City of Rochester

Center City Circulator Study
Feasibility Assessment

Interim Report

March 2011

Prepared by

C&S COMPANIES®

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Rochester Center City Circulator Study

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for

City of Rochester

Feasibility Assessment Interim Report
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CENTER CITY CIRCULATOR STUDY
FEASIBILITY ASSESSMENT INTERIM REPORT

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1.0 INTRODUCTION

The City of Rochester conducted a Comprehensive Downtown Parking Study which was completed in 2008. That study concluded that, as a whole, there is adequate parking downtown; however, parking shortages do exist in certain downtown sub-areas. In addition, current and planned development will remove additional parking from already constrained downtown districts. Among the more promising and ambitious recommendations of the report is a transit "shuttle" to connect underutilized parking facilities within and adjacent to downtown with major downtown destinations. Such a transit "shuttle" or "circulator" would help to balance out the existing supply within and adjacent to the CBD, improving overall utilization and at the same time promoting economic development by reducing developer and tenant concerns about parking. The circulator would also support the City's environmental sustainability initiative by maximizing the use of the existing parking supply and changing consumer behavior to reduce vehicle trips within downtown, thereby reducing traffic congestion and emissions. In addition to promoting local economic development, a circulator can also promote tourism and improve the attractiveness of the Downtown for conventions.

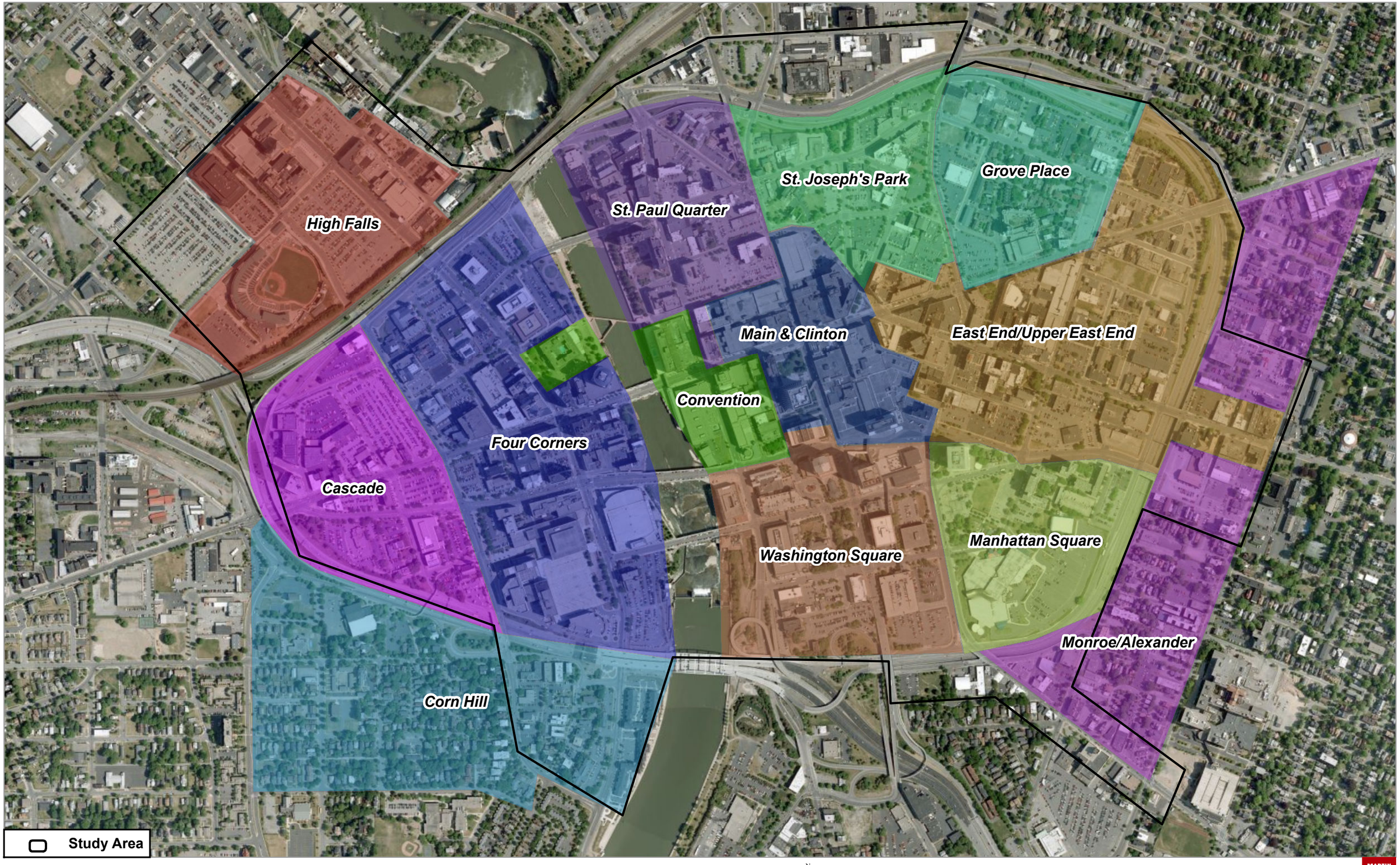
The concept of a downtown circulator is not new to Rochester. The EZ Rider system offered two routes geared toward visitors and tourists. The service was discontinued because of low ridership. Additionally, the RGRTA used to offer a fare-free zone in the Downtown. This practice was discontinued largely because of the expense and logistical complications of enforcement.

The Rochester Center City Circulator Study was initiated by the City to determine the elasticity of parking demand in Downtown Rochester through a Workforce Transportation Survey and to conduct a feasibility study for the establishment of a Center City Circulator transit service for daily commuters, tourists, and visitors. This interim report documents the feasibility of a transit circulator service linking existing and potential future perimeter parking facilities to major downtown destinations.

This feasibility study identifies key aspects of the service and several possible alignments that satisfy the service objectives. Based on these alignments, the report identifies potential system costs and discusses potential revenue sources. Finally, it applies the results of the workforce transportation survey to estimate the potential ridership as a parking circulator and impacts on the Downtown parking system. Based on the goals of the study, a recommendation for a circulator alternative is provided.

STUDY AREA

The study area includes the area bounded by the Inner Loop, as well as the High Falls, East End, Corn Hill, and Monroe/Alexander Park districts, and the Central Avenue area near the Amtrak and Greyhound stations as shown on Figure 1. The district names and boundaries are consistent with those detailed on the website of the Rochester Downtown Development Corporation (RDDC).



Study Area and Districts - Figure 1

ROCHESTER DOWNTOWN CIRCULATOR

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2.0 CIRCULATOR SERVICE GOALS

Early in the study, a review of several cities with downtown circulators was performed. In total, nine systems with a mix of trolley, streetcars, light rail, transit buses and trolley buses were interviewed and their answers, together with their thoughts and experiences from other systems, were coalesced and presented to the Project Advisory Committee (PAC). Based on these findings, the PAC laid out a series of objectives for the Center City Circulator. These goals are highlighted below as well as any relevant points relating to the recommendation.

MARKETS

AM/PM Peak Service

At a minimum, the circulator service should provide short travel times (time to travel entire route) and short headways (time between buses) during the morning (6:30-9:30 AM) and afternoon (3:30-6:30 PM) peak periods. These characteristics are intended to provide commuters with convenient service between perimeter parking facilities and downtown workplaces. Providing perimeter parking would alleviate some of the parking constraints currently found in the core of downtown, which are expected to worsen as the number of spaces is reduced due to development/redevelopment.

Four potential perimeter parking locations have been identified in and around the study area, as shown on Figures 3-7. The location to the west of the study area on West Main Street is roughly 1.7 acres and could accommodate over 180 surface parking spaces. The location to the west of the study area on Industrial Street is roughly 1.6 acres and could accommodate over 170 spaces. The location to the north on Andrews Street is roughly 0.8 acres and could accommodate over 90 spaces. Finally, the location to the east on Charlotte Street is roughly 1.9 acres and could accommodate over 200 spaces. Portions of these parking lots would require minimal resurfacing, while others would require full construction. The average cost per parking space would likely be less than $4,000. By comparison, structured parking more centrally located in Downtown could have costs in excess of $20,000 per parking space (Victoria Transport Policy Institute, 2009). Additional existing lots with excess capacity have also been highlighted.

Daytime Service

As a secondary feature, the circulator should serve as a downtown circulator during the day time (9:30 AM – 3:30 PM) that would serve both employees and tourists of downtown with circulation to and from all major destinations within the study area. Some of the key destinations include major office/employment centers, hotels, retail/restaurants, the convention center, and transportation hubs.

