 81 – UW Observatory / Johnson Loop

Route 81 is an evening route that provides supplemental service in the evening to areas that Metro Transit provides service to during the daytime (See Map 2). As shown on Map 3, areas served by the route have high concentrations of off-campus student housing. This route allows the student residents of these neighborhoods to access the campus. The route connects these students with academic areas along Observatory and Linden in the west campus area as well as State Street entertainment. The route operates weekdays and weekends when the University classes are in session. A major performance issue with this route is the low ridership in the areas east of Wisconsin Avenue. This loop that runs from Wisconsin Ave. to Ingersoll St. on Johnson St. and Gorham St. makes up over one-third of the route's distance but average's 16 passenger boardings per day.



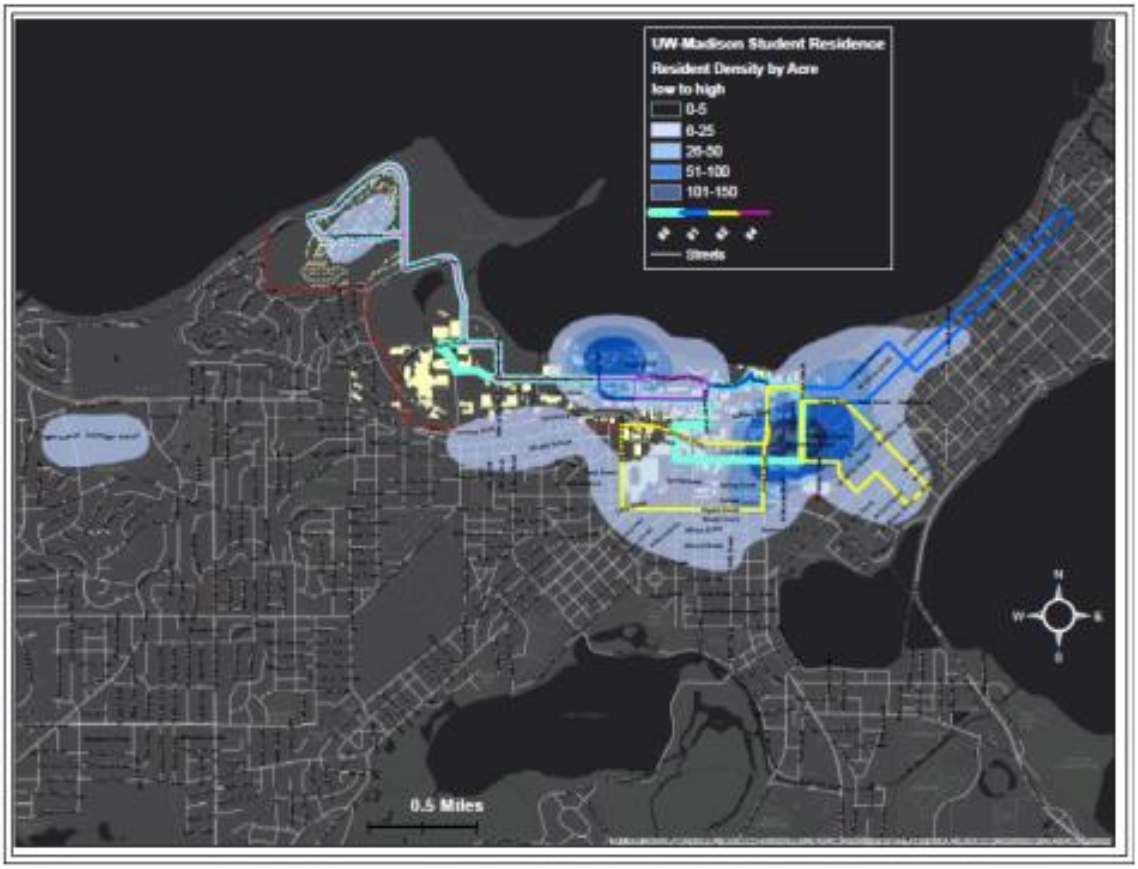
Map 2. Route 81[6]

Service Area: Off-campus student residential neighborhoods east of the campus, west campus academic areas, and State Street entertainment.

General Description of Service: This route operates both weekday and weekend service throughout the year. There is no reduced schedule during University breaks and the summer semester. There is one bus assigned to this route.

Campus Route 81	Service Times	Buses	Headway
Weekday and Weekend	6:37 p.m. to 2:07 a.m. and 3:07 a.m. on Friday and Saturday	1	30 Minutes

[6] From Metro Transit Ride Guide



Map 3. Concentration of Off-Campus Student Housing and Campus Bus Routes[7]

Major Destinations:

- Campus Academic Buildings
- State Street Entertainment
- East Off-Campus Neighborhoods
- Memorial Union

Major Boardings By Location[8]

Location	Est. Weekday Boardings	Attraction
Memorial Union - WB	137	Area Academics / Entertainment
Elm So. Of Obser.	37	West Campus Housing / Area Academics
Memorial Union - EB	33	Area Academics / Entertainment
Henry Mall	20	Area Academics
Lake @ Langdon	20	Area Academics / State St. Entertainment / West Campus Housing
Total Est. Weekday Ridership	372	

Observations: This route, while not rushed, covers a large area within a 30 headway. Boardings in the area east of Wisconsin Ave. are minimal but what is not known is how many passengers board on campus and use Route 81 to return to these neighborhoods since the boarding data do not provide information about how many passengers alight

[7] University of Wisconsin, Transportation Services
[8] Estimated Weekday Boardings from Metro Transit.

within this area. We did observe several passengers that were clearly not affiliated with the University but used the route instead of paying on the other Metro routes running in the area.

Pros:

- Even though this route only runs for 7 ½ to 8 ½ hours per day, it does perform well using the metrics of passengers per hour of service. This route, matched by Metro with Route 82, is the 19th highest route in this performance indicator of the 62 routes within the Metro system.
- Most of the daytime neighborhood routes of Metro that run in the area east of campus have stopped operation by 7:00 p.m. (Route 2 until midnight). This route provides late night service for students living in the area.
- Scheduled 30-minute frequency of service
- While there have been reports of trips that are crowded, statistically the route has adequate capacity for the current ridership.

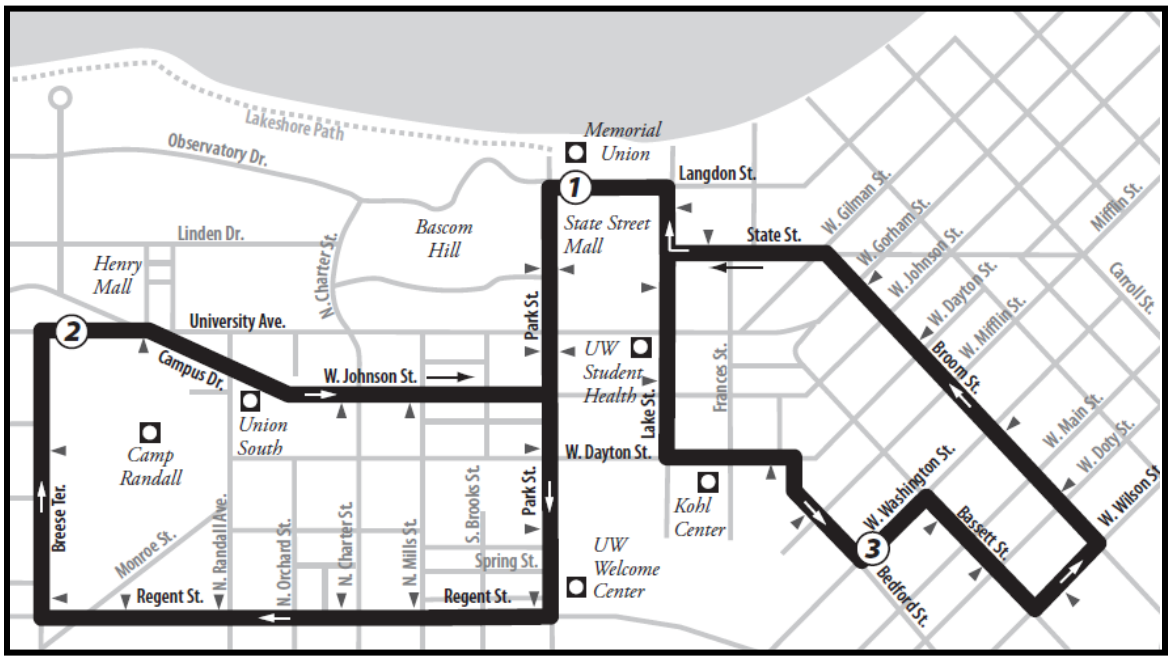
Cons:

- Low boardings east of Wisconsin Avenue.

Route 82 – UW Breese / West Washington Loop

Route 82 essentially mirrors Route 81 in operating characteristics and function. The route operates during the evening in neighborhoods with significant off-campus student housing. The Route connects these areas with campus academic and entertainment. (See Map 4) Additionally, like Route 81, there are areas of low boardings, especially southeast of the campus in the area east of Kohl Center.

Service Area: Off-campus student residential neighborhoods southwest and southeast of the campus, Memorial Union, south campus academic areas, and State Street entertainment.



Map 4. Route 82[9]

General Description of Service: This route operates both weekday and weekend service throughout the year. There is no reduced schedule during University breaks and the summer semester. There is one bus assigned to this route.

Campus Route 82	Service Times	Buses	Headway
Weekday and Weekend	6:36 p.m. to 2:06 a.m. and to 3:06 a.m. Friday and Saturday	1	30 minutes

Major Destinations:

- Campus Academic Buildings
- State Street Entertainment
- Memorial Union
- South and East Off-Campus Neighborhoods

[9] From Metro Transit Ride Guide

Major Boardings By Location[10]

Location	Est. Weekday Boardings	Attraction
Memorial Union – SB	48	Area Academics / Entertainment
Memorial Union – EB	44	Area Academics / Entertainment
State St. E of Lake	13	Entertainment
University at Charter	11	Area Academics / Housing
Total Est. Weekday Ridership	213	

Observations: As with Route 81, the route is not rushed but it does cover a large area within a 30 headway. While low boardings on Route 81 were concentrated in one area, they are more spread on this route. And the data we have do not tell us where those 100 passengers that get on at the Union get off.

Pros:

- This route provides late night service to southeast and southwest off-campus student housing areas after Metro service stops.
- Scheduled 30-minute frequency of service.
- While there have been trips that are crowded, statistically the route has adequate capacity for the current ridership.

