CORRADINO

Final Report

Knoxville Area Transit (KAT)

Transit Development Plan

Submitted to:

Knoxville Area Transit
and Knoxville Knox County
Metropolitan Planning Commission

Submitted by:

The Corradino Group, Inc.

In association with:

PB Americas
Connetics, Inc.
Data Smarts
Hall Communications

October 2009

Executive Summary

This report presents the Executive Summary for the Transit Development Plan (TDP) for Knoxville Area Transit (KAT). This plan provides guidance for operational and capital changes for KAT over the next five years. In addition, with the opening of its downtown transfer center – Knoxville Station – there will be a variety of immediate changes to systemwide operations. The need to redesign the system will also allow KAT to address longstanding routing and timing problems. This study focuses on providing this short-term guidance to KAT as well as maintaining a perspective of a longer term vision.

The work on this study included interaction with KAT staff, the Knoxville Transportation Authority (KTA) Board, and members of the community through meetings, surveys, and workshops. The specific objective of the plan was to generate efficiencies in the operations without sacrificing the overall service mission of KAT.

The issues and parameters facing transit systems like KAT are many. Obvious issues include funding, efficiency in operations, technology, union/labor, demographic change in the community, KAT's relationship with the University of Tennessee (UT), continuing and increasing traffic congestion in the urban area, and price of fuel. This study was developed in a time of an almost unprecedented surge in fuel prices for the general public and transit systems alike. This presented a dilemma for transit systems nationwide. While people were crowding transit buses, transit systems were faced with little choice but to cut services or raise fares to meet budgets. KAT was able to deal with the economic situation during this period by raising fares, eliminating one express route, and adjusting their ADA service area.

This report presents the Short-Range Transit Development Plan for KAT. It also includes summaries of information developed as part of two additional planning efforts – a downtown operations study focusing on KAT service and a high capacity transit corridor study prepared for the Knoxville Knox County Metropolitan Planning Commission. This report provides recommendations for system modifications and fare changes. It should be noted the fare changes were made during the course of the study and KAT continues to build on the route recommendations in this report.

KAT Operations

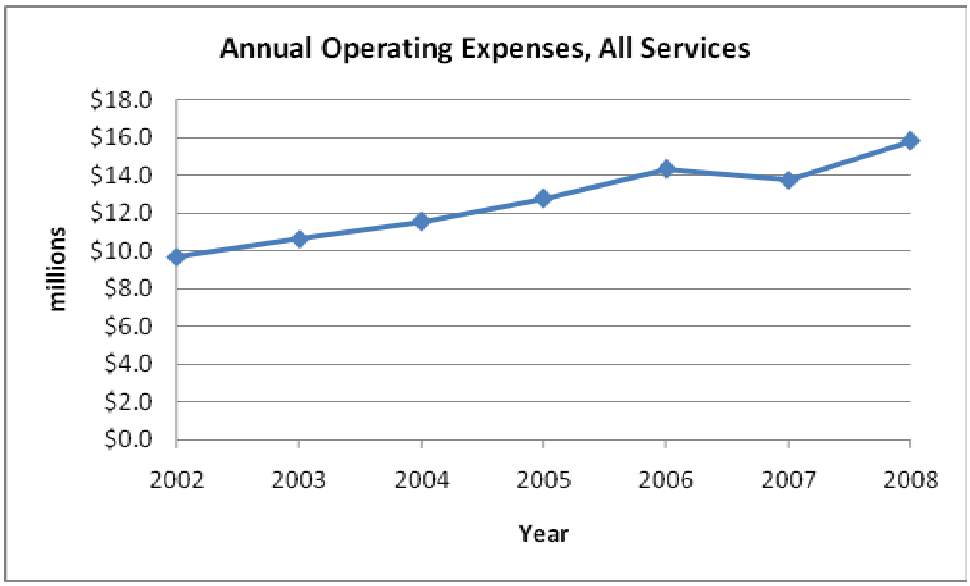
Existing conditions for the KAT system were examined using National Transit Database (NTD) data for the most recently-completed seven years (2002-2008). This data indicates a system that has expanded in recent years, with an increasing operating budget, a growing number of services provided, and ridership gains. The KAT system underwent a number of changes during the 2002-2008 time period, including implementing the "T" service on the University of Tennessee campus in 2003, changes to the fare structure in 2006, the conversion of the demand responsive Call-A-KAT to fixed-route service in 2007, and the loss of CMAQ operating funds in 2008. Externally, the 2002-2008 time period was marked by steadily rising fuel costs, culminating in record high diesel fuel prices in 2008, as well as the rising cost of providing fringe benefits to employees.