Evening Service

As a tertiary feature, the circulator could also provide an evening/late night service (6:30 PM – 2:30 AM) among entertainment venues, such as restaurants, bars, and theaters. Additional or modified routes should be considered for special events at Frontier Field, Blue Cross Arena, Rochester Riverside Convention Center, and other major venues. Evening service could be

expanded to incorporate the University of Rochester (U of R), the Rochester Institute of Technology (RIT), and other area colleges and universities.

FARE

At a minimum, AM/PM peak hour and daytime circulator service should be fare-free. A fare could be charged during evening service hours to offset some of the costs, though this would require some investment in infrastructure for collection of fares. Onboard fare collection would also increase the delay at stops, increasing overall run-times and headways. Ridership would be reduced when charging a fare, even if the fare is modest. The charging of a fare would also discourage the use of the vehicles for shelter and other unintended uses, though most systems address this through acceptable use policies and driver training.

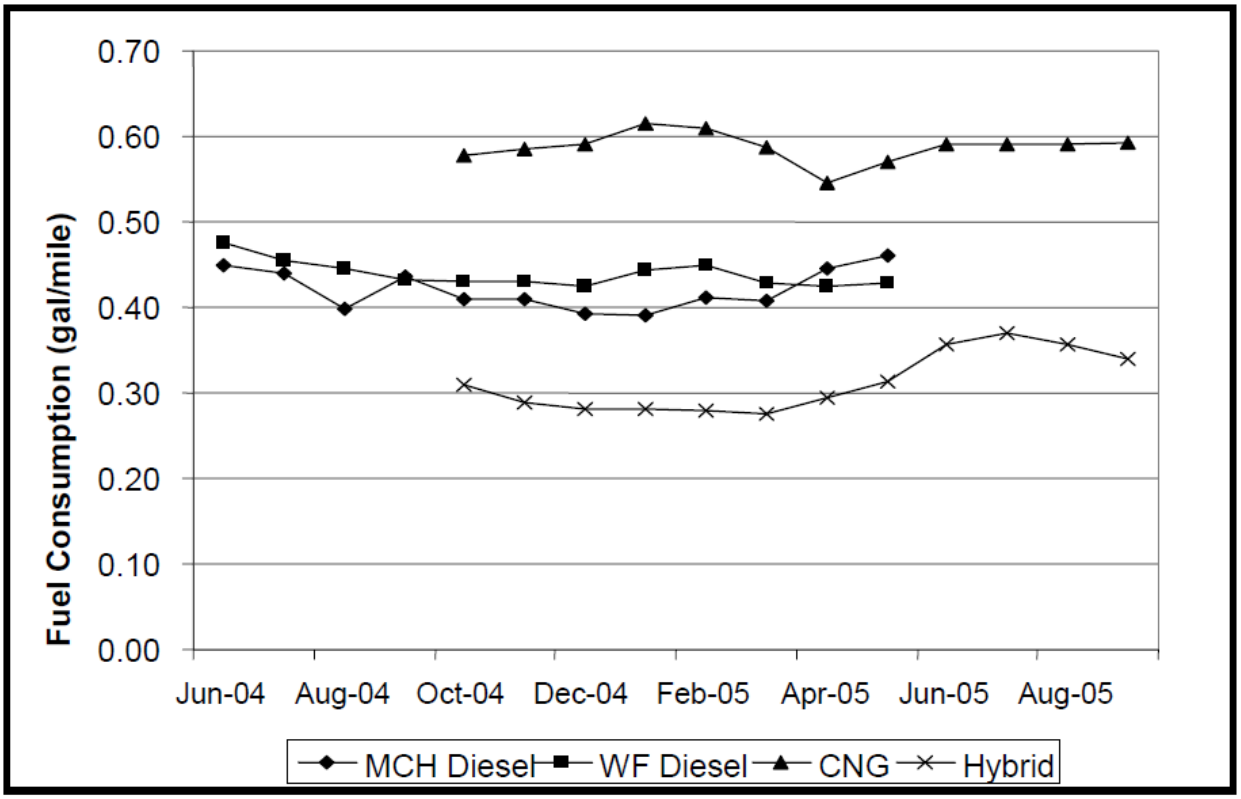
VEHICLE

The vehicle should be a low floor, full-sized bus, roughly thirty to forty feet in length, consistent with the current RTS fleet since they are considered a potential operator.

As a distinguishing feature, and to support the City's sustainability objectives, the preferred vehicle technology is a hybrid diesel/electric bus. Hybrid diesel/electric bus technology typically offers an increased fuel economy of 10-50 percent over traditional diesel buses. At low speeds, consistent with downtown circulator routes, the increased fuel economy is typically on the higher end of that range. A study of New York City Transit buses conducted from 2004-2006 showed their hybrid buses having a 37% higher fuel economy, on average, than conventional diesel buses running similar routes. In the summer, the fuel economy benefit dropped to 12% during one month, due primarily to running air-conditioning.

Compressed natural gas (CNG) buses are a lower-emissions alternative to conventional diesel buses. However, at low speeds they offer significantly lower fuel economy than conventional diesel buses. City/County green fueling stations, currently under development, are likely to provide CNG facilities, however these are not convenient to RTS' East Main Street campus. Fuel consumption from the New York City Transit study is given in Figure 2 for the three technologies. The figure includes data from two diesel depots Monta Clara Hale (MCH) and West Farms (WF). Each serves a set of routes with different operating characteristics, with West Farms having lower overall average speeds, which is reflected in the small difference in average fuel usage.

Figure 2 Fuel Consumption by Bus Technology



Source: (Barnitt & Chandler, 2006)

IMAGE

The circulator service should have a unique look that is different from typical buses and distinguishes itself from RTS service in terms of branding and vehicle appearance, based on concerns from the Downtown Workforce Transportation Survey regarding safety and reliability of existing RTS bus service. A unique, modern style can invoke curiosity and attract riders to the service. Stops should also be easily identified through branding.

LONG-TERM FLEXIBILITY

While the cost and timing of the project make fixed-guideway service (such as a street car or light rail) impractical in the short run, it is important that the Center City Circulator service lay the groundwork for a potential future system. For each of the routes, the report provides comment and insight on the potential suitability for a fixed-guideway system. As background to this discussion, additional detail on the relative merits of bus and fixed-guideway systems is discussed below.

In addition to the possible future conversion of the system to street car or light rail, the project could also be seen as a pilot project for the creation of future high-frequency service to planned transit nodes outside the downtown as well as to high-demand areas, such as service between UR, or RIT and the downtown.

Discussion of Vehicle Technology

The capital costs for a bus system are much lower than those of a fixed-guideway system. Circulator buses typically run on existing roads which in most cases requires no new investment. The vehicles cost $400,000 to $500,000 on average for hybrid diesel buses, and stops would require minimal costs for signage and amenities such as benches or shelters, particularly if the stops are collocated with RTS stops. The lead time for a bus purchase is typically about one year. Depending upon the operator, there may be a need to acquire or expand a maintenance facility to support the buses associated with the new service, though the current RTS expansion at the East Main Street facility would hopefully have sufficient room to accommodate circulator vehicles.

The costs for fixed-guideway systems, such as a streetcar, are substantially higher. In their recent feasibility studies for streetcars, Seattle and Minneapolis estimated the infrastructure costs to be $20-$30 million per mile of track. This includes tracks, overhead catenary wires, signals, electric substations, utility relocation work, platforms, and soft costs. In addition, vehicles are $2.5-$3 million each. Moreover, a maintenance facility would need to be constructed, preferably very close to the service area to avoid high capital costs associated with a distant location. Colorado Springs performed a streetcar feasibility study which estimated that the maintenance facility would need to be 2 to 5 acres in size. The Seattle feasibility study estimated the costs of a maintenance facility to be $2.6 million. For full-sized fixed-guideway projects, the project cycle is typically a decade or longer.

There are several advantages of streetcars including:

- **Ability to catalyze development.** Many streetcar systems see significant investment and development around their lines which is often credited to the system. Portland, Oregon estimated about $3 billion in investment around its streetcar lines. It is difficult to parse out how much of this investment is directly attributable to the streetcar system, however there does seem to be at least some stimulation of development. Also, several studies have shown an increase in property values in the vicinity of rail stations.

- **Ability to attract more riders and more varied riders.** Streetcars usually attract 15-50 percent more riders than bus systems. Streetcars may attract more "choice" riders and a greater diversity of trip purposes, whether for work, tourism, or discretionary purposes, as there is often a general preference for rail and an inherent perception of rail as a cleaner, safer, and/or more efficient technology. Indeed, there were several comments in the Downtown Workforce Transportation Survey expressing the desire for non-bus circulator options. Further, streetcars may attract new riders who otherwise would not take public transportation.