Cons:

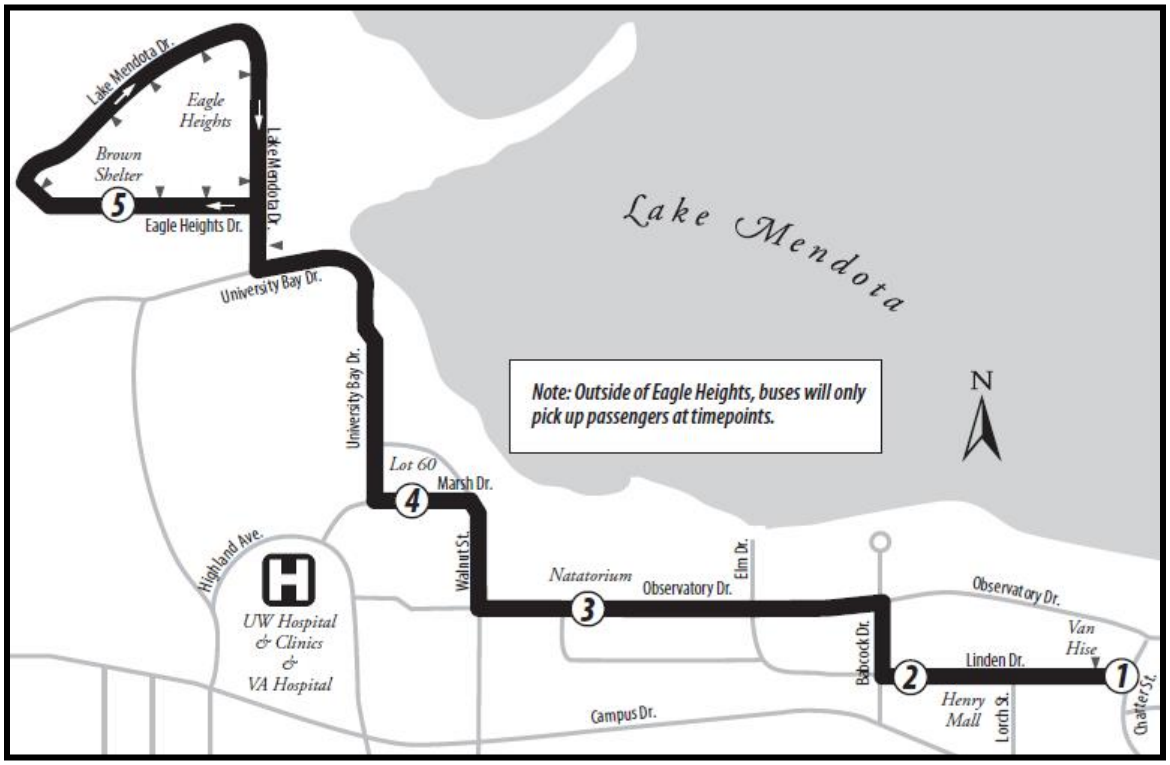
- Low ridership

[10] Estimated Weekday Boardings from Metro Transit.

Route 84 – UW Eagle Heights Express

Route 84 provides two hours of late afternoon, limited stop service directly to the Eagle Heights housing area northwest of campus. Boardings are outbound only leaving from Van Hise Hall on Linden. (See Map 5)

Service Area: West academic area buildings, Natatorium, Hospital parking, and Eagle Heights.



Map 5. Route 84[11]

General Description of Service: This route operates weekdays only during both the academic year and recess schedule. There is one bus assigned to this route.

Campus Route 82	Service Times	Buses	Headway
Weekday	4:40 p.m. to 6:54 p.m.	1	30 minutes

Major Destinations:

- West Campus Academic Buildings
- Eagle Heights Housing
- Employee Parking

[11] From Metro Transit Ride Guide

Major Boardings By Location[12]

Location	Est. Weekday Boardings	Attraction
Van Hise Hall on Linden	49	Area Academics
Linden and Babcock	49	Area Academics
Total Est. Weekday Ridership	115	

Observations: Route 84 provides premium transit service to Eagle Heights from the west campus area. In speaking with one of the passengers living at Eagle Heights who identified herself as a professor, she indicated she preferred this route over Route 80 as it was less crowded. This route does not stop at the heavily used west residence hall stop.

Pros:

- Exclusive service for the residents of Eagle Heights and those employees parking in remote campus lots.

Cons:

- Duplicates Route 80 service which is operating every 7 to 12 minutes to Eagle Heights during the same time.

[12] Estimated Weekday Boardings from Metro Transit.

Metro Transit Routes

While this report is not directed to review the University's relationship with Metro Transit line service, it is necessary to recognize the use by students and employees of Metro Transit and the impact these routes have for access to and through the campus. As mentioned earlier, employees and students may get an unlimited pass that allows access to these fixed routes.

Use of this pass cannot be understated. University ridership, both students and employees, account for over 65% of the routes' ridership shown below. These routes are some of the highest ridership routes in the Metro system. Overall, for this period of February 2017, University use of all Metro routes account for almost 50% of total Metro ridership.

University Utilization of Metro Transit Fixed Routes - February 2017
Top 15 Routes

Metro Route	Student Rides Feb 2017	Employee Rides Feb 2017	Total Student and Employee	Total Route Ridership	University Percentage of Riders	Route Charactieristic
10	62,944	15,915	78,859	84,896	92.89%	Class time service to east campus neighborhood - Route 81.
1	3,086	179	3,265	3,522	92.70%	Mid-Day service in area of Route 82
28	18,822	13,276	32,098	35,205	91.17%	A.M./P.M. service - Route 81
44	4,067	2,766	6,833	7,780	87.83%	Peak hour A.M./P.M. southeast of campus -Route 80
38	19,120	11,152	30,272	36,288	83.42%	Peak hour A.M./P.M. east of campus - Route 80
11	3,555	2,590	6,145	7,615	80.70%	Peak hour A.M./P.M. to east Park/Ride - Route 80
8	2,213	416	2,629	3,334	78.85%	Weekend Shopper
37	4,213	836	5,049	6,417	78.68%	Peak hour A.M./P.M. Crosstown
19	7,869	3,453	11,322	15,367	73.68%	Southwest connector
2	57,801	23,158	80,959	110,040	73.57%	WTP/NTP Crosstown.
14	10,723	6,780	17,503	25,098	69.74%	West Madison campus connector
48	360	95	455	667	68.22%	Limited A.M./P.M. connector to STP
72	3,554	4,820	8,374	12,451	67.26%	Peak hour A.M./P.M. commuter - Middleton
15	16,043	11,463	27,506	41,135	66.87%	Peak ETP connector
70	6,367	2,062	8,429	12,650	66.63%	Northwest connector to Capitol
Total Metro Ridership	308,810	156,214	465,024	937,298	49.61%	

The natural geography of the City forces all cross-through routes to bi-sect the campus (Johnson/University). Route planning by Metro recognizes the demand for transit to key campus destinations and in off-campus neighborhoods and therefore mimics both Route

80 and the areas served by Routes 81 and 82. The similar access these routes provide are significant in reducing single occupancy vehicles to campus and demand for University/non-University parking investment. It also reflects the high use of the Metro bus service reflected in both student and employee surveys as a mode choice.

III. General Findings and Recommendations

KA Associates was hired to assist Transportation Services in a review of the Campus Bus Service they offer. The background material was essential in creating a fundamental understanding of the current Campus Bus system and how it operates, the expectations of the passengers, and their current attitudes to the service.

Our key findings are –

- **The Campus** – as with most historic campuses, the University of Wisconsin – Madison has had to grow new services into an historic campus whose internal street alignments and capacity has not generally changed in over a century. Furthermore, campus planning design standards focus on the development of academic and support facilities, aesthetics, and functionality. Typically, the transportation system must "fit" into the existing conditions and infrastructure. This is particularly true at Wisconsin where a need to access classrooms, labs, and even entertainment and recreation has created conflicts between pedestrians, scooters, skateboards and other modes. All of these conflicting demands for circulation and accommodation challenge the ability to provide efficient transit service.

- **Route 80 is a challenge.** While there are considerable bus resources invested in its operation, Route 80 is overcrowded. Therefore, it is not surprising that it is also the best performing route within the Metro Transit fixed route system. Not only is the passenger demand high, the route is challenged by major pedestrian/vehicle conflicts at key intersections along the route during peak ridership that limit the ability to maintain its schedule.

  KA Associates was hampered by minimal boarding and alighting data which limits our ability to fully know when peaks in demand exist. Based on survey feedback, we understand that demand for service on Route 80 is potentially five times greater in bad weather than it is in good weather. These factors complicate the analysis of adequate passenger demand, both present and future. There are, however, many opportunities to address this challenge.

- **Identified Unmet Mobility Need** – The University has a diverse modal split. Because of the minimal parking available on campus (and virtually none available to students), students and employees coming to campus on a regular basis must consider alternatives to an automobile. The result is a large part of the student body and employees walking, biking, using bus, even scooters to come to and get around campus. However, even with these options, student use of the Campus Bus increases at night as other choices become less appealing or service stops. Because of this night in interest in Campus Bus use, there are some unserved residential areas surrounding the campus that need attention.

A. Recommendation Realities

Based on these findings and supporting data, critical realities are revealed regarding improvements to on-campus transit at the University of Wisconsin – Madison. The University as the major player within the overall Metro transit system is a reality. Federal and state formula operating and capital grants use system ridership as a major metric in determining funding to transit agencies. As a result of high overall University ridership – both on campus as well as off – Metro is able to capture significantly higher apportionments for Madison. These University assisted ridership indicators contribute to the overall transit service in Madison for the benefit of all citizens.

Another reality is the linear and compact nature of the campus. Thus, the ability to identify and implement transit-oriented route alignments that can provide improvements to travel time without major impact to existing circulation of other modes or impacts to historical buildings, campus aesthetics, or protected vistas is problematic. This means that looking for route changes must do so within the existing transportation network. As part of this review of the route alignments, our planning experience has been that campus routes achieve maximum effectiveness when the route can provide a reasonable walking distance. Due to the compactness of the University of Wisconsin – Madison campus, a distance of two blocks should be the goal.

A third reality is that passenger safety and service reliability are critical to current and future success of the Campus Bus as well as Metro fixed line service. As such, both in perception and reality, the system must, to the extent financially and operationally possible be –

- **Reliable** to meet customer expectations
- **Safe** – both at stops, on the bus, and after bus use, and;
- Meet the **destination needs** of the passenger to get around campus, to off-campus residences when other services are limited, and to common student entertainment.

Therefore, to the extent possible both on campus and off, safe stops, on-time information technology, and identification of major (and sometimes changing) trip destinations are critical to the success of the service.

The recommendations below are developed in three parts to provide a range of solutions for existing Campus Bus service:

- **Survival** – what substantial changes can be implemented for the various Campus Bus services that would provide some improvement to existing problems at very minor costs.
- **Moderate** – changes that may be implemented that provide some solution with minimal financial, social, or physical cost.
- **Ideal** – provide premium impact to resolve the problem as it currently exists.

B. Recommendations – Route 80

Survival Options

- Initiate the split between the shorter route from the trips to Eagle Heights earlier in the schedule.
- Change the route into two distinct routes during the peak time. Route 80 would be operated as the full route with the Eagle Heights destinations and operate all day. The second route, Route 80S, would be peak service operating on the same alignment but terminating at the west campus remote parking and hospital.
- Promote the other Metro routes that operate internally on the same streets as options to Route 80.
- Eliminate the published peak schedule and promote an "approximate" frequency of service for Route 80.
- Adjust the late-night schedule to match as close as possible with Routes 81 and 82 at the Memorial Union transfer point.
- Confirm all stop locations in the Eagle Heights loop are ADA compliant.