As Table S-1 and Figure S-1 indicate, annual operating expenses increased from $9.7 million in 2002 to $15.8 million in 2008, an increase of more than 60 percent over the time period. Table S-1 shows that the rate at which operating expenses are increasing continues to grow. The sharp rise in 2008 operating expenses can be at least partially attributed to the spike in diesel fuel costs in the summer of 2008, but other factors have also contributed to the continued rise in costs. Transit agencies across the country have seen operating expenses increase as a result of the rising cost of labor and fringe benefits, including health care, and the increase in demand for paratransit services. Implementation and expansion of service to the University of Tennessee during the 2002-2008 time period also contributed to the increase in KAT's operating expenses.

Table S-1
Annual Operating Expenses, All Services

Year	Amount	Percent Change from Previous Year
2008	$15.8	15.0%
2007	$13.8	-3.9%
2006	$14.3	12.0%
2005	$12.8	10.8%
2004	$11.5	8.5%
2003	$10.6	9.9%
2002	$9.7	

Figure S-1
Annual Operating Expenses, All Services



The fixed route system represents most of the overall budget ($14.3 million in 2008). Nevertheless, KAT's paratransit costs are increasing and the service is much more costly to provide. The growth of paratransit-related expenses has been a problem in many transit agencies across the country, both large and small, and will be an important statistic to monitor going forward.

KAT Fare Policy Review and Future Options

The structure of KAT's fare policy is important for generating and maintaining ridership and the overall perception of the agency within the community. Obviously fares must be collected on routes as a way to partially offset the cost of the operations. If the fare is too low then it will not recoup an acceptable percentage of the operating costs. In 2008, KAT recovered only nine percent of its operating expenses from fare collection, a much lower rate than most transit agencies nationwide. However, if fares are set too high, it could dissuade riders from using the service by making other forms of travel more cost effective.

During the course of this study, KAT made several changes to its fare policy. Many of these changes were implemented upon recommendations that arose from this transit development plan, including changes in fare structure and farebox technology. Due to the immediate need to cover the cost of rising fuel prices, regular cash fares for local and express routes were increased in January 2009. The cost of all monthly and UT semester passes, discounted fares, and transfers were also raised at this time. In addition to changes in fare pricing, multi-trip and multi-day passes were added as new components to the fare structure. A new farebox technology was adopted to allow for the use of magnetic fare cards and possible integration with KAT's future AVL system.

Early ridership numbers for 2009 indicate that the new fare structure has had little impact on the ridership gains KAT has made in recent years. While ridership is down from 2008 levels, when rising fuel prices attracted new transit riders nationwide, ridership remains higher than in 2007. Moreover, farebox recovery – or the percent of operating expenses covered by fares – has improved with the new fare structure.

Route Analysis and Recommendations

The consultant team and staff conducted two planning workshops to review the route structure for KAT with the primary purpose to identify operational efficiencies while trying to provide the most effective service possible to KAT riders.

The analysis was based on the following:

- Results of a 100 percent boarding and alighting survey conducted on the system routes;
- Results of an on-board survey of riders;
- Input from drivers and staff (obtained by posting maps of individual routes in common areas for several days to allow for comment);
- Peer analysis with other communities; and,
- Information about running time, schedule adherence, and other factors developed during the study.

Following is a discussion of each of the tools used to develop the KAT recommendations.

Boarding/Alighting Survey

A 100 percent boarding and alighting survey of KAT routes was conducted in the fall of 2008. The survey was conducted by Data Smarts, a data collection firm specializing in surveys under subcontract to Corradino. Figures S-2 and S-3 present examples of the graphics prepared for each route.

Graphics for each route are presented in the appendix. Overall, like most transit system, the analysis shows distinct travel patterns based on generators. KAT does have a number of routes with large segments that have very little ridership. In addition, Route 90, while the most used route in the system, represents a disproportionate percentage of KAT's operating budget.