However, there are several disadvantages to streetcars as well:

- **Visual impacts.** Streetcars must have catenary (overhead) wire systems to operate which may be considered unsightly to some (though there are examples of good aesthetic design). There must also be frequent poles to support the wires. Stations may require more elaborate design and/or infrastructure, such as platforms and shelters. (There are options for in-ground power provision, but these are typically avoided in northern climates as they can be clogged with snow and ice.)

- **Cost.** As previously discussed, the initial capital costs are significantly higher than bus systems. This is also true of operating costs. Operating costs for streetcars are generally 35-50 percent higher than bus operating costs, running from $130 to $200 per revenue hour, though the cost per passenger may be lower due to increased capacity and ridership.

- **Flexibility.** As downtowns grow and evolve, there is frequent redevelopment that occurs. A streetcar system cannot be shifted to adapt to changing downtown land uses and densities as easily or inexpensively as a bus system.

- **Maintenance Facilities.** Maintenance facilities for streetcars must be constructed adjacent to the service area because of the huge capital costs that would be required to reach a distant maintenance facility. Although it is important for all systems to minimize deadhead time to and from maintenance/storage facilities, this is much less problematic for buses.

- **Pedestrian and Bicycle Impacts.** Streetcars are often credited with improving pedestrian areas and encouraging walking, but there can be conflicts, particularly with bicycles crossing the tracks. It is important for bicyclists to cross tracks at close to a 90-degree angle to minimize the risk of a crash from getting a wheel caught in the track bed.

3.0 SERVICE OPTIONS

SERVICE ALTERNATIVES

The service alternatives were developed based on the desire to provide circulator access to parking facilities, major employment destinations, and retail/entertainment destinations. For this analysis, circulator routes were assumed to run all day, not just during peak commuting hours. Routes would operate in the directions indicated on the accompanying figure. Evening service headways of up to twenty minutes were utilized as well. Once a final option is recommended, a cost sensitivity analysis should be performed to show the effects of reducing/eliminating mid-day service for the circulator route(s) and/or running multiple evening circulators to reduce headways. The cost assumptions are based on the RGRTA's all-inclusive average hourly cost of the RTS service of $119 per hour. Additional details on the assumptions used to develop costs for the circulator options are given in Appendix A. Capital costs associated with the purchase of the vehicles and any supporting infrastructure, such as a maintenance facility, are discussed in the following section and are not included in the costs presented below. The five circulator alternatives are given in decreasing order of capital and operating costs.

Circulator Option 1

Circulator option 1 has the greatest coverage, but requires three routes and five buses. Route 1a (shown in blue) is primarily a parking circulator, connecting conceptual perimeter parking locations with recognized parking "hotspots" in the core of downtown (i.e., Four Corners and Midtown). The more linear nature of Route 1a also makes it an attractive candidate for future conversion to a fixed-guideway system if ridership demand is commensurate. Routes 1b and 1c serve, respectively, as west and east circulator routes, connecting Frontier Field, Amtrak and Greyhound Stations, and several parking locations with most employment, retail, and entertainment destinations within the study area. Route 1c would continue in the evenings using two buses and a potential route deviation as shown on Figure 3. While the nighttime headway of 18 minutes for route 1c is fairly typical for such service, a second vehicle could be added to the nighttime service at an additional operating cost of roughly $240,000 annually, cutting the headway to 9 minutes. For visitors or anyone unfamiliar with this circulator option, the complexity of this system could make it difficult to use. The annual operating cost is roughly $2.3 million. This system is shown on Figure 3.

Table 1 Circulator Option 1 Costing

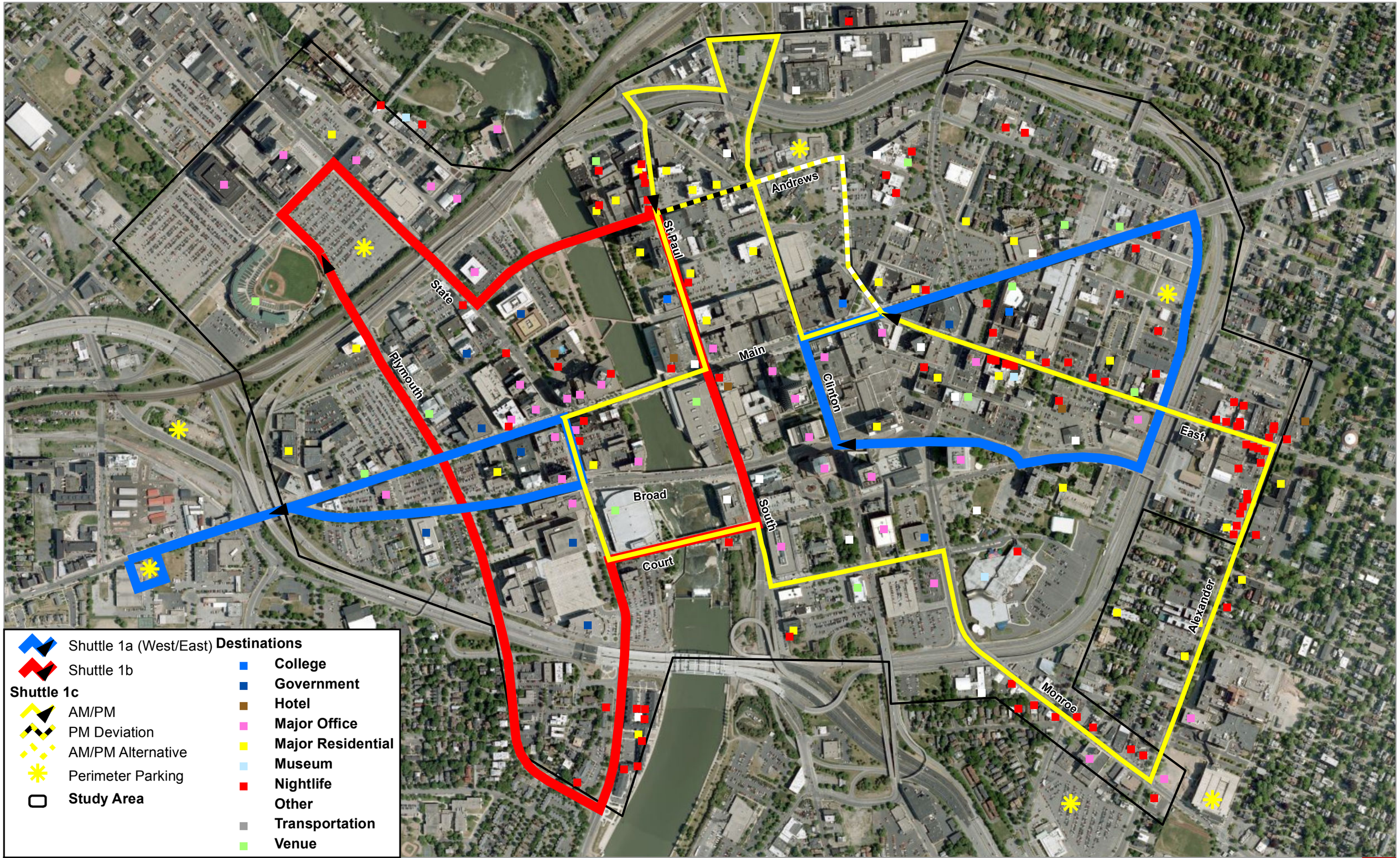
	1a West (Day)	1a East (Day)	1b (Day)	1c (Day)	1c (Night)
Number of Buses	1	1	1	2	1
Headway (minutes)	8	8	15	10	18
Revenue Miles (per day)	120	120	120	240	80
Revenue Hours (per day)	12	12	12	24	8
Cost (per day)	$1,428	$1,428	$1,428	$2,856	$952
Total Cost (per day)	$8,092				
Total Annual Cost	$2,296,700				

Circulator Option 2

Circulator option 2 has a very similar coverage area to circulator option 1, but has only two routes and four buses, no longer utilizing a dedicated east/west parking circulator route. Circulator option 2 has the benefit of providing all-day service to perimeter parking lots, where other circulator options might restrict service to remote parking to peak commuting hours only to reduce operating costs. However, with no east-west route, certain trips within Downtown could be prohibitively difficult. Route 2a (shown in green) acts as a western circulator route, serving perimeter parking, Frontier Field, Corn Hill, Four Corners, St. Paul Quarter, the Cascade District, High Falls, and the Convention Center district. Route 2a (shown in blue) acts as an eastern circulator route, serving perimeter parking, the Amtrak and Greyhound Stations, the Convention Center district, Main/Clinton, East End, Monroe/Alexander, Manhattan Square, Washington Square, St. Paul Quarter, St. Joseph's Park, and Grove Place. Route 2c would run in the evenings using one bus with 17 minute headways. While the nighttime headway of 17 minutes for route 2c is fairly typical for such service, a second vehicle could be added to the nighttime service at an additional operating cost of roughly $240,000 annually, cutting the headway to 8 minutes. The annual operating cost is roughly $1.9 million. This system is shown on Figure 4.