Pros	Cons
Earlier Long/Short Split: • Adds one additional trip per hour. • Increases carrying capacity. • Reduces overcrowding during operating period. • No additional cost to the University.	**Earlier Long/Short Split:** • Changes Eagle Heights headway from 7 minutes to 12 minutes during operating period.
Route Name Designation: • We found the routes confusing between the long and short peak routes. The split between the two routes would eliminate this confusion. • No change to the current schedule or frequency of service.	**Route Name Designation:** • Initial confusion. • Marketing and promotion.
Metro Route Promotion: • Would provide an option to Route 80 in trip planning. • Reduce overcrowding on Route 80 from current demand.	**Metro Route Promotion:** • Would result in a potential increase in subsidy to ASM and Transportation Services. • Would require additional marketing.
Eliminate Printed Peak Schedule: • Minimize frustration from buses bunching and not maintaining the schedule. • Eliminate passenger anticipation regarding bus arrival from printed schedule. • More effectively manage customer expectations.	**Eliminate Printed Peak Schedule:** • Due to the reduced frequency to Eagle Heights area, unpublished schedules may create heightened anxiety for passengers waiting for bus service to that area.
Match Transfer at Memorial Union with Routes 81 & 82: • Limited service between all three routes requires timed transfer at the Union to encourage greater use of Route 80 with Routes 81 and 82.	**Match Transfer at Memorial Union with Routes 81 & 82:** • None identified.

ADA Access: • Increased accessibility.	**ADA Access:** • None identified.

Moderate Options

- Change the peak hour service vehicle assignment from four buses operating on the Eagle Heights route and three on the short route to three Eagle Heights and four on the short route to the remote west parking lots. This proposed shift will change the current "scheduled" 6-minute frequency between buses due to the 36-minute short trip length versus the 48-minute trip length for the Eagle Heights loop to a schedule alignment resulting in buses matching up at the same location throughout the peak service. However, as seen on the table below, it will provide an additional four buses stopping at key academic locations within the 15-minute window before class times. This adds over 200 bus seats of additional capacity at times in which transit demand is highest to access classrooms. (See Sample Proposed Schedule - Attachment 1)

Route 80 Trips: Four Short/Three Long Split – Arrival 15-Minutes Before Class Time				
Class Time		**Memorial Union**	**Linden / Charter**	**Randall / Engineering**
9:55 a.m. MWF	Current Trips	3	3	3
	Proposed Split	**2**	**2**	3
11:00 a.m. MTWThF	Current Trips	3	2	2
	Proposed Split	3	**3**	**3**
12:05 p.m. MWF	Current Trips	2	2	2
	Proposed Split	**3**	**3**	**3**
1:00 p.m. TTH	Current Trips	3	2	2
	Proposed Split	**2**	**3**	**3**
1:20 p.m. MWF	Current Trips	3	3	3
	Proposed Split	3	3	3
2:25 p.m. MWF	Current Trips	3	3	3
	Proposed Split	3	3	3
2:30 P.M. TTH	Current Trips	3	2	2
	Proposed Split	3	2	**3**
3:30 P.M. MWF	Current Trips	3	1	1
	Proposed Split	3	**2**	**2**

- Metro Transit invest in new on-line technology that will report in real time the bus location and current vehicle occupancy. Install real time bus arrival information in the shelters along Route 80 indicating when the next bus arrives.
- Change the route to use Park after leaving the Memorial Union to University, west on University to Henry Mall, north to Linden to continue the current outbound route and inbound use Park from Dayton to Johnson and Johnson from Park to Lake. While this change adds approximately 0.12 miles from the current trip length (appr. 7.41 miles, 9.26 mph) to proposed (appr. 7.53 miles, 9.41 mph), we believe that the elimination of one of the trips through the Linden and Charter intersection will reduce overall travel time. The other advantage will be to take the route off of the Bascom Hill hairpin where traffic congestion can further delay the route. While the elimination of the route on Observatory from Park to Charter will result in the loss of the two stops on Observatory east of

Charter, the addition of University between Park and Henry Mall will introduce access to currently unserved academic buildings. The route change will also maintain that all academic buildings on the west and south campus will be for the most part within no more than a two-block walk to the new route alignment. (See Map 6)

Pros	Cons
Reassign Buses: • Increases number of trips per hour. • Increases capacity at critical class access times. • No additional cost to the University.	**Reassign Buses:** • Increases headway in Eagle Heights area from 12 minute to 16 minute average during peak period. • Schedule alignment has buses short and long trips running together and arriving at destinations together at certain times in the schedule. • Would require sophisticated scheduling analysis to create efficiencies between the two routes.
Technology: • Provides real time arrival information to passengers at bus stops and on-line. • Manages passenger expectations of bus location, arrival, and capacity. (Current technology does not provide real time or capacity information.) • Indicates current capacity levels to assist waiting passengers in trip planning. • Technology is readily available for new buses or to retrofit in existing fleet.	**Technology:** • These systems can be costly and do require maintenance and monitoring. • Increases capital and operating costs to Metro.
Route Alignment Change: • Reduces travel time by eliminating one trip through congested Linden Drive/Charter Street intersection. • All academic buildings within the west and south campus core are within two blocks of the route. • Promotes access to currently unserved campus buildings on University. • Maintains direct service to Memorial and South Unions. • No additional costs to the University.	**Route Alignment Change:** • Eliminates route on Observatory between Park Street and Charter Street. • Moves access to Kohl Center one block. • Would require some modification of Linden at Henry shelter location.

Map 6. Proposed Route Alignment – Route 80

Ideal Options

- Add a fourth bus to the short portion of Route 80 during the peak period of 9:30 a.m. to 3:00 p.m. Route 84 recommendations further in this report suggest cancellation of that route. Should this be realized, the funding currently committed to Route 84 could be diverted to funding a portion of this additional bus. The additional bus on Route 80 which is part of this proposal would be an approximate 5 ½ hours of new service on full service weekdays. For this operating year, there are 162 full days of weekday service meaning that the additional bus would consume a total of 891 revenue hours. The cost differential between the Route 84 savings and the added cost of the 8th bus would be approximately 379 net additional revenue hours of service for the University. At a current operating cost of $60 per hour the net additional cost to the University would be approximately $22,740 for a 16.6% increase in hourly capacity of the route during peak time. (See Sample Schedule for 8th Peak Bus - Attachment 2)
- Gain a commitment from Metro Transit to place the purchase of articulated buses as a priority with a projected timeline.

Pros	Cons
Additional Bus: • Adds an additional nine trips during this time period. • Increases passenger capacity by over 500 during this time period.	**Additional Bus:** • Additional 3 ½ hours of operating expense for the overall service.

Articulated Buses: • Increases overall passenger capacity by 50%.	**Articulated Buses:** • Cost of rolling stock from initial purchase. • Fuel consumption is three times higher over conventional 40-foot buses, thereby increasing overall operating cost.

C. Recommendations – Route 81

Survival Options

- Due to low passenger boardings and low identified student housing in the east neighborhood area, eliminate the portion of the route between Blair Street and Ingersoll Street. Reassign that time resource to expansion of the route into the southeast neighborhood covered by Route 82. The current route is approximately 5.59 miles (11.18 mph) and the proposed route is approximately 3.67 miles (7.34 mph). Should the University choose to keep the route extended to Ingersoll, the new route with the combined southeast neighborhood portion would extend the route to approximately 4.92 miles (9.84 mph). (See Map 7)
- Due to duplication with Route 80, eliminate the portion of the route west of the Memorial Union.
- Promote other Metro routes that operate internally on the same streets as options to Route 81.
- Adjust late night schedule to match as close as possible with Routes 80 and 82 at Memorial Union transfer point.

Pros	Cons
Modification of Route Alignment: • Concentrates this route as an "East Campus" route. • Allows Route 82 to expand to unserved off-campus housing areas. • Maintains current headways. • Maintains access to campus academic buildings as well as State Street entertainment. • Maintains current service area from Route 82. • No additional cost to the University	**Modification of Route Alignment:** • Loss of current coverage in area north and east of Blair Street. • Loss of coverage to Langdon between Lake Street and Wisconsin Avenue.
Metro Route Promotion: • Would provide an option to Route 81 in trip planning. • Reduce crowding on Route 81 from current demand.	**Metro Route Promotion:** • Would result in a potential increase in subsidy to ASM and Transportation Services. • Would require additional marketing.
Match Transfer at Union with Routes 80: • Limited late-night service between all three routes requires timed transfer at the Memorial Union to encourage greater coordination with Routes 80 and 82.	**Match Transfer at Union with Routes 80:** • None identified.

Moderate Options

- Metro Transit invest in new on-line technology that will report in real time the bus location and current vehicle occupancy. Install real time bus arrival information in the shelters along Route 81 indicating when the next bus arrives.

Pros	Cons
Technology: • Provides real time arrival information to passengers at bus stops and on-line. • Manages passenger expectations of bus location, arrival, and capacity. (Current technology does not provide real time or capacity information.) • Indicates current capacity levels to assist waiting passengers in trip planning. • Technology is readily available for new buses or to retrofit in existing fleet.	**Technology:** • These systems can be costly and do require maintenance and monitoring. • Increases operating costs

Ideal Options

- Add a second bus to the route when demand justifies the increase.

Pros	Cons
Additional Bus: • Increases current headway from 30 minutes to 15 minutes. • Increases overall passenger capacity.	**Additional Bus:** • Doubles operating expense for this route. • Demand does not currently exist to justify the additional cost.

Map 7. Proposed Route Alignment – Route 81

D. Recommendations – Route 82

Survival Options

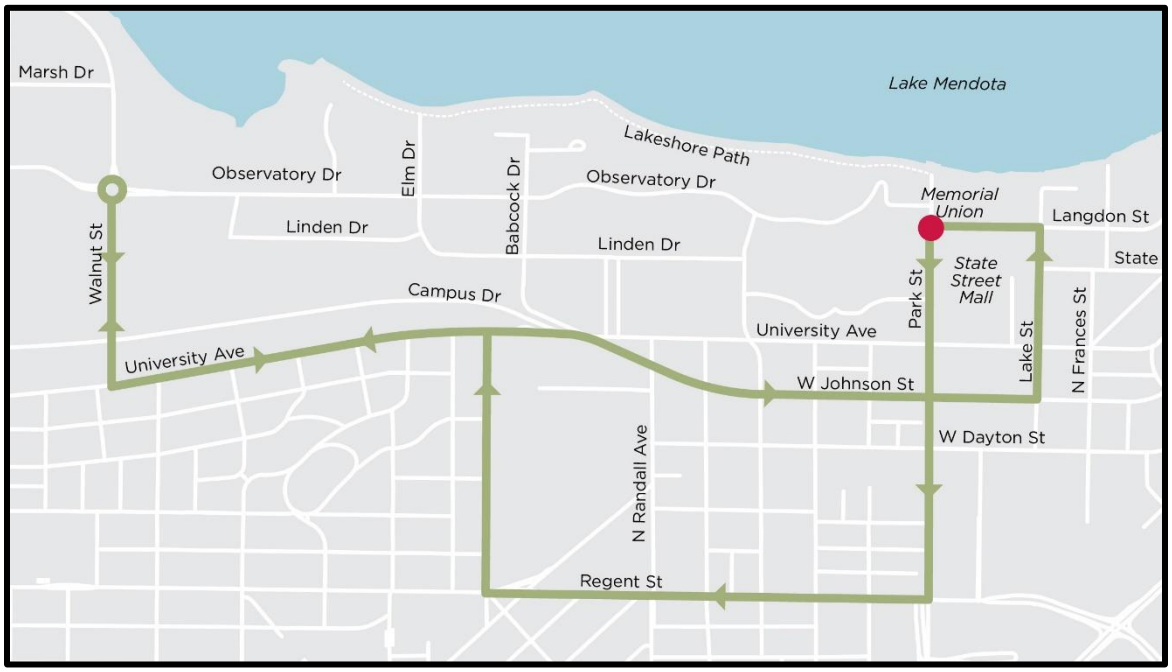
- Eliminate the southeast portion of Route 82 taken over by new Route 81 and use the additional time to extend the route on University from Breese Terrace to Walnut Street and north on Walnut to the Observatory Drive traffic circle. Modify the end of the route to Lake Street. (See Map 8)
- Promote the other Metro routes that operate internally on the same streets as options to Route 82.
- Adjust late night schedule to match as close as possible with Routes 80 and 81 at Memorial Union transfer point.