Figure S-2
Sample Boardings Graphic

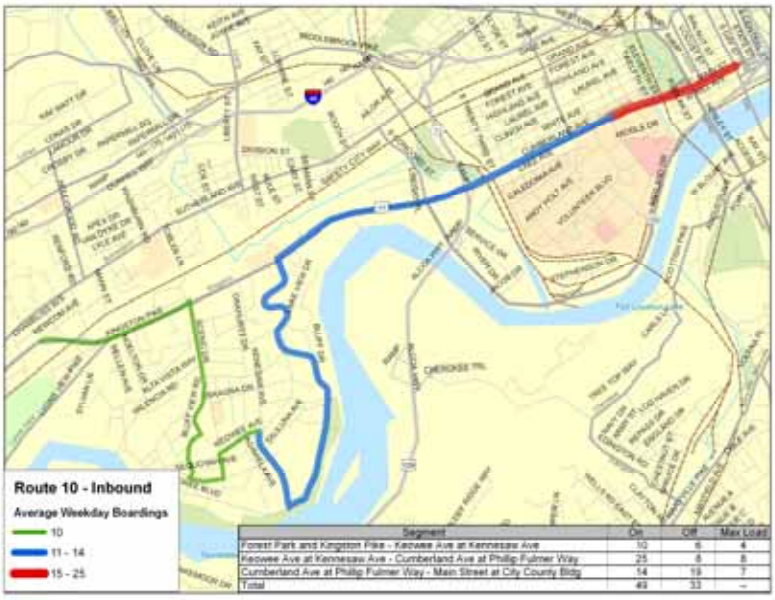
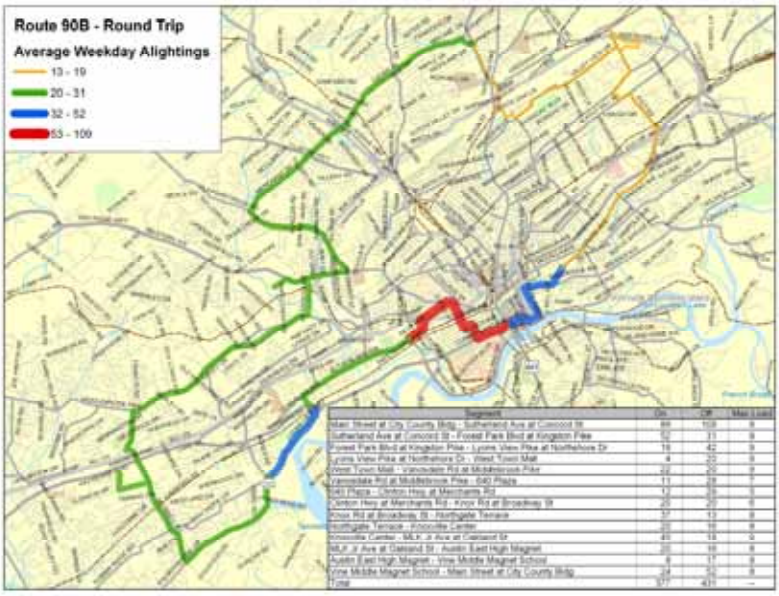


Figure S-3
Sample Alightings Graphic



On-board Survey

In September 2008, the consultant team conducted an on-board survey of KAT riders. The survey was conducted by intercepting and interviewing bus passengers on their trips. Four-hundred and seventy one surveys were collected for the fixed route survey representing most routes in the KAT system. Most trips (about 70 percent for both questions about where are you "going to" or "coming from") were associated with home or work. Shopping and school together were the second largest response. About 35 percent of the respondents reported boarding the bus at the downtown transfer point. An additional 26 percent indicated they would get off the bus at the transfer point. Based on that information, over 60 percent of all KAT riders use the downtown transfer point. Approximately 46 percent of the riders indicated that they had gotten on the bus after transferring from another KAT bus.

Of those responding to the question about how they got on the bus 66 percent reported walking with the only other mode (besides transferring from another bus) of significance was driving a car, which likely indicates the increase in use of express bus and park-and-ride options. Over seventy percent of the riders use the bus several times a week with over fifty percent using it daily. Thirty percent reported using cash to pay their fare while about 40 percent used a monthly pass. Fifty-five percent of the respondents reported that they were licensed drivers and able to drive while 44 percent said they could not drive. Over fifty percent of the respondents did not have access to vehicles in their household while less then 25 percent of households reported having access to two or more vehicles. In terms of evaluation of KAT services, about 57 percent rated the system as "good" while 23 percent rated it as "excellent." Two percent of the respondents rated the system as "poor."