Table 2 Circulator Option 2 Costing

	2a (Day)	2b (Day)	2c (Night)
Number of Buses	2	2	1
Headway (minutes)	10	11	17
Revenue Miles (per day)	240	400	80
Revenue Hours (per day)	24	40	8
Cost (per day)	$2,856	$2,856	$952
Total Cost (per day)	$6,664		
Total Annual Cost	$1,939,700		



Circulator Option 1 - FIgure 3

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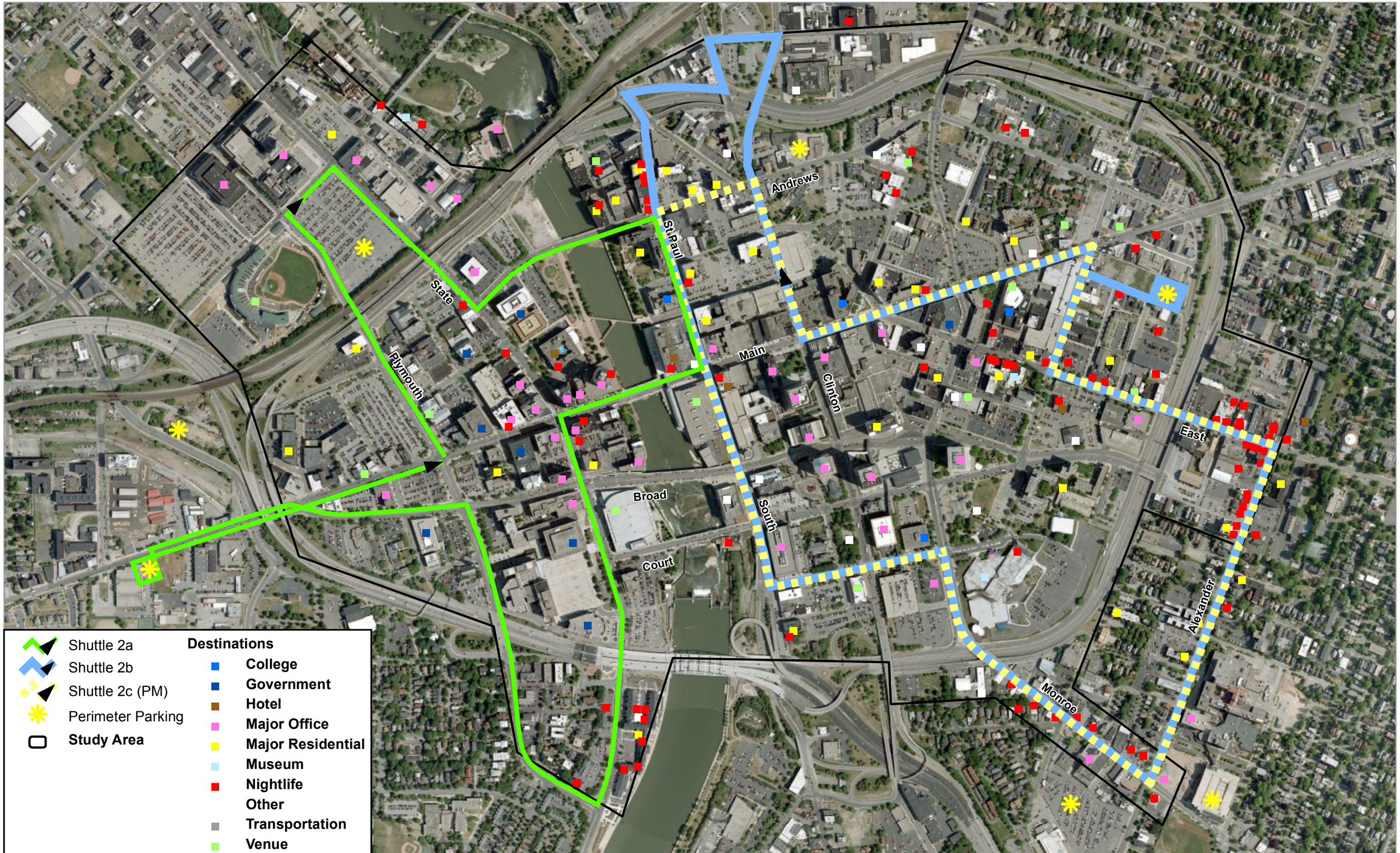

Circulator Option 2 - Figure 4

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Circulator Option 3

Circulator option 3 is comprised of two A.M. routes and one P.M route, utilizing four buses total. The two A.M. routes roughly form an X pattern, with an east/west and a northwest/southeast route. While the coverage area is not as good as circulator option 2, circulator option 3 is easier for the user to comprehend and the more linear nature allows for denser coverage, which provides the users with more options for boarding/alighting. Route 3c would run in the evenings using one bus with 17 minute headways. While the nighttime headway of 17 minutes for route 3c is fairly typical for such service, a second vehicle could be added to the nighttime service at an additional operating cost of roughly $240,000 annually, cutting the headway to 8 minutes. Circulator option 3 provides simple and convenient access to most key destinations in Downtown. However, for those unfamiliar with the system, there could be some confusion, particularly with the nighttime route change. The annual operating cost is roughly $1.9 million. This system is shown on Figure 5.

Table 3 Circulator Option 3 Costing

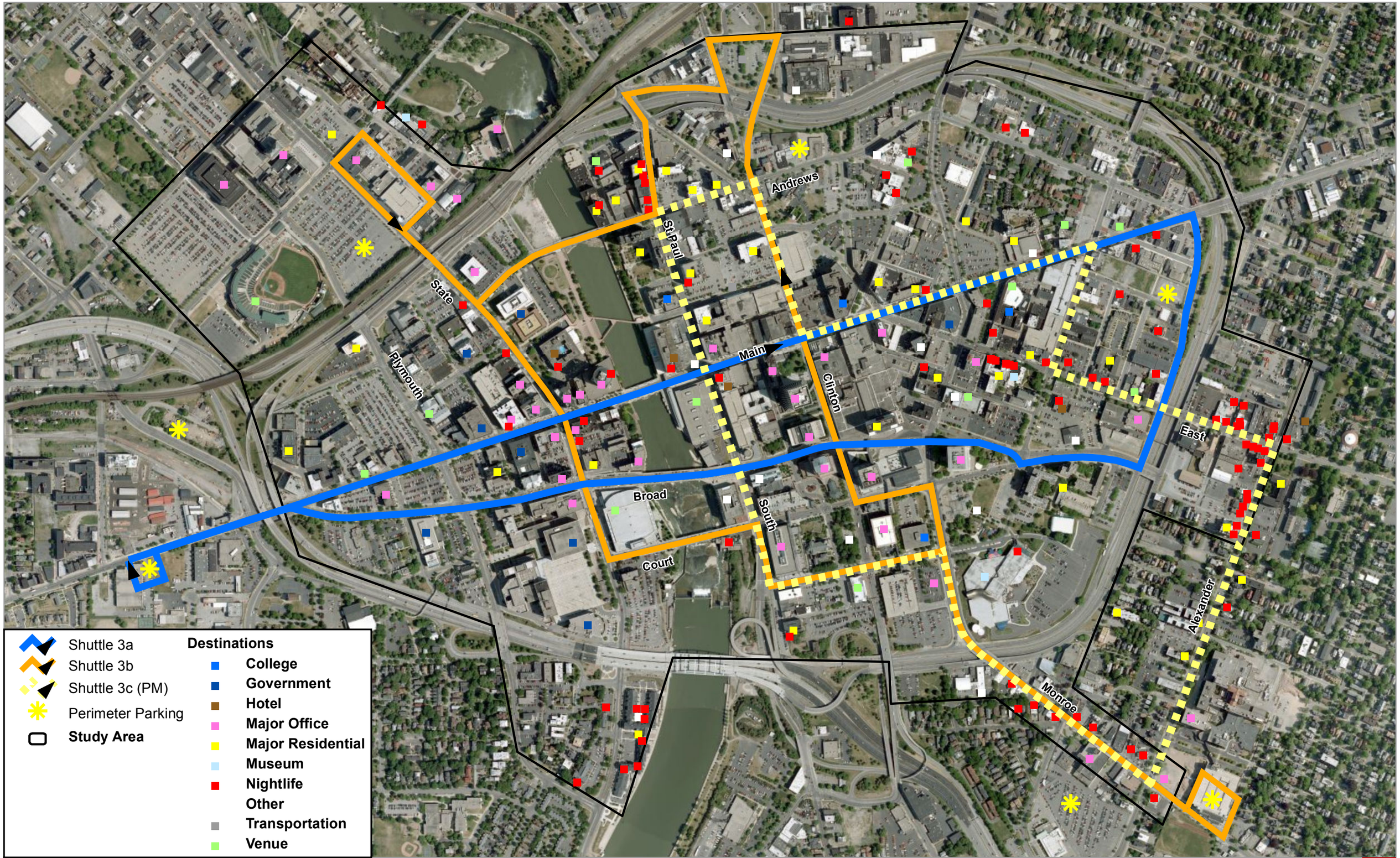
	3a (Day)	3b (Day)	3c (Night)
Number of Buses	2	2	1
Headway (minutes)	10	12	17
Revenue Miles (per day)	240	400	80
Revenue Hours (per day)	24	40	8
Cost (per day)	$2,856	$2,856	$952
Total Cost (per day)	$6,664		
Total Annual Cost	$1,939,700		