Pros	Cons
Modification of Route Alignment: • Extends late night bus service into a currently unserved off-campus student housing area on West University Avenue. • Maintains current headways. • Introduces University Hospital destination for this route.	**Modification of Route Alignment:** • Regent Street loop travel time will be extended.
Metro Route Promotion: • Would provide an option to Route 82 for passenger trip planning. • Would reduce crowding on Route 82 from current demand.	**Metro Route Promotion:** • Would result in a potential increase in subsidy to ASM and Transportation Services. • Would require additional marketing.
Match Transfer at Union with Routes 80: • Limited late-night service between all three routes requires timed transfer at the Memorial Union to encourage greater coordination with Routes 80 and 81.	**Match Transfer at Union with Routes 80:** • None identified.

Moderate

- Metro Transit invest in new on-line technology that will report in real time the bus location and current vehicle occupancy. Install real time bus arrival information in the shelters along Route 82 indicating when the next buses will arrive.

Pros	Cons
Technology: • Provides real time arrival information to passengers at bus stops and on-line. • Manages passenger expectations of bus location, arrival, and capacity. (Current technology does not provide real time or capacity information.) • Indicates current capacity levels to assist waiting passengers in trip planning. • Technology is readily available for new buses or to retrofit in existing fleet.	**Technology:** • These systems can be costly and do require maintenance and monitoring. • Increases operating costs



Map 8. Proposed Route Alignment – Route 82

Ideal Option

- Add a second bus to the route when demand justifies the increase.

Pros	Cons
Additional Bus: • Increases current headway from 30 minutes to 15 minutes. • Increases overall passenger capacity.	**Additional Bus:** • Doubles operating expense for this route. • Demand does not currently exist to justify the additional cost.

E. Recommendations – Route 84

Survival Option

- This route is a premium service to residents of Eagle Heights and to employees parking in the west campus remote parking areas. It duplicates the existing Route 80 and provides limited service during a time in which capacity on Route 80 is available. Recommend the elimination of this route.

Pros	Cons
Route Elimination: • Cost savings that can be applied to additional service to Route 80 during peak. • Current capacity surplus on Route 80 can absorb this Route's ridership.	**Route Elimination:** • Service cancellation will impact current passengers and access to Eagle Heights.

Moderate Options

- None Identified.

Ideal Options

- None Identified.

F. Recommendations – Clean Slate

As part of this study, the University requested one planning option be designed to develop an "ideal state" transit plan as if it was a new system start-up designed to meet the existing mobility needs of the current passenger and expectations of the administration. This exercise fully understands the conflict that exists between transit planning and campus planning; that is, the desire for a robust transit operation versus the impact a robust system has to preservation and maintenance of the historical, aesthetic, and functional environs of the University.

Additionally, a "clean slate" planning exercise needs to be mindful of the realistic administrative, financial, and operational constraints of providing a public transportation service. The realities of today's transportation delivery model are quickly changing as new transportation choices of car-share (Uber/Lyft), electric and hydrogen fuels, bus rapid transit including other dedicated transit guideways, and autonomous navigation (and how driverless vehicles will impact the need for close proximity parking) become the norm. The clean slate approach needs to complement other standing and planned transportation and physical improvements.

In all instances, a clean slate needs to be mindful of the customers that the campus transit system serves – namely students, faculty, staff, patients, athletic fans, alumni or anyone with a need to come to and get around the campus. It needs to ask the question: Is the system satisfying a mobility need efficiently and safely? An **Ideal Reality** Campus Bus service on the University of Wisconsin – Madison campus is designed within this framework.

- **Ideal External Coordination** – Due to the natural geography of this area, the University is strategically located where generally any bus route traveling from east to west in Madison must pass through the University campus. From a transit perspective, the paired streets of University Avenue and Johnson Street currently serve as a de facto transit way and offer a considerable transit service to the campus. The University's willingness to provide subsidized student and employee access to the Metro system is unique to the University of Wisconsin – Madison and should be continued.

  However, in the event that the costs associated with underwriting the Metro services become too expensive or that the responsiveness to the needs of the University are not being met by the Metro administration, the University has options that are available for campus bus operations. Options that are used by other universities include the direct operation of on-campus system in place of the current operating agreement or contracting the service out to a third party transit operator. Investigation by KA Associates found that third party operating costs for university shuttle services range between $105 to $120 per operating hour per vehicle. This figure includes all operating and maintenance costs as well as the cost for the vehicle. Currently, the hourly cost Metro charges the University is approximately $60 per hour per vehicle, substantially less.

  The University provides significant ridership and income to the Transit Authority. As such, much of their formula grants would suffer significantly should the University

chose to withdraw from their operating system or to stop the subsidy of the bus passes to University students and employees. Because of this unique and controlling position, the University has an opportunity to leverage this significant ridership and income into improvements that benefit University students and employees – such as larger capacity buses or real time bus locators – while at the same time achieving major mobility goals of the University – future BRT, rail(?), intermodal center(s), or transit oriented developments that benefit the University and surrounding community.

While not included as a focus of this study, University students and employees make up a significant percentage of the overall ridership on several of the Metro routes. Since the University pays a subsidy for each student and employee passenger, an investigation should be undertaken to determine whether the subsidy amount exceeds the actual operating cost of the route. If any situations like this do exist, the University should consider full operation of the route to reduce overall costs. Public fare box revenue could be credited back to the University.

- **Ideal Campus Transit Operation** – Whether or not a part of the BRT system, a transit center that would accommodate route coordination and transfer should be located somewhere in the central campus. Currently, the stop in front of the Memorial Union serves this function as it is the layover for a variety of transportation services – Campus Bus and intercity bus service, taxi, bicycle storage, and close proximity to other Metro Transit routes.

  To be functional, a transit center needs to convey a presence that distinguishes itself as a transportation hub. The Memorial Union stop could continue this function and would be more inviting and identifying with enhanced passenger amenities (statement shelters, next bus technology displays, etc.) as well as a more coordinated parking area for both public and private bus services, taxi, and Uber/Lyft services.

- **Ideal Campus Mode Recognition** – The University, like most campuses, is blessed/cursed with a variety of transportation modes – buses, cars, motorcycles, scooters, pedestrians, pedestrians not paying attention, bicyclists, skateboards, etc. And as expected, many times these modes are in conflict. A clean slate would recognize these conflicts and eliminate them before they were created by separating modes. However, this is not always possible.

  Major vehicle / pedestrian conflicts occur on the campus. And while barriers and barricades may be erected to address these conflicts, they cannot eliminate human behavior in opposition to these strategies. One of the most severe of these conflict points is the intersection of Linden Drive and Charter Street. As documented in this study, from experience and data collection, morning class change times at this intersection create absolute gridlock for up to eight minutes – enough time to disrupt flow and result in schedule adherence problems for buses and danger for pedestrians.

  These streets are too critical to the overall circulation of traffic on campus to close them for a pedestrian mall. The clean slate (and expensive) solution would be to

utilize the existing change in grade to separate the pedestrian / bicycle modes from the vehicular. This however, is a very expensive and disruptive undertaking to resolve this problem.

- **Ideal Campus Route Services** – Many options used on other campuses to create efficient campus routes which reduce travel times and maintain access to the campus and community are difficult to replicate on the UW-Madison campus. Due to the compact nature of the campus, a dedicated surface transitway (i.e. Southeast Missouri State University) that provides exclusive bus access through the campus would be difficult to create. Elevated guideways (i.e. West Virginia University Personal Rapid Transit) are expensive and considered by some to be unsightly.

  The best option for continued campus mobility will be high capacity vehicles in the existing street infrastructure. The goal of a campus bus system should be safe and reliable access to university services and, to the extent possible, the community at large. As such, the current and proposed alignment and function of Route 80 meets this purpose as a campus circulator in general and specifically as a route for on-campus residents to University classes, recreation, and entertainment.

  A clean slate approach would also include extending transit service to off-campus neighborhoods to provide service to students and employees to gain access to the campus when other Metro routes are not operating. Routes 81 and 82 in their proposed alignments recognize where off-campus student populations reside and provide service when Metro has stopped.

  Ideal Campus Route System – Like most services of a university transportation and parking department, the Campus Bus system is underappreciated. In many ways it is a victim of its own success. Route 80 carries the most passengers per hour in the entire Metro Transit route system. Routes 81 and 82, in addition to producing an impressive performance metric of their own, provide essential late-night service for students to campus and campus entertainment venues when Metro service is completed for the day. And yet, feedback from consumer surveys rank the service low as a mode choice. Complaints are made that overall the Campus Bus system is overcrowded (it is), that the buses are late (they are) and system is slow (which it can be).

  Studies that review transit routes generally don't include recommendations about self-promotion, but there are a lot of great things about the Campus Bus routes. The bus operators were courteous and committed to providing a safe service. Passengers interviewed seem to overall like and appreciate the value it provides them. Administrators recognize the critical and essential nature of the service to a campus that has limited employee and virtually no student parking. An additional important recommendation includes promotion of the Campus Bus service as a safe service that provides a valuable product.

  The initiation of this study recognizes the reality that the administration values the Campus Bus services and is interested in identifying options for improvement. Implementation of the identified improvements can assist in making the Campus Bus system a superior future reality.