Seventy percent of respondents felt that KAT buses usually ran "on time" with twenty percent saying they always ran on time. This response is unusual when viewed at in light of the schedule adherence data developed in the boarding and alighting survey, which showed that the majority of buses were not operating on time. This survey was conducted in September 2008 when the fuel markets were in upheaval and the effects of the global recession were beginning to appear. In response to a question whether raising a fare to $1.50 would affect their use of KAT, most riders (81%) said no.

Input From Drivers and Staff

Input from drivers and staff was gathered through a variety of means. Corradino presented the TDP plan and process during meetings that included drivers, maintenance employees, and others involved in KAT operations. One of the unique things done as part of this plan was an idea of KAT staff. Corradino developed large posters of each route which were then placed on boards located in common areas. Drivers and staff could take pen and marker and mark up the various maps. These proved very valuable during the route analysis process.

Peer Analysis

The consultant conducted a number of peer analyses for KAT through the TDP process. The most telling is passengers per hour. As shown in Table S-2, KAT does not appear to carry as many riders per hour as its peers.

Table S-2
Peer Analysis – Passengers Per Hour

Unlinked Passenger Trips per Revenue Hour	
Nashville MTA	28.47
TARC (Louisville)	24.67
IndyGo	20.80
Greenlink (Greenville, SC)	19.49
CARTA (Chattanooga)	16.14
KAT	14.98

The passengers per hour number shown for KAT includes UT ridership. Excluding UT ridership, KAT totals are even lower with the system averaging about 12 passengers per hour. The reasons for KAT's lower productivity in terms of passenger per hour are unclear. The system has levels of service comparable to other systems in terms of frequency (headways), coverage, hours of service, and demographics.

Route Planning Workshops

Using the various data described above the consultant engaged a project steering committee in workshops to review the KAT operations. The objective of the work was to:

- Identify modifications to reduce inefficient and redundant service;
- Identify improvements that would support better schedule adherence throughout the system, including building time into the schedules for transfers; and,
- Minimize looping and other inefficient routing.

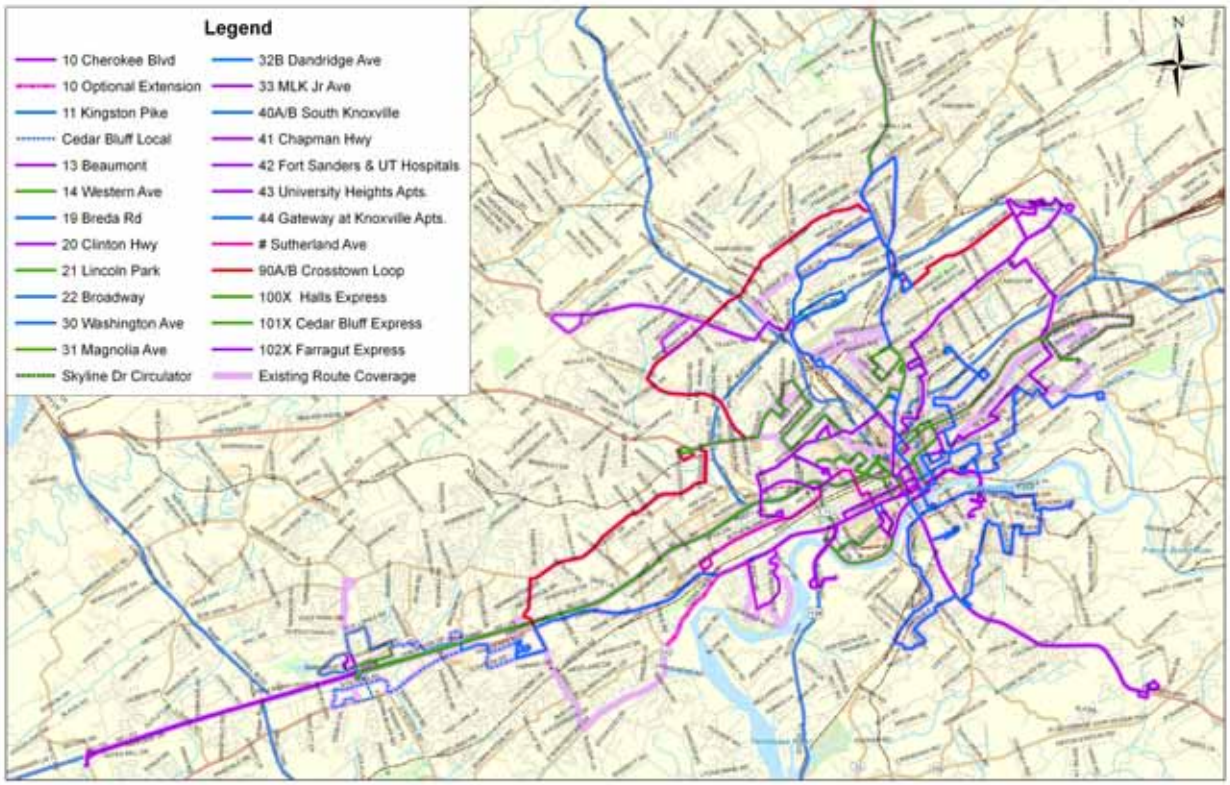
As a result of the workshops and subsequent refinements, the following routing changes are recommended as shown in Table S-3.