Circulator Option 4

Circulator option 4 is comprised of two small circulator routes with short enough run times to require only one bus each, translating to significant capital and operations cost savings. This option would utilize several RTS routes (namely 2, 4, and 8) that run along the Main Street east-west spine of downtown to serve destinations in and around the Cascade District and perimeter parking to the west. These three RTS routes could be made fare-free on Main Street from Canal Street on the west to Pitkin Street on the east. The routes could include additional signage/branding to designate them as part of the circulator system. The RTS route timing would need to be adjusted to minimize "bunching" and standardize headways within the fare-free zone. The use of RTS buses as parking circulators could be less convenient for commuters, but would likely have minimal effects on non-commuters that are well-served by routes 4a and 4b. Only route 4b would continue to run in the evenings, using one bus with 13 minute headways. The annual operating cost is roughly $1.2 million, which does not include any operating costs associated with RTS buses, establishing a fare-free zone, or signage/branding for RTS buses. This system is shown on Figure 6.

Table 4 Circulator Option 4 Costing

	4a (Day)	4b (Day/Night)
Number of Buses	1	1
Headway (minutes)	15	13
Revenue Miles (per day)	120	200
Revenue Hours (per day)	12	20
Cost (per day)	$1,428	$2,380
Total Cost (per day)	$3,808	
Total Annual Cost	$1,225,700	



Circulator Option 3 - Figure 5

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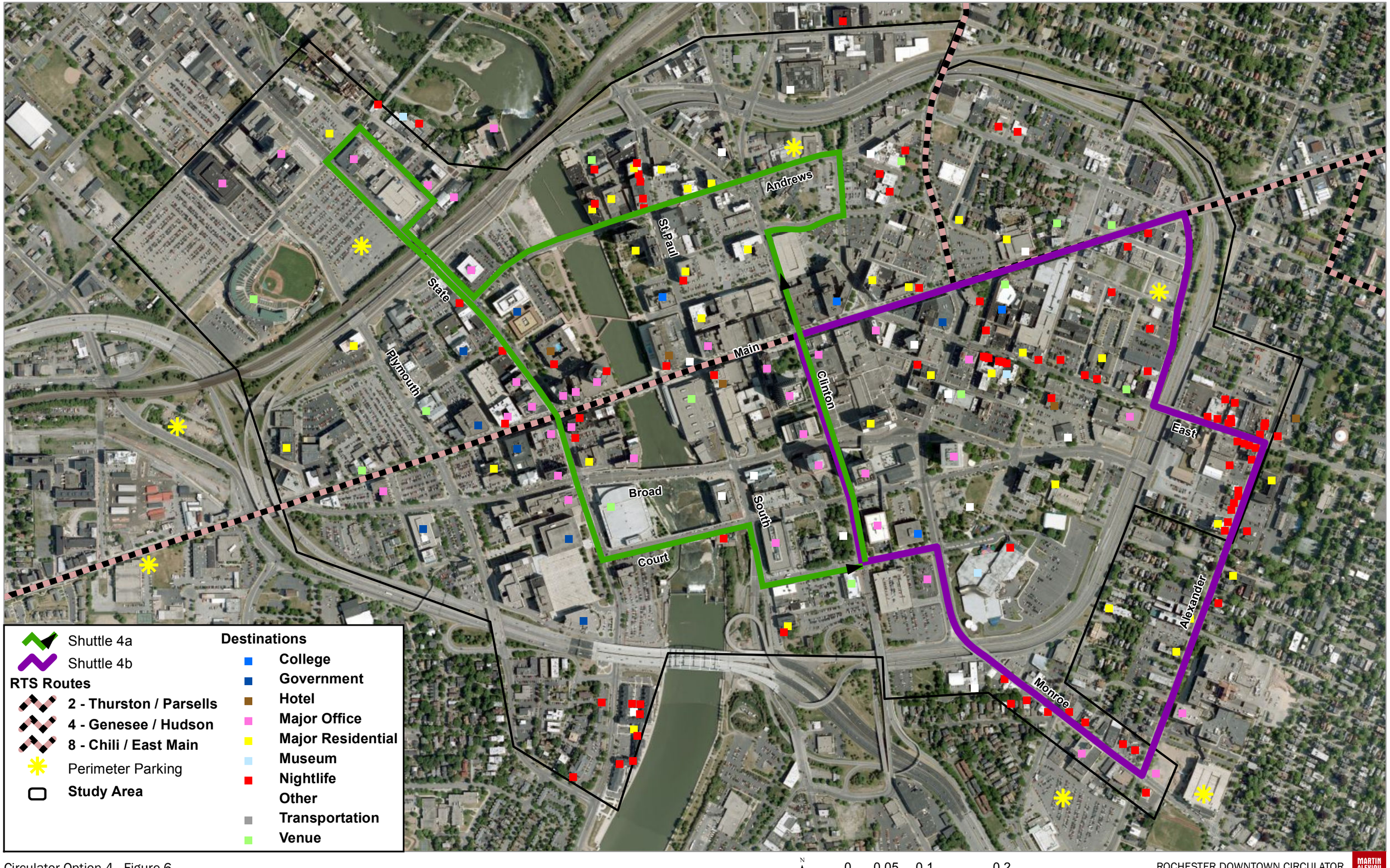