Attachments

- **Attachment 1. Suggested Route 80 Schedule – Four Buses Short/Three Buses Long Route**
- **Attachment 2. Current Campus Bus Route 80 Plus Extra Peak Bus**
- **Attachment 3. Route 80 and 81 Boarding by Stop**
- **Attachment 4. Route 82 and 84 Boarding by Stop**
- **Attachment 5. Route Comparison**
- **Attachment 6. Evening Route Comparison**

ATTACHMENT 1. CURRENT CAMPUS BUS ROUTE 80 4/3 Split

Apr-18

M-W-F ARRIVALS 15 MINUTES BEFORE SCH CLASS START

T-TH ARRIVALS 15 MINUTES BEFORE SCH CLASS START

SHARED ARRIVAL TIMES

Union Langdon	Observatory & Elm	Univ @ Lot 60	Eagle Htgs & Brown Shelter	Marsh & Lot 76	Observatory & Elm	Randall & Engineering	Langdon & Union	
			06:10 AM	06:17 AM	06:20 AM	06:25 AM	06:33 AM	A
06:15 AM	06:20 AM	06:24 AM	06:30 AM	06:37 AM	06:40 AM	06:45 AM	06:54 AM	B
06:35 AM	06:40 AM	06:44 AM	06:50 AM	06:57 AM	07:00 AM	07:05 AM	07:14 AM	A
06:50 AM	06:55 AM	06:59 AM	07:05 AM	07:12 AM	07:15 AM	07:20 AM	07:29 AM	C
07:02 AM	07:09 AM	07:14 AM	07:21 AM	07:29 AM	07:33 AM	07:39 AM	07:50 AM	B
07:14 AM	07:21 AM	07:26 AM	07:33 AM	07:41 AM	*07:45 AM*	07:51 AM	08:02 AM	A
07:21 AM	07:28 AM	07:33 AM	07:40 AM	07:48 AM	07:52 AM	07:58 AM	08:09 AM	D
07:28 AM	07:35 AM	07:40 AM	07:47 AM	07:55 AM	07:59 AM	08:05 AM	08:16 AM	E
07:35 AM	07:42 AM	07:47 AM	07:54 AM	08:02 AM	08:06 AM	08:12 AM	08:23 AM	C
07:42 AM	07:49 AM	07:54 AM	08:01 AM	08:09 AM	08:13 AM	08:19 AM	08:30 AM	F
07:49 AM	07:56 AM	08:01 AM	08:08 AM	08:16 AM	08:20 AM	08:26 AM	08:37 AM	G
07:56 AM	08:03 AM	08:08 AM	08:15 AM	08:23 AM	08:27 AM	08:33 AM	08:44 AM	B
08:03 AM	08:10 AM	08:15 AM	08:22 AM	08:30 AM	08:34 AM	08:40 AM	08:51 AM	A
08:10 AM	08:17 AM	08:22 AM	08:29 AM	08:37 AM	08:41 AM	08:47 AM	08:58 AM	D
08:17 AM	08:24 AM	08:29 AM	08:36 AM	08:44 AM	08:48 AM	08:54 AM	09:05 AM	E
08:24 AM	08:31 AM	08:36 AM	08:43 AM	08:51 AM	08:55 AM	09:01 AM	09:12 AM	C
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08:38 AM	08:45 AM	08:50 AM	08:57 AM	09:05 AM	09:09 AM	09:15 AM	09:26 AM	G
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09:20 AM	09:26 AM	09:31 AM	09:37 AM	09:45 AM	09:49 AM	09:55 AM	10:06 AM	F
09:27 AM	09:34 AM	09:39 AM	09:46 AM	09:54 AM	09:58 AM	10:04 AM	10:15 AM	G
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11:19 AM	11:26 AM	11:31 AM	11:38 AM	11:46 AM	11:50 AM	11:56 AM	**12:07 PM**	A
11:22 AM	11:29 AM			11:37 AM	11:41 AM	11:47 AM	11:58 AM	F
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ATTACHMENT 1. CURRENT CAMPUS BUS ROUTE 80- 4/3 Split (Cont)

Apr-18

M-W-F ARRIVALS 15 MINUTES BEFORE SCH CLASS START

T-TH ARRIVALS 15 MINUTES BEFORE SCH CLASS START

SHARED ARRIVAL TIMES

Union Langdon	Observatory & Elm	Univ @ Lot 60	Eagle Htgs & Brown Shelter	Marsh & Lot 76	Observatory & Elm	Randall & Engineering	Langdon & Union	
01:01 PM	01:08 PM			01:16 PM	01:20 PM	01:26 PM	01:37 PM	C
01:10 PM	01:17 PM			01:25 PM	01:29 PM	01:35 PM	01:46 PM	F
01:11 PM	01:18 PM	01:23 PM	01:30 PM	01:38 PM	01:42 PM	01:48 PM	01:59 PM	E
01:19 PM	01:26 PM			01:34 PM	01:38 PM	01:44 PM	01:55 PM	B
01:27 PM	01:34 PM	01:39 PM	01:46 PM	01:54 PM	01:58 PM	02:04 PM	02:15 PM	G
01:28 PM	01:35 PM			01:43 PM	01:47 PM	01:53 PM	02:04 PM	D
01:37 PM	01:44 PM			01:52 PM	01:56 PM	02:02 PM	02:13 PM	C
01:43 PM	01:50 PM	01:55 PM	02:02 PM	02:10 PM	02:14 PM	*02:20 PM*	02:31 PM	A
01:46 PM	01:53 PM			02:01 PM	02:05 PM	02:11 PM	02:22 PM	F
01:55 PM	02:02 PM			02:10 PM	02:14 PM	*02:20 PM*	02:31 PM	B
01:59 PM	02:06 PM	02:11 PM	02:18 PM	02:26 PM	02:30 PM	02:36 PM	02:47 PM	E
02:04 PM	02:11 PM			02:19 PM	*02:23 PM*	02:29 PM	02:40 PM	D
02:13 PM	02:20 PM			02:28 PM	02:32 PM	02:38 PM	02:49 PM	C
02:15 PM	02:22 PM	02:27 PM	02:34 PM	02:42 PM	02:46 PM	02:52 PM	03:03 PM	G
02:22 PM	02:29 PM			02:37 PM	02:41 PM	02:47 PM	02:58 PM	F
02:31 PM	02:38 PM			02:46 PM	02:50 PM	02:56 PM	03:07 PM	B
02:31 PM	02:38 PM	02:43 PM	02:50 PM	02:58 PM	03:02 PM	03:08 PM	03:19 PM	A
02:40 PM	02:47 PM	02:52 PM	02:59 PM	03:07 PM	03:11 PM	03:17 PM	03:28 PM	D
02:47 PM	02:54 PM	02:59 PM	03:06 PM	03:14 PM	03:18 PM	03:24 PM	03:35 PM	E
02:54 PM	03:01 PM	03:06 PM	03:13 PM	03:21 PM	03:25 PM	03:31 PM	03:42 PM	C
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04:52 PM	04:59 PM	05:04 PM	05:11 PM	05:19 PM	05:23 PM	05:29 PM	05:40 PM	B
04:59 PM	05:06 PM	05:11 PM	05:18 PM	05:26 PM	05:30 PM	05:36 PM	05:47 PM	A
05:06 PM	05:13 PM	05:18 PM	05:25 PM	05:33 PM				D
05:13 PM	05:20 PM	05:25 PM	05:32 PM	05:40 PM				E
05:20 PM	05:27 PM	05:32 PM	05:39 PM	05:47 PM	05:51 PM	05:57 PM	06:08 PM	C
05:32 PM	05:39 PM	05:44 PM	05:51 PM	05:59 PM	06:03 PM	06:09 PM	06:20 PM	F
05:44 PM	05:51 PM	05:56 PM	06:03 PM	06:11 PM	06:15 PM	06:21 PM	06:32 PM	B
05:56 PM	06:03 PM	06:08 PM	06:15 PM	06:23 PM	06:27 PM	06:33 PM	06:44 PM	A
06:08 PM	06:15 PM	06:20 PM	06:27 PM	06:35 PM	06:39 PM	06:45 PM	06:56 PM	C
06:20 PM	06:27 PM	06:32 PM	06:39 PM	06:47 PM	06:51 PM	06:57 PM	07:08 PM	F
06:32 PM	06:39 PM	06:44 PM	06:51 PM	06:59 PM	07:03 PM	07:09 PM	07:20 PM	B
06:44 PM	06:51 PM	06:56 PM	07:03 PM	07:11 PM	07:15 PM	07:21 PM	07:32 PM	A
06:56 PM	....							

ATTACHMENT 2. CURRENT CAMPUS BUS ROUTE 80 PLUS EXTRA PEAK BUS

CLASS TIME ARRIVALS M-W-F AT KEY ACADEMIC DESTINATIONS
CLASS TIME ARRIVALS T-TH AT KEY ACADEMIC DESTINATIONS

SHARED ARRIVAL TIMES
KA ASSOCIATES Apr-18

Union Langdon	Observatory & Elm	Univ @ Lot 60	Eagle Htgs & Brown Shelter	Marsh & Lot 76	Observatory & Elm	Randall & Engineering	Langdon & Union	
			06:10 AM	06:17 AM	06:20 AM	06:25 AM	06:33 AM	A
06:15 AM	06:20 AM	06:24 AM	06:30 AM	06:37 AM	06:40 AM	06:45 AM	06:54 AM	B
06:35 AM	06:40 AM	06:44 AM	06:50 AM	06:57 AM	07:00 AM	07:05 AM	07:14 AM	A
06:50 AM	06:55 AM	06:59 AM	07:05 AM	07:12 AM	07:15 AM	07:20 AM	07:29 AM	C
07:02 AM	07:09 AM	07:14 AM	07:21 AM	07:29 AM	07:33 AM	07:39 AM	07:50 AM	B
07:14 AM	07:21 AM	07:26 AM	07:33 AM	07:41 AM	07:45 AM	07:51 AM	08:02 AM	A
07:21 AM	07:28 AM	07:33 AM	07:40 AM	07:48 AM	07:52 AM	07:58 AM	08:09 AM	D
07:28 AM	07:35 AM	07:40 AM	07:47 AM	07:55 AM	07:59 AM	08:05 AM	08:16 AM	E
07:35 AM	07:42 AM	07:47 AM	07:54 AM	08:02 AM	08:06 AM	08:12 AM	08:23 AM	C
07:42 AM	07:49 AM	07:54 AM	08:01 AM	08:09 AM	08:13 AM	08:19 AM	08:30 AM	F
07:49 AM	07:56 AM	08:01 AM	08:08 AM	08:16 AM	08:20 AM	08:26 AM	08:37 AM	G
07:56 AM	08:03 AM	08:08 AM	08:15 AM	08:23 AM	08:27 AM	08:33 AM	08:44 AM	B
08:03 AM	08:10 AM	08:15 AM	08:22 AM	08:30 AM	08:34 AM	08:40 AM	08:51 AM	A
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08:31 AM	08:38 AM	08:43 AM	08:50 AM	08:58 AM	09:02 AM	09:08 AM	09:19 AM	F
08:38 AM	08:45 AM	08:50 AM	08:57 AM	09:05 AM	09:09 AM	09:15 AM	09:26 AM	G
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09:20 AM	09:26 AM	09:31 AM	09:37 AM	09:45 AM	09:49 AM	09:55 AM	10:06 AM	F
09:27 AM	09:34 AM	09:39 AM	09:46 AM	09:54 AM	09:58 AM	10:04 AM	10:15 AM	G
09:34 AM	09:41 AM			09:49 AM	09:53 AM	09:59 AM	10:10 AM	B
09:42 AM	09:49 AM	09:54 AM	10:01 AM	10:09 AM	10:13 AM	10:19 AM	10:30 AM	A
09:43 AM	09:50 AM			09:58 AM	10:02 AM	10:08 AM	10:19 AM	H
09:52 AM	09:59 AM			10:07 AM	10:11 AM	10:17 AM	10:28 AM	D
09:54 AM	10:01 AM	10:06 AM	10:13 AM	10:21 AM	10:25 AM	10:31 AM	10:42 AM	E
10:01 AM	10:08 AM			10:16 AM	10:20 AM	10:26 AM	10:37 AM	C
10:06 AM	10:13 AM	10:18 AM	10:25 AM	10:33 AM	10:37 AM	10:43 AM	10:54 AM	F
10:10 AM	10:17 AM			10:25 AM	10:29 AM	10:35 AM	10:46 AM	B
10:18 AM	10:25 AM	10:30 AM	10:37 AM	10:45 AM	*10:49 AM*	*10:55 AM*	11:06 AM	G
10:19 AM	10:26 AM			10:34 AM	10:38 AM	10:44 AM	10:55 AM	H
10:28 AM	10:35 AM			10:43 AM	*10:47 AM*	*10:53 AM*	11:04 AM	D
10:30 AM	10:37 AM	10:42 AM	10:49 AM	10:57 AM	11:01 AM	11:07 AM	11:18 AM	A
10:37 AM	10:44 AM			10:52 AM	*10:56 AM*	11:02 AM	11:13 AM	C
10:42 AM	10:49 AM	10:54 AM	11:01 AM	11:09 AM	11:13 AM	11:19 AM	11:30 AM	E
10:46 AM	10:53 AM			11:01 AM	11:05 AM	11:11 AM	11:22 AM	B
10:54 AM	11:01 AM	11:06 AM	11:13 AM	11:21 AM	11:25 AM	11:31 AM	11:42 AM	F
10:55 AM	11:02 AM			11:10 AM	11:14 AM	11:20 AM	11:31 AM	H
11:04 AM	11:11 AM			11:19 AM	11:23 AM	11:29 AM	11:40 AM	D
11:06 AM	11:13 AM	11:18 AM	11:25 AM	11:33 AM	11:37 AM	11:43 AM	11:54 AM	G
11:13 AM	11:20 AM			11:28 AM	11:32 AM	11:38 AM	11:49 AM	C
11:18 AM	11:25 AM	11:30 AM	11:37 AM	11:45 AM	11:49 AM	11:55 AM	**12:06 PM**	A
11:22 AM	11:29 AM			11:37 AM	11:41 AM	11:47 AM	11:58 AM	B
11:30 AM	11:37 AM	11:42 AM	11:49 AM	11:57 AM	12:01 PM	12:07 PM	**12:18 PM**	E
11:31 AM	11:38 AM			11:46 AM	11:50 AM	11:56 AM	**12:07 PM**	H
11:40 AM	11:47 AM			11:55 AM	11:59 AM	**12:05 PM**	**12:16 PM**	D
11:42 AM	11:49 AM	11:54 AM	**12:01 PM**	**12:09 PM**	**12:13 PM**	**12:19 PM**	**12:30 PM**	F
11:49 AM	11:56 AM			**12:04 PM**	**12:08 PM**	**12:14 PM**	**12:25 PM**	C
11:54 AM	**12:01 PM**	**12:06 PM**	**12:13 PM**	**12:21 PM**	**12:25 PM**	**12:31 PM**	**12:42 PM**	G
11:58 AM	**12:05 PM**			**12:13 PM**	**12:17 PM**	**12:23 PM**	**12:34 PM**	B
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12:16 PM	**12:23 PM**			**12:31 PM**	**12:35 PM**	**12:41 PM**	**12:52 PM**	D
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01:30 PM	**01:37 PM**	**01:42 PM**	**01:49 PM**	**01:57 PM**	**02:01 PM**	**02:07 PM**	**02:18 PM**	G