Table S-3
Route Change Recommendations

Route	Changes	Issues	Ridership Impacts	Cost Impacts	Schedule Adherence
10	■ Terminates at Kingston-Scenic ■ Restructuring of route in Sequoyah Hills ■ Optional extension to Lakeshore Mental Health Hospital	■ Low ridership ■ Schedule adherence issues with interline with Route 21 ■ Realigned portion in Sequoyah Hills ■ Extension to Lakeshore Mental Health Hospital to cover eliminated portion of Route 90	Low	Could increase costs	Improvement
11	■ Consider using circulator (small bus) past West Towne Mall; create super stop on Kingston Pike at the end of the route.	■ Schedule adherence on the Kingston Pike route is a continuing problem	Increase	Neutral	Improvement
12	■ Combined with Route 14, named Route 14	■ Three routes in area (12, 13, 14) have similar alignments, mid-range ridership ■ Simplifies routes, saves one vehicle during weekday operation	Possible	Savings	Improvement
14	■ Combined with Route 12, named Route 14				
15	■ Proposed for elimination as part of KAT's Saturday service proposals	■ Low ridership			
19	■ Route 20B becomes Route 19		Possible	Savings	NA
20A/C	■ Combined 20A and 20C, all trips make 20C route pattern; renamed Route 20.	■ Simplify routes, eliminate confusion	Increase	Increase	Improvement
21	■ Terminate at Broadway at Oglewood	■ Low ridership on northern portion of route; schedule adherence issue	Possible	Savings	Improvement
22	■ Add additional vehicle to route operation	■ Schedule adherence issue; indirect route alignment on north end of route	Increase	Increase	Improvement
30	■ No alignment change recommended; may consider elimination of interline with Route 42.	■ Use interline with route 42 to improve on-time performance of another route.	NA	NA	Improvement
31	■ Consider using circulator (small bus) on Skyline Drive; create super stop on Magnolia at the end of the route.	■ Would provide more neighborhood friendly service on Skyline Drive. ■ Would reinforce Magnolia trunk line as a primary route.	Increase	Increase	Improvement
32	■ Eliminate 32A; expand 32B (rename 32).	■ Route Simplification; eliminate redundant service	Possible	Savings	NA
33	■ Eliminate portion of alignment east of Kirkwood; extend to Knoxville Center on existing 90A/B alignment	■ Replace 90A/B in this area	Possible	Increase	Improvement
90A/B	■ Eliminate southern segments of 90A/B between Knoxville Center and Westown Mall	■ Route consumes too high a proportion of system resources (15% of total budget); lower ridership in this segment; duplication of service.	Possible	Savings	Improvement

With the proposed recommendations, the revised system is shown in Figure S-4.

Figure S-4
Revised KAT System Map



The overall impact of the proposed recommendations is a revenue neutral plan (i.e., operating costs will remain about the same) and a more efficient, customer friendly system. Any savings that may result from this plan should be used to address on-time performance issues. This amount could be absorbed into operations through service frequency improvements on the systems best performing routes (as recommended in the 2010 Action Plan produced in 2002) or to cover additional unforeseen operating expenses that occur with the transition to Knoxville Station in August 2010.