Circulator Option 4 - Figure 6

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Circulator Option 5

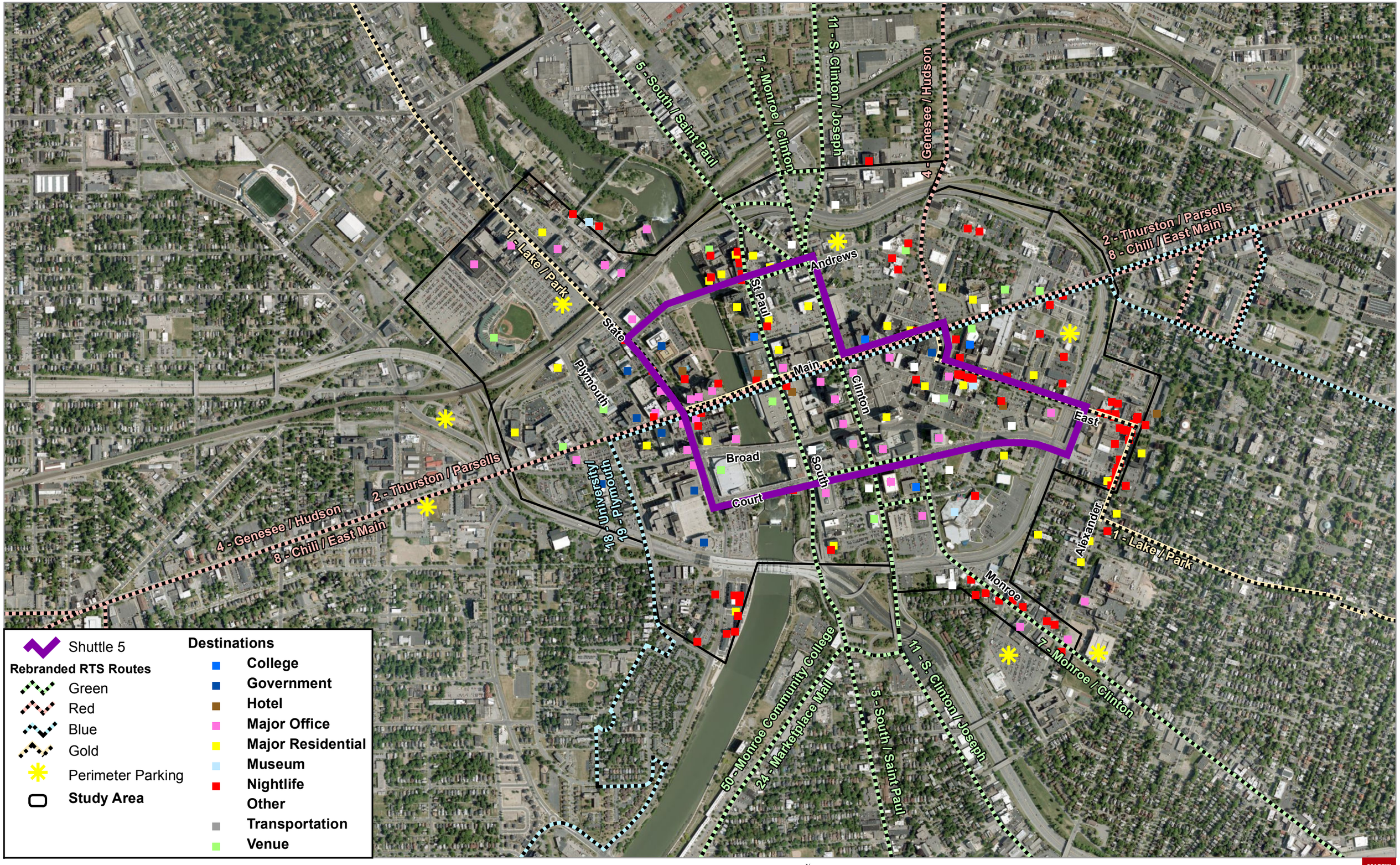
Circulator option 5 is comprised of a small route with a short enough run time to require only one bus, requiring the lowest capital and operations costs of any circulator option. This option would rely heavily on multiple RTS routes, as shown on Figure 7. RTS routes could include additional signage/branding to designate them as part of the circulator system. RTS routes serving the same destinations could be given the same route color so users aren't required to look for multiple route numbers. Variable headways on the RTS routes could be a detractor for commuters. Thus, the RTS route timing should be adjusted to minimize "bunching" and standardize headways within the fare-free zone. Some conceptual perimeter parking locations, such as the eastern lot on Charlotte Street, would not be directly served, as they are in other options. Overall, the use of RTS buses as parking circulators would be less convenient for commuters, but would likely have lesser negative effects on non-commuters that would primarily use circulator 5. The annual operating cost is roughly $0.7 million, which does not include any operating costs associated with RTS buses, establishing a fare-free zone, or signage/branding for RTS buses. This system is shown on Figure 7.

Table 5 Circulator Option 5 Costing

	5 (Day/Night)
Number of Buses	1
Headway (minutes)	14
Revenue Miles (per day)	200
Revenue Hours (per day)	20
Cost (per day)	$2,380
Total Cost (per day)	$2,380
Total Annual Cost	$731,850

SUMMARY OF SERVICE ALTERNATIVES

Each of the alternatives was evaluated with respect to the service goals laid out by the PAC. This includes route frequency, cost, service coverage and ease of use. The key districts and destinations are based on the districts used by the RDDC, as well as additional key parking and transportation facilities. The service alternatives are summarized below in Table 6.



Circulator Option 5 - Figure 7

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Route	Route 1a West (AM) [3]	Route 1a East (AM)	Route 1b (AM)	Route 1c (AM)	Route 1c (PM) [4]	Route 2a (AM)	Route 2b (AM)	Route 2c (PM)	Route 3a (AM)	Route 3b (AM)	Route 3c (PM)	Route 4a (AM)	Route 4b (AM/PM)	RTS Routes (2,4, 8)	Route 5 (AM/PM)	RTS Routes (Multiple)
Time Estimate (Minutes)	8	8	15	21	18	20	22	17	19	22	17	15	13		14	
Number of Buses [1]	1	1	1	2	1	2	2	1	2	2	1	1	1		1	
Buses Required	5					4			4			2			1	
Headway (Minutes)	8	8	15	10	18	10	11	17	10	11	17	15	13		14	
Annual Cost [2]	$2,296,700					$1,939,700			$1,939,700			$1,225,700			$731,850	
Key Districts/Destinations Served																
Perimeter Parking (West Main)																
Perimeter Parking (Charlotte St)																
Cascade																
Amtrak/Greyhound																
Mortimer Street Future Hub																
Kodak/High Falls																
Four Corners Intersection																
Convention																
Main/Clinton																
Corn Hill																
Manhattan Square																
St. Paul Quarter																
St. Joseph's Park																
East End																
Alexander Park																
Grove Place																
Washington Square																
% of Key Districts/Destinations Served	100%					100%			94%			88%			94%	
Simplicity and Ease of Use (Commuter)																
Simplicity and Ease of Use (Visitors)																
Pros/Cons:	While most expensive in terms of capital and operations costs, shuttle option 1 offers the best coverage area and service to all key destinations. For commuters, perimeter and interior parking is well connected to employment destinations. However, for visitors to downtown, deciding which of the shuttles to take and where to board could be difficult.					Shuttle option 2 is less expensive than shuttle option 1, but no longer has a route serving the east-west spine of downtown. Visitors to downtown should be able to familiarize themselves with the two routes fairly quickly.			Shuttle option 3 has the same cost as shuttle option 2. It offers a fairly straightforward east/west and north/south route structure that serves all destinations, with the exception of Corn Hill. The PM route change could be confusing to visitors of downtown.			Shuttle option 4 requires only two buses, which significantly reduces capital and operations costs from shuttle options 1, 2, and 3. The coverage area and destinations served are somewhat sacrificed, but the route run-times are relatively short. Commuters using perimeter parking to the west of downtown would have to rely on RTS routes as shuttles into the downtown core. The RTS routes 2, 4, and 8 could be branded as circulator routes in addition to RTS routes and could be fare-free within downtown. While the headways are fairly frequent, they are somewhat sporadic which could be a detractor for commuters looking for consistent headways.		Shuttle option 5 relies heavily on existing RTS routes to cover much of the downtown perimeter For visitors to downtown, the route 5 circulator would suffice as a circulator in and of itself and is very straightforward. For commuters looking to access parking facilities or destinations on the perimeter of downtown, the reliance on RTS routes could be a challenge. Sporadic headways on the RTS routes could be a detractor for commuters and the issue of fare and branding could be overly complicated.	

Notes:

1 Recommended number to achieve 10-15 minute headways during the day and less than 20 minutes at night

2 Assumes 6:30 AM to 2:30 AM service. Based on NTD, RTS service costs $119 per hour to operate. This analysis assumes an estimated operating cost of $90 per hour to operate, given administrative efficiencies, etc.

3 6:30 AM to 6:30 PM

4 6:30 PM to 2:30 AM

SERVICE OPERATOR

The circulator service could be directly operated by RTS/RGRTA or contracted to a private transportation provider. RTS operation would benefit from shared resources, such as facilities, maintenance tasks (e.g. clearing of snow), and personnel. RTS operation could also provide more flexibility in terms of number of buses and total capacity for special events or periodic fluctuations in demand. Purchased operation would provide the benefit of fixed, predictable costs and less financial risk. Most private-operator contracts include service standards and other provisions to guarantee high levels of service and customer satisfaction in a way not possible with public operators – though there is typically a price premium associated. For example, the R-Line in downtown Raleigh, NC operates under the local transportation authority, Capital Area Transit, which has an operating contract with a private operator. At an estimated $80 per service hour, the R-Line is more costly to operate than most of the peer systems reviewed, though the cost per rider is the lowest.

If a private operator is selected to operate the service, assuming the federal dollars are available, it would likely be much more cost-effective to have the RGRTA own (and possibly maintain) the buses. While the City and other quasi-governmental agencies can theoretically receive federal funding to support transit vehicle purchases, as the RGRTA is the designated provider for the area, funneling funds to another entity would be very complicated.

4.0 ASSESSMENT OF OPERATIONS

SCHEDULE

The service hours for a circulator system should be tailored to suit the desired goals of the system. The highest level of ridership can typically be expected during the morning and afternoon commuting hours, mid-day during lunch hours, evenings during dinner hours, and the late evening on weekends during "nightlife" hours.

Based on the City of Rochester's desire to provide circulator access to parking facilities, major employment destinations, and retail/entertainment destinations, service should commence no later than 7 A.M. and run until at least 10 P.M. Peer systems with the goal of serving more than commuters all run until at least 10 P.M, with the exception of West Palm Beach which runs from 11 A.M. until 9 P.M. and is designed to serve from "lunch until dinner." Initial service hours should be as extensive as is financially possible in order to best promote awareness and use of the new service. Once the service has been in operation for some time, service hours could be expanded or reduced based upon user surveys and ridership data.