ATTACHMENT 2. CURRENT CAMPUS BUS ROUTE 80 PLUS EXTRA PEAK BUS (CONT)

CLASS TIME ARRIVALS M-W-F AT KEY ACADEMIC DESTINATIONS
CLASS TIME ARRIVALS T-TH AT KEY ACADEMIC DESTINATIONS

SHARED ARRIVAL TIMES
KA ASSOCIATES Apr-18

Union Langdon	Observatory & Elm	Univ @ Lot 60	Eagle Htgs & Brown Shelter	Marsh & Lot 76	Observatory & Elm	Randall & Engineering	Langdon & Union	
01:37 PM	01:44 PM			01:52 PM	01:56 PM	02:02 PM	02:13 PM	C
01:42 PM	01:49 PM	01:54 PM	02:01 PM	02:09 PM	02:13 PM	*02:19 PM*	02:30 PM	A
01:46 PM	01:53 PM			02:01 PM	02:05 PM	02:11 PM	02:22 PM	B
01:54 PM	02:01 PM	02:06 PM	02:13 PM	02:21 PM	*02:25 PM*	02:31 PM	02:42 PM	E
01:55 PM	02:02 PM			02:10 PM	02:14 PM	*02:20 PM*	02:31 PM	H
02:04 PM	02:11 PM			02:19 PM	*02:23 PM*	02:29 PM	02:40 PM	D
02:06 PM	02:13 PM	02:18 PM	02:25 PM	02:33 PM	02:37 PM	02:43 PM	02:54 PM	F
02:13 PM	02:20 PM			02:28 PM	02:32 PM	02:38 PM	02:49 PM	C
02:18 PM	02:25 PM	02:30 PM	02:37 PM	02:45 PM	02:49 PM	02:55 PM	03:06 PM	G
02:22 PM	02:29 PM			02:37 PM	02:41 PM	02:47 PM	02:58 PM	B
02:30 PM	02:37 PM	02:42 PM	02:49 PM	02:57 PM	03:01 PM	03:07 PM	03:18 PM	A
02:31 PM	02:38 PM			02:46 PM	02:50 PM	02:56 PM	03:07 PM	H
02:40 PM	02:47 PM			02:55 PM	02:59 PM	03:05 PM	03:16 PM	D
02:42 PM	02:49 PM	02:54 PM	03:01 PM	03:09 PM	03:13 PM	03:19 PM	03:30 PM	E
02:49 PM	02:56 PM			03:04 PM	03:08 PM	03:14 PM	03:25 PM	C
02:54 PM	03:01 PM	03:06 PM	03:13 PM	03:21 PM	03:25 PM	03:31 PM	03:42 PM	F
03:01 PM	03:08 PM	03:13 PM	03:20 PM	03:28 PM	03:32 PM	03:38 PM	03:49 PM	B
03:08 PM	03:15 PM	03:20 PM	03:27 PM	03:35 PM	03:39 PM	03:45 PM	03:56 PM	G
03:15 PM	03:22 PM	03:27 PM	03:34 PM	03:42 PM	03:46 PM	03:52 PM	04:03 PM	D
03:22 PM	03:29 PM	03:34 PM	03:41 PM	03:49 PM	03:53 PM	03:59 PM	04:10 PM	A
03:29 PM	03:36 PM	03:41 PM	03:48 PM	03:56 PM	04:00 PM	04:06 PM	04:17 PM	C
03:36 PM	03:43 PM	03:48 PM	03:55 PM	04:03 PM	04:07 PM	04:13 PM	04:24 PM	E
03:42 PM	03:49 PM	03:54 PM	04:01 PM	04:09 PM	04:13 PM	04:19 PM	04:30 PM	F
03:49 PM	03:56 PM	04:01 PM	04:08 PM	04:16 PM	04:20 PM	04:26 PM	04:37 PM	B
03:56 PM	04:03 PM	04:08 PM	04:15 PM	04:23 PM	04:27 PM	04:33 PM	04:44 PM	G
04:03 PM	04:10 PM	04:15 PM	04:22 PM	04:30 PM	04:34 PM	04:40 PM	04:51 PM	D
04:10 PM	04:17 PM	04:22 PM	04:29 PM	04:37 PM	04:41 PM	04:47 PM	04:58 PM	A
04:17 PM	04:24 PM	04:29 PM	04:36 PM	04:44 PM	04:48 PM	04:54 PM	05:05 PM	C
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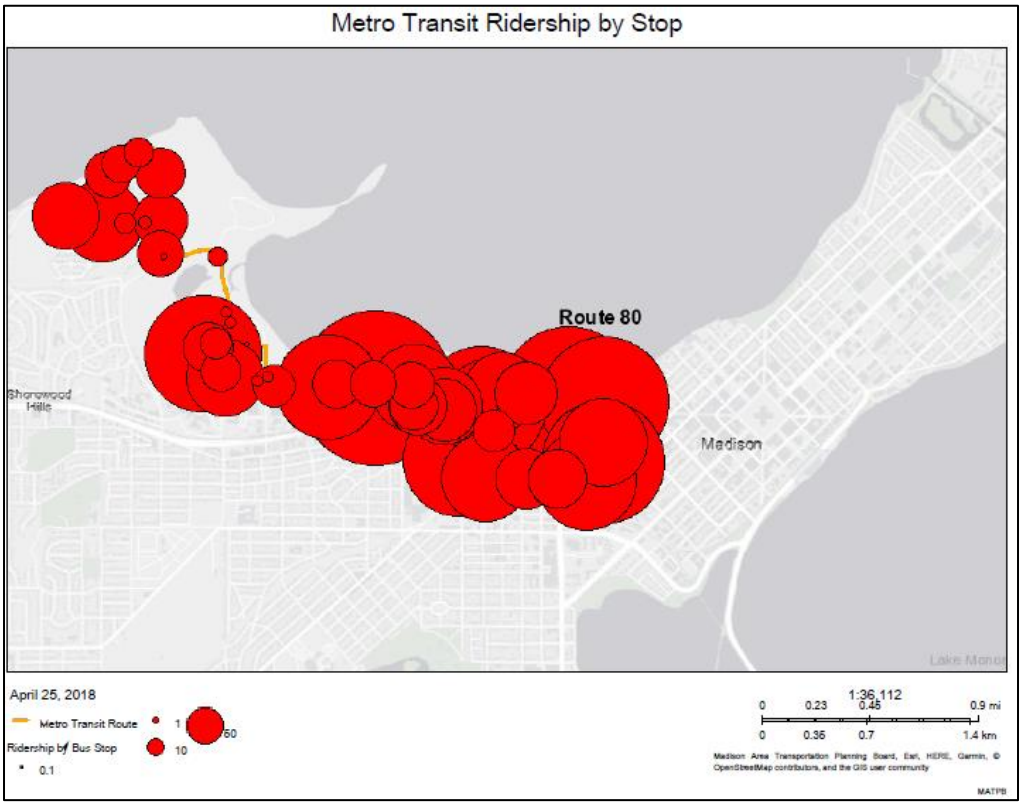
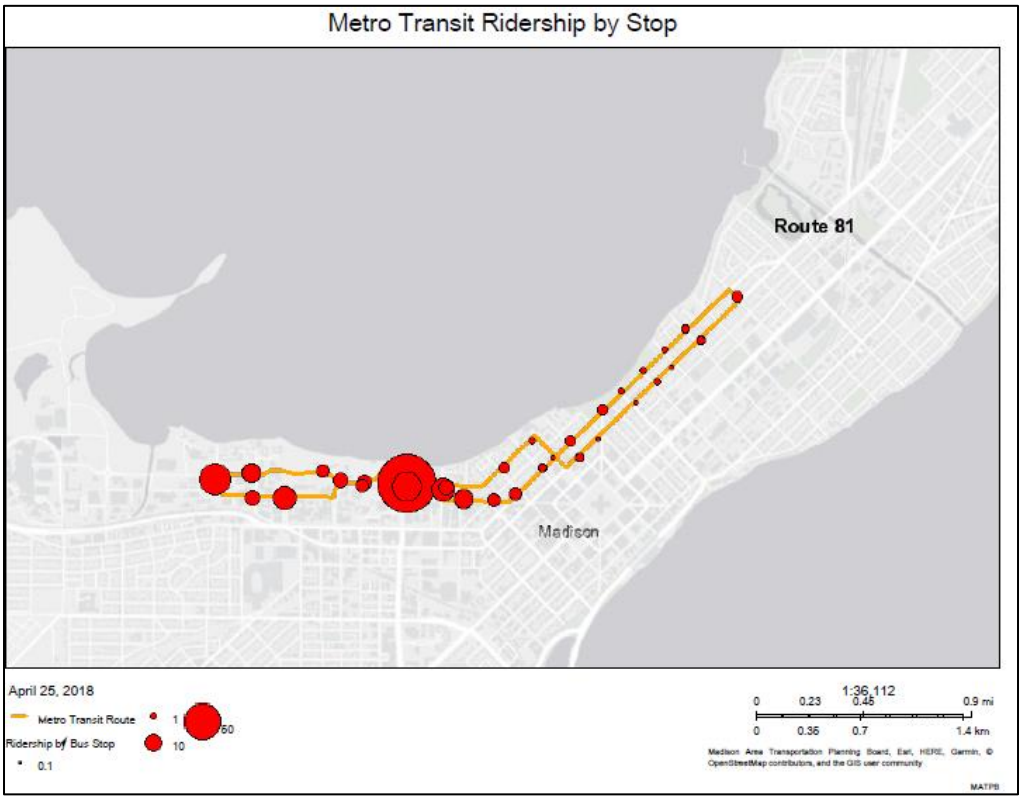
04:31 PM	04:38 PM	04:43 PM	04:50 PM	04:58 PM	05:02 PM	05:08 PM	05:19 PM	F
04:38 PM	04:45 PM	04:50 PM	04:57 PM	05:05 PM	05:09 PM	05:15 PM	05:26 PM	B
04:45 PM	04:52 PM	04:57 PM	05:04 PM	05:12 PM	05:16 PM	05:22 PM	05:33 PM	G
04:52 PM	04:59 PM	05:04 PM	05:11 PM	05:19 PM				D
04:59 PM	05:06 PM	05:11 PM	05:18 PM	05:26 PM	05:30 PM	05:36 PM	05:47 PM	A
05:06 PM	05:13 PM	05:18 PM	05:25 PM	05:33 PM	05:37 PM	05:43 PM	05:54 PM	C
05:13 PM	05:20 PM	05:25 PM	05:32 PM	05:40 PM				E
05:20 PM	05:27 PM	05:32 PM	05:39 PM	05:47 PM	05:51 PM	05:57 PM	06:08 PM	F
05:27 PM	05:34 PM	05:39 PM	05:46 PM	05:54 PM	05:58 PM	06:04 PM	06:15 PM	B
05:36 PM	05:43 PM	05:48 PM	05:55 PM	06:03 PM				
05:48 PM	05:55 PM	06:00 PM	06:07 PM	06:15 PM	06:19 PM	06:25 PM	06:36 PM	
06:00 PM	06:07 PM	06:12 PM	06:19 PM	06:27 PM	06:31 PM	06:37 PM	06:48 PM	
06:12 PM	06:19 PM	06:24 PM	06:31 PM	06:39 PM	06:43 PM	06:49 PM	07:00 PM	
06:24 PM	06:31 PM	06:36 PM	06:43 PM	06:51 PM	06:55 PM	07:01 PM	07:12 PM	
06:35 PM	06:42 PM	06:47 PM	06:54 PM	07:02 PM	07:06 PM	07:12 PM	07:23 PM	
06:48 PM	....							