The following summarizes the impacts of the service recommendations, in terms of service hours and operating costs, and presents the steps required to implement the service recommendations concurrent with the move to Knoxville Station.

Service Recommendations

The estimated changes in annual revenue hours associated with the TDP recommendations and the resulting operating and maintenance (O&M) cost estimates by route are presented in Table 6-1. No capital cost estimates for vehicles are included, as the proposed service modifications result in a

net decrease to the peak requirement. Seven less regular and neighborhood service buses would be required in peak service. There would be no increase in the maximum number of trolley buses required.

The projected O&M costs per revenue hour have been developed using KAT's FY 2008 National Transit Database (NTD) report and FY 2009 operator wage rates for each fixed route service classification. Given the nation's current economic downturn, these FY 2008 and FY 2009 costs are assumed to remain constant prior to the opening of Knoxville Station (i.e., no inflation has been assumed).

KAT has four classifications of wage rates for bus operators with adjustments in pay scale for four different route classifications. Total costs per revenue hour ($66.02), were adjusted to account for the variations in the wage rates. The resulting rounded costs per revenue hour by route classification are as follows:

- Regular Service Routes: $72.40
- Trolley Service Routes: $52.75
- T Operator: $49.75
- Neighborhood Service Operator: $48.60

Table S-4 presents the annual estimated revenue hours and estimated O&M costs by route for the proposed TDP route modifications and proposed changes to the downtown trolley system.

Table S-4
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		
Route		Annual Service Hours	Annual Direct O&M Cost	Route		Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost	Comments
10	Cherokee	3,410	$165,705	10	Cherokee	3,078	$149,567	(332)	($16,138)	Route 10 is shortened.
11	Kingston Pk.	17,531	$1,339,342	11	Kingston Pk.	11,991	$916,112	45	($151,799)	Route 11 is shortened to terminate at West Town Mall. The western sections of the route eliminated will be served by the Cedar Bluff Local.
					Cedar Bluff Local	5,585	$271,431			The Cedar Bluff Local operates as a shuttle serving the portions of Route 11 that were eliminated.
12	Western Ave	7,480	$571,487	12	Combine with 14	-	$0	(7,480)	($571,487)	Route 12 is replaced by Route 14, operating on the existing 12 C alignment.
13	Beaumont	3,641	$278,203	13	Beaumont	3,641	$278,203	-	$0	
14	College St.	4,654	$355,599	14	College St.	7,125	$544,350	2,471	$188,751	Existing 12C becomes Route 14 and maintains the existing Route 12 weekday headways and Saturday headways.
15	West Town Direct	508	$38,805	15	Eliminate	-	$0	(508)	($38,805)	
20	Central Ave.	7,937	$606,378	19	Breda Rd	5,020	$383,528	5,033	$384,530	Route 19 is the existing Route 20B with some modifications and the same headways.
				20	Clinton Hwy	7,950	$607,380			Route 20 is the existing Routes 20A and 20C combined. Same headways.
21	Lincoln Pk.	3,696	$179,626	21	Lincoln Pk.	3,333	$161,984	(363)	($17,642)	Route is shortened.
22	Broadway	9,733	$743,592	22	Broadway	9,733	$743,592	-	$0	Vehicle on-time performance improved.
23	Millertown Pk.	4,883	$373,076	23	Millertown Pk.	4,883	$373,076	-	$0	
30	Washington Ave.	3,592	$274,417	30	Washington Ave.	3,592	$274,417	-	$0	
31	Magnolia	8,659	$661,580	31	Magnolia	6,668	$509,416	(1,992)	($152,163)	Assumed 23 percent of existing hours are devoted to what will be the Skyline Drive Circulator.
					Skyline Dr. Circulator	1,992	$96,795	1,992	$96,795	Skyline Dr Circulator will operate 23 percent of the previous Route 31 hours.