SYSTEM COSTS

Capital Costs

Depending on the technology used, each bus could cost up to $500,000. Depending upon the alternative selected, this would translate into initial vehicle costs of up to $2.5 million, excluding any spare vehicles. Normally, at least one extra vehicle would be required as a spare. Up to 80

percent of the cost of rolling stock can be acquired from the Federal Transit Administration under Section 5307 or 5309 grant funds. The most likely source of 5309 funds are bus grants, though these allocations have historically been made entirely by earmark. Other Section 5309 funds could be attained competitively (as part of the New Starts process), however the service standards for such systems include additional infrastructure investments – such as substantial stations and signal priority – that extend beyond the initial vision for the circulator. If federal funds are available, the state will typically contribute ten percent of the project cost, leaving the remaining ten percent to be covered by a mix of funds from local government, private entities, and non-profit agencies. Depending upon the number of additional vehicles and their maintenance requirements, the project may incur additional capital costs for any additional maintenance and storage facility requirements. These infrastructure upgrades are typically eligible for 80 percent federal funding, as well, under 5307 and 5309 grants.

If a private operator is selected to run and maintain the system, it is also possible that it would be responsible for procuring vehicles and a maintenance facility. These costs are then typically rolled into the charge per service hour and diminish for longer contract terms (as the contractor is able to amortize the cost over a longer period, up to the useful life of the vehicle).

Operating and Maintenance Costs

The use of hybrid electric bus technology can significantly reduce fuel costs, particularly at low speeds, consistent with downtown circulator routes (*see **Vehicle***). Many cities have found hybrid buses to be more reliable and have lower maintenance requirements than conventional diesel buses, though initial maintenance costs associated with training and inefficiency from the "learning curve" may be much higher.

Based on data from RGRTA, RTS service costs $119 per hour to operate and maintain. As such, operations and maintenance costs estimates for the analysis included in this report assumed an operating cost of $119 per hour, though actual costs could be lower given potential administrative efficiencies, state operating support and fuel savings if hybrid vehicles are used. The cost per service hour for the peer systems studied ranged from $50 to $81, including systems in cold-weather climates. The estimates of operating costs for each circulator option are based on moderate ridership demand. A typical 40-foot transit bus can transport about 80 passengers at full load; at seven trips per hour, one circulator bus could transport approximately 560 passengers per hour. If high demand for perimeter parking circulators is experienced, then there would be additional costs necessary to cover the additional runs needed to achieve higher frequencies. These additional trips would also likely require additional vehicles unless the operator had spares regularly available for use on the service.

Service operated by the RGRTA could also be eligible for state operating assistance (STOA). Current rates are $0.405 per passenger and $0.69 per vehicle mile. A local match equal to the amount of state assistance is required. In the case of fare-free service, in order to collect the per-passenger assistance, an additional local match would be necessary in the amount of at least 30 cents per rider. Private operators may also be eligible for STOA.

Marketing and Branding Costs

There will be one-time costs associated with the development of a logo and marketing campaign. Assuming the initial vehicles are new, the vehicle branding and styling will be included as part of the vehicle charges.

Initial marketing costs will vary with the extent of the campaign. The RDDC and local agencies should pursue in-kind donations to support these initial efforts and minimize ongoing marketing costs. If RTS is selected to operate the service, much of the oversight and development of these continuing campaigns could likely be rolled into ongoing operations. Unless the City or RDDC chooses to take on sole marketing and branding responsibility, this cost would typically be rolled into the operating agreement (with RGRTA or a private operator).

In conjunction with downtown circulator service, it is not uncommon for cities or business districts to introduce "ambassadors" or other public awareness and assistance campaigns. These range from special websites and call-in numbers to the creation of a small staff who patrol the district or are stationed at key locations, providing assistance and reinforcing the "brand" of the district. In some cases, this can extend to assisting with daytime maintenance of circulators or otherwise aiding in efforts to improve perceived security on the vehicles and at the circulator stops. Such efforts are typically organized and operated largely independently of transit operations. In Downtown Rochester, the circulator "ambassador" service could be an extension of the existing Safety Services "Red Shirts" program.

FUNDING STRATEGY

Operating costs for the circulator service could be funded through a number of sources, but it is important to have a reliable and dedicated source of funding to ensure continuity and reliability of service. A tiered parking fee structure could be implemented, with the highest parking fees in the areas with the highest demand and nominal or no parking fees for perimeter parking. The additional "incremental" parking fees could be used to finance some of the circulator operating costs without displacing existing parking funds, while encouraging more commuters to take advantage of the circulators. The City of Rochester, the Rochester Downtown Development Corporation (RDDC), or other local government and non-profit agencies could assist in funding the service. Similarly, a tax overlay district for the service area could be used to fund the service, in lieu of funding through the RDDC. Advertising can provide some revenue, but would most likely be a minor contribution to overall operating costs.

Grants may be obtained from the Federal Transit Administration (FTA), particularly to cover capital costs associated with the system. The Rochester area has too large a population to make it eligible for FTA operating grants, though assistance from the state is possible. Federal money from the Congestion Mitigation and Air Quality (CMAQ) Improvement Program is distributed at a state level, and may be available for the circulator if potential emissions reductions attributable to the system are demonstrated. While the proposed system might be eligible for funding under one of the competitive Section 5309 federal grants – such as the recent Urban Circulator Systems or "State of Good Repair" programs –, much of this money is allocated via Congressional earmark so successful lobbying may prove critical to ensuring federal monies. Additional

stimulus-type legislation could free additional competitive funding, however there are no indications that such legislation is forthcoming. Section 5307 funds received by the RGRTA could be used for the project's capital costs as well. In all cases, the federal support will be no more than 80 percent of the project cost with remaining funds coming from local or state monies.

If the evening service is expanded to serve special events and area colleges, these private entities could contribute a share of the operating subsidy. If extra vehicles were required – and this cost were not rolled into the operating cost – they might also be expected to defray part of this cost.

MAINTENANCE AND STORAGE

If the circulator bus system operated under the Rochester Genesee Regional Transportation Authority, the circulator buses could utilize RGRTA maintenance and storage facilities. RGRTA is in the midst of a major facilities expansion at its East Main Street campus, which should accommodate fleet expansion, if necessary.

LONG TERM EXPANSION

While the proposed circulator system would primarily serve persons working in or visiting Downtown Rochester who have first driven there, the long term aspiration is to provide a more extensive system that would connect directly to residential neighborhoods or other key demand generators. There are two aspects of such a system which have been discussed by the PAC. First, there is interest in the possibility of a fixed-guideway system. This is generally envisioned as a downtown streetcar or light rail line that would stretch beyond the Inner Loop, with potential future connections to suburban locations. Rather than circulate through the downtown, it would likely bisect it linearly along Main Street, State Street or Clinton Avenue. This service would likely be commuter and fare-driven though there are many examples of fare-free zones in city centers. If the system does not extend beyond the CBD, though, it is unlikely it will be fare-free as the costs will be substantial enough that some cost recovery will be necessary.

Route 3a provides coverage similar to what an east-west oriented line traveling down Main Street would provide. Route 3b provides coverage similar to what a north-south oriented line would provide if it were to leave north along State Street, cross the river and continue south along Clinton Avenue or Monroe Avenue. Route 1b provides coverage similar to that of a line that followed State Street without crossing the river. Option 4 provides a system that would most likely represent the future circulator system were the RTS routes along Main Street upgraded to a fixed-guideway system.

The second aspect of system expansion revolves around better capturing the evening and weekend demand. Such service would likely be express to high demand generators such as the University of Rochester and RIT, but could also include service to park and ride lots or suburban activity centers. The service would be similarly branded as the downtown circulator service using similar vehicles. Routes serving universities would likely need to be funded primarily by the institutions. Routes to other areas could charge a fare, but it would need to be low enough to be competitive with evening parking rates Downtown. As economic development tools, such routes would likely, at least initially, need support from the RDDC, the City or other entities. It

would also be critical to ensure that the service not dilute the brand that has been established for the Downtown circulator, particularly if it has different operating characteristics. It would also be important to ensure that the bus and the patrons remained orderly and safe, not acting as a "bar bus".

5.0 ASSESSMENT OF BENEFITS TO PARKING SYSTEM

A Workforce Transportation Survey was conducted earlier in this study in order to determine the commuting patterns and preferences of downtown employees. Based on the stated preference data from the survey, elasticities of demand for garage/parking lot price, circulator price, circulator travel time, and circulator frequency were calculated for the following four options: drive and park at current location, drive and park at a peripheral lot and take a circulator bus, take an RTS bus, or use alternative modes (e.g. walk, bike, get dropped off).