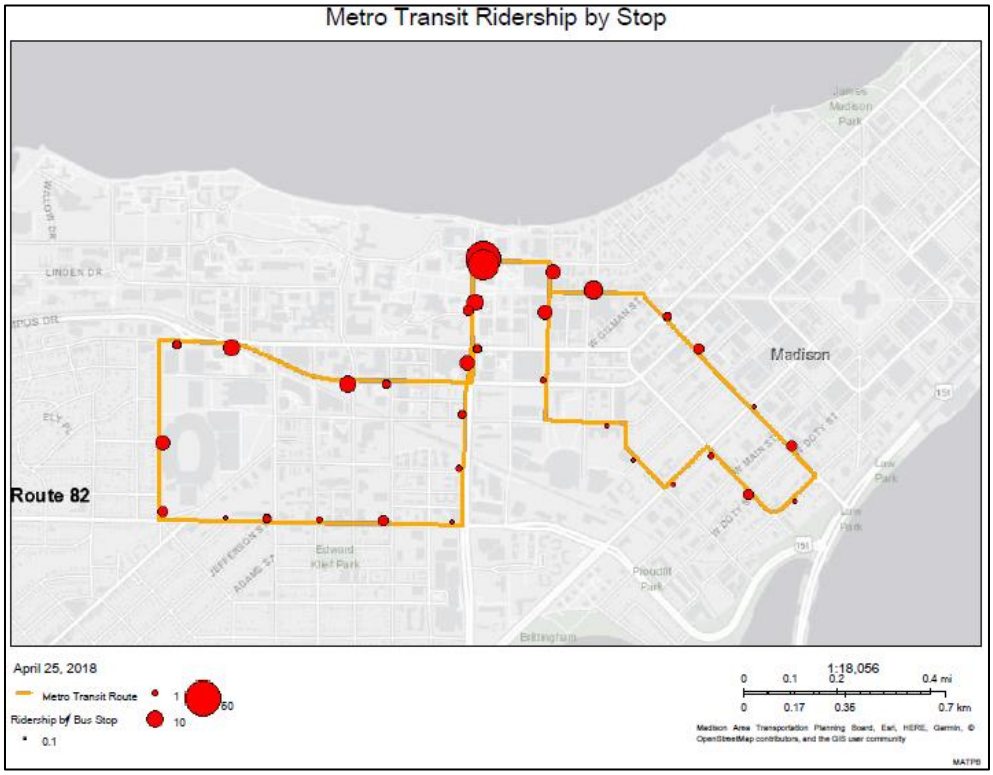
ROUTE CONTINUES CURRENT APRIL 2018 EVENING SCHEDULE

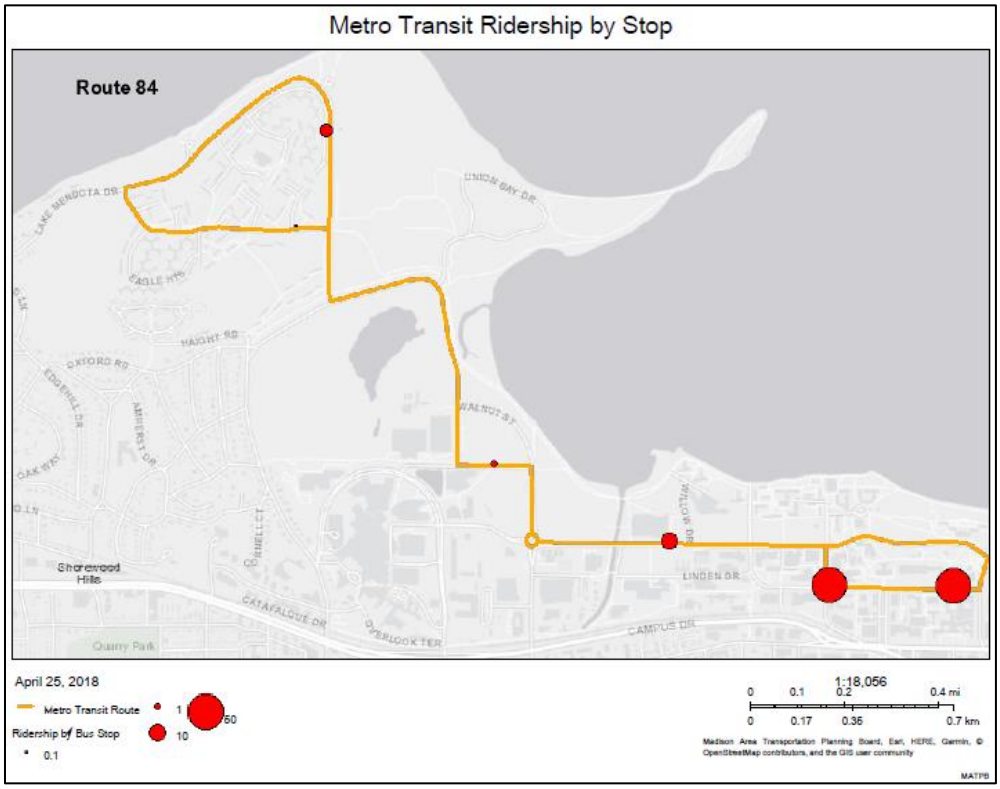
Attachment 3 – Route 80 and 81 Boardings by Stop





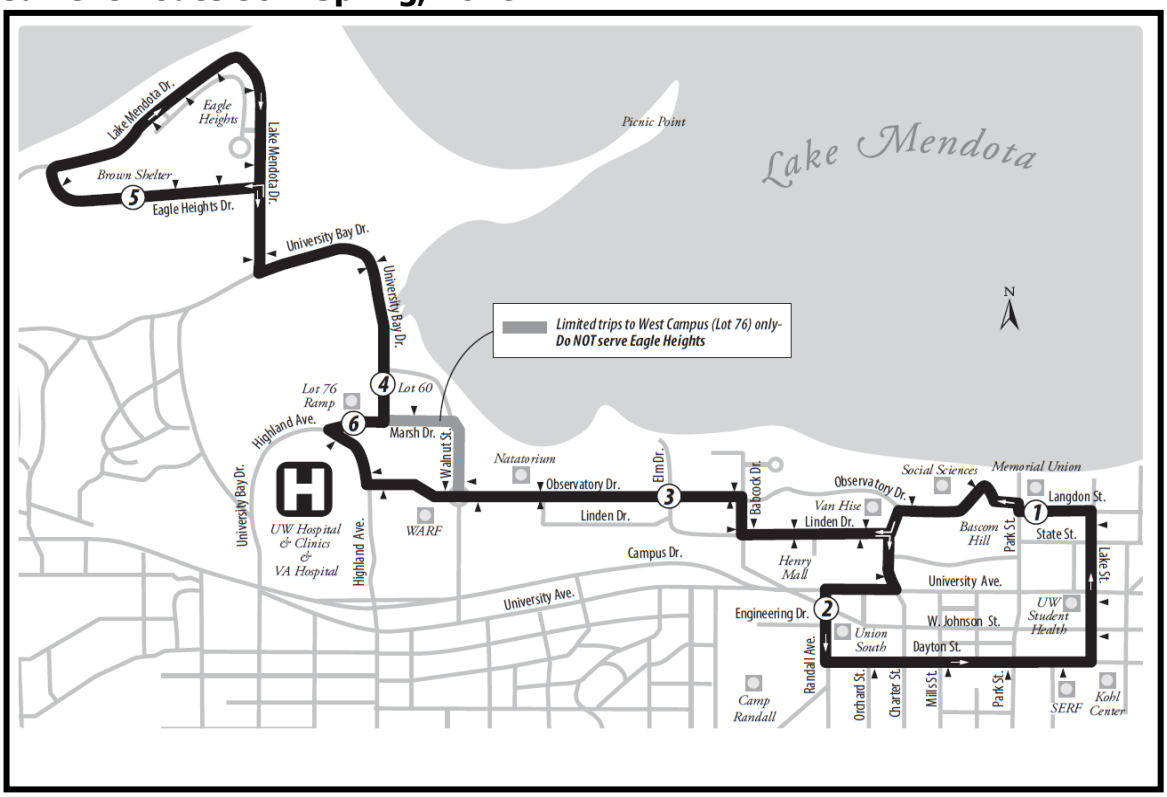
Attachment 4 – Route 82 and 84 Boardings by Stop