Table S-4 (continued)
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		
Route		Annual Service Hours	Annual Direct O&M Cost	Route		Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost	Comments
32	Dandridge	7,685	$587,103	32	Dandridge	7,685	$587,103	-	$0	
33	MLK	5,749	$439,199	33	MLK	10,682	$816,105	4,933	$376,906	Route nearly doubles in length to serve Knoxville Center and replace existing 90A/B service.
40	South Knox	7,061	$539,485	40	South Knox	7,061	$539,485	-	$0	
41	Chapman Hwy.	6,963	$531,969	41	Chapman Hwy.	6,963	$531,969	-	$0	
42	Ft. Sanders/ UT Hospital	7,350	$561,540	42	Ft. Sanders/ UT Hospital	7,350	$561,540	-	$0	
43	University Heights Apts.	1,829	$139,697	43	University Heights Apts.	1,829	$139,697	-	$0	
44	Gateway at Knox Apts.	1,749	$133,624	44	Gateway at Knox Apts.	1,749	$133,624	-	$0	
50	UT Services	54,218	$2,697,349	50	UT Services	54,218	$2,697,349	-	$0	
80	Blue Line Trolley	8,253	$435,346	80	Blue Line Trolley	5,300	$279,575	(2,953)	($155,771)	Blue Trolley is realigned, making a more efficient route.
82	Orange Line Trolley	11,962	$631,019	82	Orange Line Trolley	13,600	$717,400	1,638	$86,381	Orange Trolley is realigned to allow passengers to get to other downtown locations without going to UT first.
84	Green Line Trolley	1,749	$92,260	84	Green Line Trolley	-	$0	(1,749)	($92,260)	Green Trolley is eliminated.
86	Late Line Trolley	1,383	$72,964	86	Late Line Trolley	1,383	$72,964	-	$0	
				87	Red Line Trolley	5,300	$279,575	5,300	$279,575	Red Trolley is added.
90	Crosstown	17,358	$1,326,133	90	Crosstown	10,752	$821,453	(6,606)	($504,680)	Route 90 is shortened and converted to an east/west route that operates between Knoxville Center and West Town Mall without going downtown.
#	Sutherland Ave.	-	$0	#	Sutherland Ave.	3,584	$273,818	3,584	$273,818	The Sutherland Ave. route replaces service eliminated on the south portion of Route 90A/B.
100	Halls Express	461	$35,233	100	Halls Express	461	$35,233	-	$0	

Table S-4 (continued)
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		Comments
Route		Annual Service Hours	Annual Direct O&M Cost	Route		Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost	
101	Cedar Bluff Express	1,492	$113,977	101	Cedar Bluff Express	1,492	$113,977	-	$0	
102	Farragut Express	1,948	$148,824	102	Farragut Express	1,948	$148,824	-	$0	
	Total	212,934	$14,073,530		Total	215,947	$14,059,540	3,013	($13,990)	

Discontinued Routes			
87	Red Line Trolley	2,419	127,612.80
103	Oak Ridge Express	2,016	154,022.40
104	Dtwn/Oak Ridge Express	799	61,031.38
		218,168	14,416,196
vs. FY 2008 KAT Report		218,176	

TDP Next Steps

In August 2010, KAT is scheduled to open Knoxville Station, its new off-street transit center in downtown Knoxville. The move to the new station will involve the re-routing and scheduling of more than 20 routes. Concurrently, the TDP service recommendations, including regular service, neighborhood service, and trolley service routes, are also proposed for implementation. These combined activities will warrant a significant change in scheduling structure, likely resulting in new interlining strategies.

The move to Knoxville Station will be a complex and challenging process over the next 13 months. To ensure a successful move, a schedule of activities has been developed, as shown in Table S-5.

Table S-5
Timeline for Implementation of TDP Recommendations

2009	
July	■ Run all routes from TDP recommendation for timing and mileage
August	■ Design routes and schedules based upon KTA guidelines ■ KTA committee updates of progress
September	■ Cost analysis of routes and revisions
October	
November	■ Finalize route proposals ■ Run proposed routes to confirm viability
December	■ Prepare information for public and board
2010	
January	■ Schedule public meetings and outreach ■ Meet with all operators ■ Introduce routes to board
February	■ Public meetings ■ Schedule board workshop, if necessary
March	■ KTA public hearing
April	■ Final public meeting ■ KTA vote
May	■ Schedule revisions
June	■ Run cut
July	■ Run cut ■ Operator pick
August	■ Begin operations from Knoxville Station August 16, 2010

The schedule begins with a route-by-route analysis requiring the following steps:

1. Run all routes per the TDP recommendations in the appropriate vehicle (some with both bus and van to determine an average percent difference in run time) during peak congestion to determine run time and mileage, taking into consideration stop time, estimated number of stops, etc.