The study determined that circulator demand is most affected by the price of the circulator (including circulator parking and fare), with an elasticity of -60 percent (i.e., a 100 percent increase in parking/fare results in a 60 percent decrease in circulator ridership). The second biggest effect on circulator demand is the price of current parking, with an elasticity of 30 percent. As such, the price to park in garages/lots with limited capacity could be increased to incentivize use of peripheral circulator parking. In this way, a tiered parking rate structure could be developed based on known demand and capacity of parking lots and garages from the Walker Parking Study. The third greatest effect on circulator demand is circulator travel time, with an elasticity of -20 percent. Thus, parking circulator routes should be as short and direct as possible, while still adequately serving primary destinations.

The data from the survey was used to create a parking mode-choice model as part of the first phase of the project. The model was calibrated to the results of the 2000 Census Transportation Planning Package (CTPP) for the City of Rochester. CTPP provides information on worker-flows between home and work. Additionally, the results of this survey were weighted by parking location obtained from the 2008 Comprehensive Downtown Parking Study by Walker Parking Consultants. The model inputs include CBD parking fee, circulator lot parking cost (including circulator fare if applicable), circulator time (average time from circulator lot to employer), additional circulator in-vehicle travel time (IVTT) (average additional travel time to access perimeter circulator lot), RTS in-vehicle travel time (average additional travel time incurred taking RTS versus driving and parking in CBD), and circulator frequency (circulator circulator trips per hour).

As part of this study, the model was used to conduct a sensitivity analysis for public parking demand and associated annual revenue. The variables for additional circulator in-vehicle travel time (IVTT), RTS IVTT, and circulator frequency were held constant at four, ten, and ten minutes, respectively. Parking demand and total annual revenue estimates from public parking fees for each scenario are given in Table 7. The table is meant to show general shifts in annual public parking revenue with the introduction of a parking circulator service in Downtown Rochester, as CBD public parking cost, circulator parking cost, and circulator time are varied.

To establish the baseline conditions, the 2000 CTPP was used to determine the number of commuters to the Rochester CBD (approximately 19,200); this is the same dataset that was used to calibrate the parking mode-choice model. As a baseline for the peak public (versus private) parking occupancy, the number of drive alone commuters (15,400) was multiplied by the proportion of peak occupied public parking spaces as reported in the Walker Study (67.6 percent). The average existing CBD peak public parking usage was thus calculated to be approximately 10,400, which is consistent with the peak parking inventory determined as part of the Walker Study. Annual parking revenue was estimated using an average daily parking cost of $4.73 (from the Walker Study) and 240 annual business days. Additionally, as the model predicts a different mode split by season, the annual total reflects this seasonal variation by calculating the mode split for each of the four seasons and assuming that each represents one quarter of the total annual revenue. It should be noted that as the mode split shifts with each scenario, the total number of parkers may go up or down. Also, while the City has increased parking rates since the survey was conducted, the analysis is based on previous pricing for consistency for the survey. However, for comparison purposes, the sensitivity analysis shown here adequately demonstrates the effects of the various demand elasticities.

As the table shows, low parking fees in the CBD and at remote parking will likely result in a net decrease in parking revenues. A noticeable increase in the CBD parking fees, coupled with a modest fee for remote parking could result in a positive revenue stream that could be used to cover some costs associated with circulator operations. For example, increasing CBD parking by $2.00 to $6.73 and charging $2.00 for perimeter circulator parking with a direct circulator that takes only 7 minutes to transport passengers would increase annual revenue from public parking fees over $800,000 compared to the baseline scenario with no circulator. On the other hand, a nominal perimeter parking fee of $0.50 per day, with all other factors unchanged, would incentivize use of the parking circulator while decreasing revenue from perimeter parking: annual public parking revenue would decrease $1.3 million compared to the baseline scenario. Thus, changing the cost of perimeter circulator parking by $1.50 per day, while holding every other factor constant, could affect annual revenue from public parking by more than $2.1 million.

It is important to note that while the model was carefully constructed to be as accurate as possible given the available data, it is based on stated preference data from survey respondents. There is always a difference between stated and revealed preference, and individuals are often more optimistic about behavior change than revealed by their actual behavior. Additionally, the majority of survey respondents indicated that they are satisfied with the current parking options in Downtown meaning that it will likely take price signals in addition to the introduction of a shuttle to shift parking habits. It will also likely take some time for employees to shift parking habits, and as such smaller numbers are likely at the outset of the circulator service. Additionally, this analysis assumes that all other factors are equal. There is currently increasing demand for parking downtown, with many core lots and garages full or nearly so. While this could lead to the ability to support higher prices over time, at the same time there are pressures to offer reduced rate parking in order to attract or retain businesses.

Table 7 Parking Circulator Sensitivity Analysis

	Average Daily Parking Fee (CBD)	Circulator Parking Fee	Circulator Time	Circulator Parking	CBD Public Parking	Total Annual Parking Revenue	Change from Baseline
Baseline (Current)	$4.73	N/A	N/A	N/A	10,399	$ 11,804,746	$ 0
No Parking Increase	$4.73	$0.50	7 Minutes	4,263	7,299	$ 8,278,243	$(3,526,503)
	$4.73	$0.50	15 Minutes	3,908	7,519	$ 8,361,753	$(3,442,993)
	$4.73	$2.00	7 Minutes	3,741	7,621	$ 9,970,265	$(1,834,482)
	$4.73	$2.00	15 Minutes	3,418	7,823	$ 10,042,886	$(1,761,861)
$2.00 Parking Increase	$6.73	$0.50	7 Minutes	4,682	6,750	$ 10,505,043	$(1,299,703)
	$6.73	$0.50	15 Minutes	4,309	6,982	$ 10,836,814	$(967,933)
	$6.73	$1.50	7 Minutes	4,310	6,979	$ 11,980,996	$ 176,249
	$6.73	$2.00	7 Minutes	4,132	7,090	$ 12,646,804	$ 842,057
	$6.73	$2.00	15 Minutes	3,788	7,306	$ 12,829,445	$ 1,024,698
$4.00 Parking Increase	$8.73	$0.50	7 Minutes	5,119	6,187	$ 12,319,380	$ 514,633
	$8.73	$0.50	15 Minutes	4,730	6,426	$ 12,769,230	$ 964,484
	$8.73	$2.00	7 Minutes	4,545	6,538	$ 14,784,822	$ 2,980,075
	$8.73	$2.00	15 Minutes	4,183	6,764	$ 15,080,279	$ 3,275,533

6.0 CONCLUSIONS

This study has examined several alternatives for developing a commuter and visitor circulator system in the Rochester CBD. While all five options are viable, overall, Circulator Options 1, 2 and 3, generally provide the best balance of serving commuters and visitors. Circulator operating costs would likely range from $1.5 to $1.75 million per year based on typical hourly operating costs. While the startup costs will vary with vehicle selection, branding campaign and maintenance requirements, initial costs, separate to the operating costs, in the range of $2-$3 million seem likely. Additionally, unless center-city parking rates are raised, the introduction of the circulator could result in a sizable decrease in parking revenue.

While the PAC and the public will ultimately select the preferred option, based on technical merit alone Option 2 generally provides the best balance of serving commuters and visitors in both day and nighttime, particularly given its ability to easily convert from daytime to nighttime

operations with minimal change in route structure. If the ability to serve visitors is deemed financially impossible in the short-term, Route 3a provides the best commuter service while still maintaining some usefulness for daytime circulation within the CBD.

7.0 REFERENCES

Barnitt, R., & Chandler, K. (2006). *New York City Transit (NYCT) Hybrid (125 Order) and CNG Transit Buses: Final evaluation results.* Golden, CO: National Renewable Energy Laboratory.

8.0 APPENDICES

CIRCULATOR COSTING ASSUMPTIONS

In order to estimate the costs for the five circulator service alternatives, some key assumptions were made regarding service parameters. Costing estimates were based on the number of service hours, at an operating cost of $119 per hour. This represents the full RTS cost per service hour and is a conservative estimate; actual operating cost, regardless of operator, would hopefully be lower. For vehicle headways and run times, the average circulator speed was assumed to be 10 miles per hour. This includes any stop time for boarding/alighting or signalized/stop-controlled intersections. "Day" service operates from 6:30 AM until 6:30 PM; "Evening" service operates from 6:30 PM until 2:30 AM. For circulator options 1-4, the annual cost was calculated as the daily cost times 250 annual work days, plus the cost of running two buses for 10 hours a day for the remaining 115 days a year (weekends and holidays). For circulator option 5, the annual cost was calculated as the daily cost times 250 annual work days, plus the cost of running one bus for 10 hours a day for the remaining 115 days a year (weekends and holidays).