Attachment 5 – Route 80 Comparison

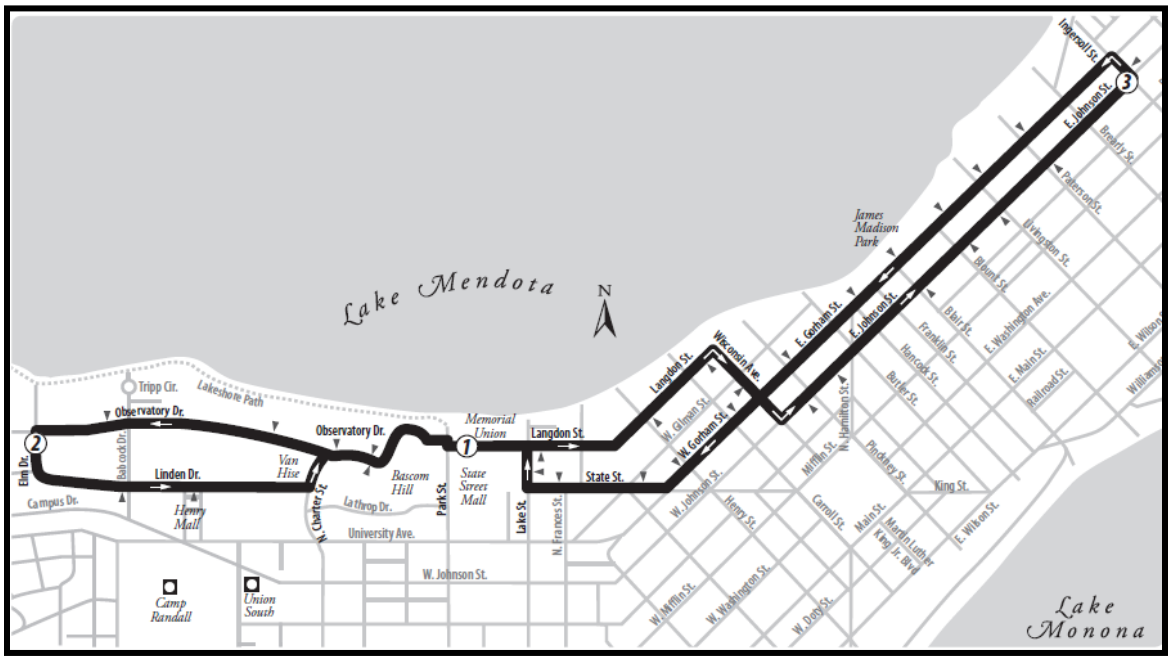
Current Route 80 – Spring, 2018



Proposed Route 80

Attachment 5 – Route 81 Comparison

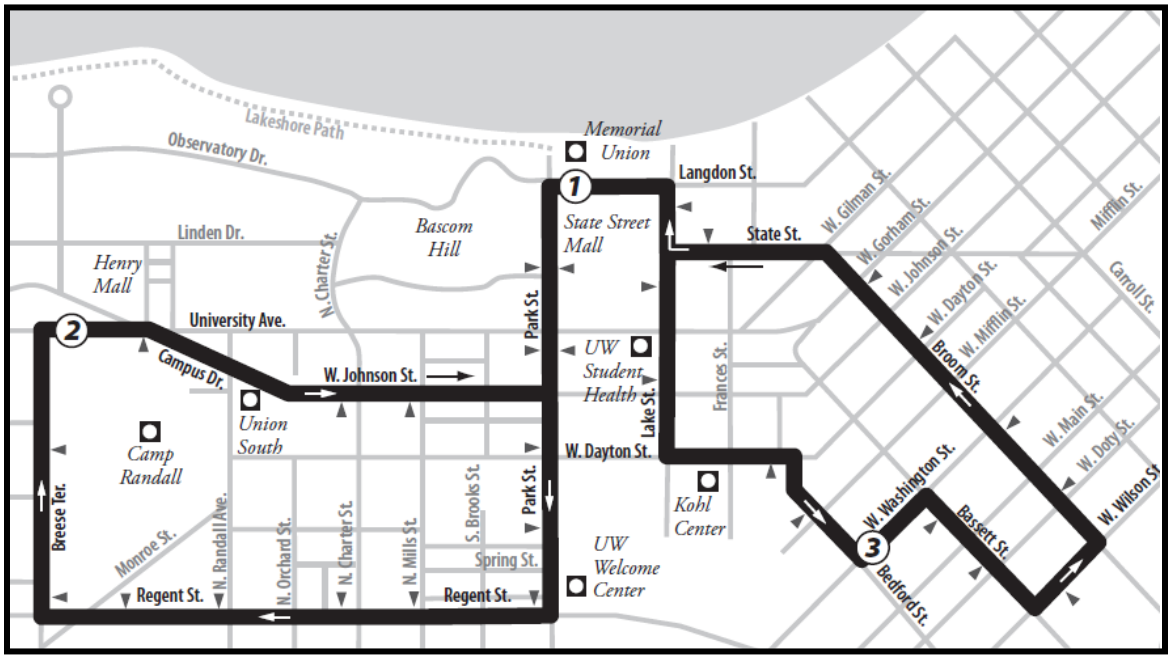
Current Route 81 – Spring, 2018



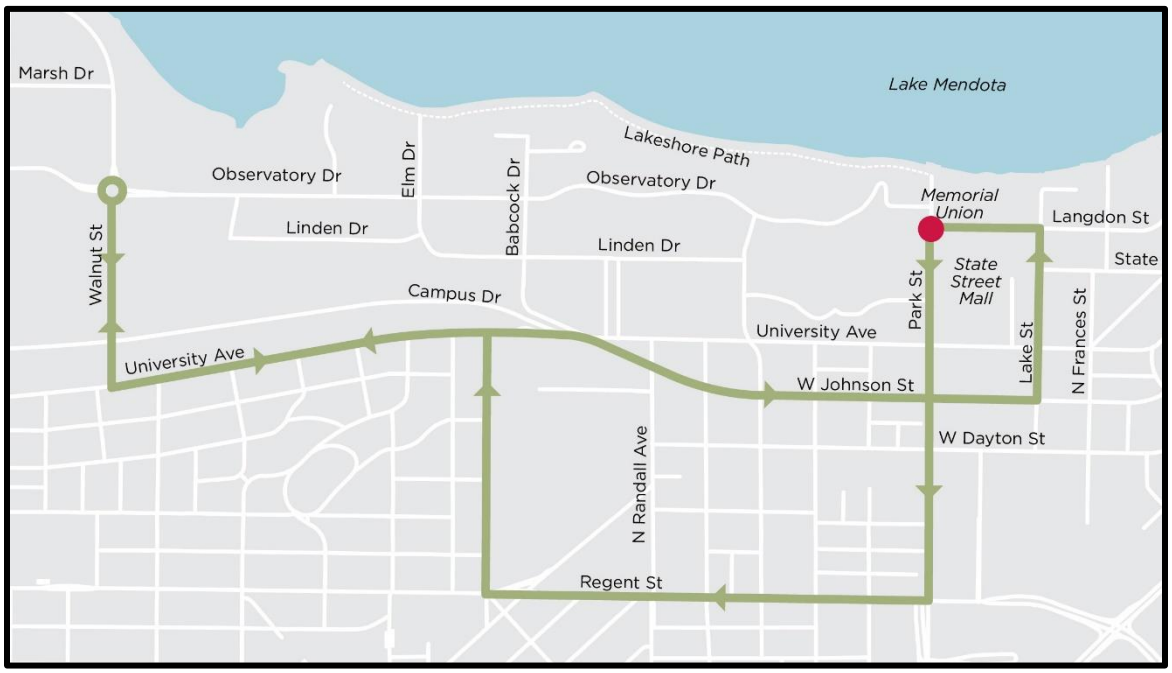
Proposed Route 81

Attachment 5 – Route 82 Comparison

Current Route 82 – Spring, 2018

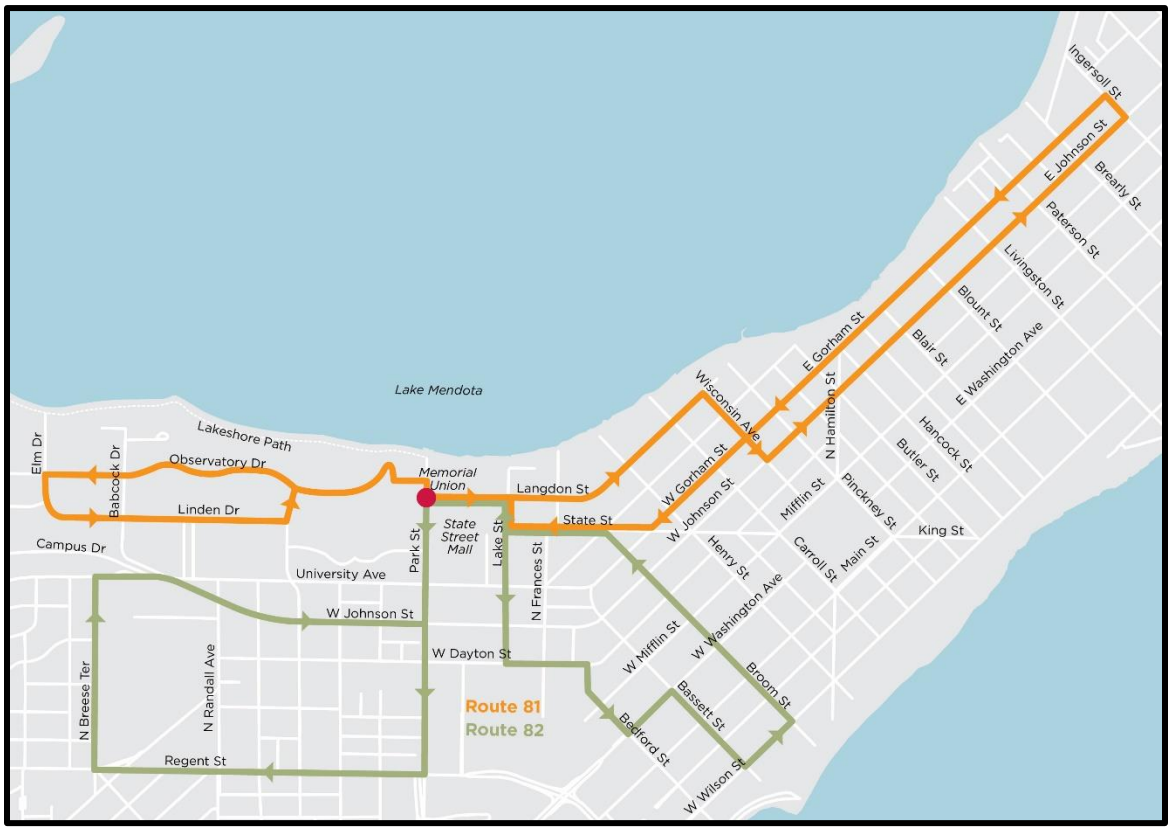


Proposed Route 82



Attachment 6 – Evening Route Comparison

Current Routes 81 and 82 – Spring 2018



Proposed Routes 81 and 82