2. Using the running time analysis, develop interlining strategies for weekday (including evening), Saturday and Sunday service schedules that allow for prescribed layover and recovery times. Route streamlining will also be considered as an alternative to achieve desired running times where feasible.

3. Assess cost impacts of the proposed routes and revisions.

4. Finalize proposals, including interlines, based on KAT's fiscal constraints, and run all routes to confirm viability.

5. Compile route information for presentation to the KTA Board and public and make final changes to the plan.

The remaining activities are standard processes that are engaged in a typical service change. It will be critical that KAT adhere to the recommended timeline to ensure the successful opening of Knoxville Station, as well as the multiple service changes that are scheduled to occur concurrently.

Beyond Knoxville Station

Following the opening of Knoxville Station, route adjustments should be held to a minimum for at least one year, to allow sufficient time for passengers to adjust to the changes and for ridership levels and patterns to mature. Regular service monitoring will be particularly important during this time period.

Future service changes will be largely dictated by passenger needs and revenue projections, including farebox revenues and federal, state, and local funding levels. Rather than route alignment adjustments, priorities for future service changes may include frequency improvements from hourly to half-hourly service on select routes, span of service expansion, and expansion of weekend service. As part of the TDP final report, a set of performance guidelines to be used by staff for making minor changes is presented.

Additionally, two separate reports were prepared as part of the TDP effort and are summarized in the full TDP report. These are a Downtown Operations Plan, which focuses on KAT's bus and trolley routing in the downtown and report prepared for the Metropolitan Planning Commission that examined from a planning perspective future possible high capacity corridors in the Knoxville area.

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1. Introduction

This report presents the Short-Range Transit Development Plan (TDP) for Knoxville Area Transit (KAT). This plan provides guidance for operational and capital changes for KAT over the next five years. In addition, with the opening of its downtown transfer center – Knoxville Station – there will be a variety of immediate changes to systemwide operations. The need to redesign the system will also allow KAT to address longstanding routing and timing problems. This study focuses on providing this short-term guidance to KAT as well as maintaining a perspective of a longer term vision.

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2. Existing Conditions

KAT History

Knoxville's transit history is a familiar one similar to many other American cities, large and small, beginning with private operation, decline during the great depression and the onset of the automobile, public takeover in the post-war period, and growth and improvement as a public entity in the recent decades. Public transit in Knoxville began in 1876 with horse-and mule-drawn streetcars of the Knoxville Street Railway Company operating on Gay Street. Knoxville Real Estate Company started a steam street railway from Gay Street to their property in East Knoxville. A second "dummy" line later connected downtown to North Knoxville. These improvements facilitated the development of these areas and the growth of the city in the years before widespread auto use. The first electric street car began operating in 1890. By 1910, after several name changes, the Knoxville Railway and Light Company ran 42 miles of track and carried 11 million passengers per year. Ridership peaked in 1923 at 20 million passengers but then began feeling the effects of auto ownership. By 1933, in the midst of the depression, ridership had fallen back to 1910 levels at 11 million passengers per year.

Buses began operating in Knoxville in 1929 and originally were used to reach areas beyond the streetcar lines. The relative versatility and cost-effectiveness of buses soon became apparent in an environment where roads were being maintained publicly for use by private vehicles. Buses can operate on any public roads, while streetcars are limited to their own privately -maintained track and overhead wire. The last streetcars ended service in 1947. Shuttle bus service on the University of Tennessee campus began in the 1950s. The City of Knoxville took over operation of the transit system in 1967, naming it the Knoxville Transportation Corporation. The city moved the transit system into a renovated facility in 1975. In the same year, Knoxville Transportation Authority was established by city ordinance. The public name was changed that year to K-Trans. Currently named Knoxville Area Transit (KAT), the system moved into its current maintenance and storage facility in 1989. The system was restructured in 1995 and reversed a long-term decline in ridership.

In 2004, the American Public Transportation Association's (APTA) awarded KAT its annual Public Transportation System Outstanding Achievement Award for the category of systems that carry between one and four million riders per year. The award honors systems that demonstrate achievement in efficiency and effectiveness in many areas such as services and programs, safety, operations, customer service, financial management, attendance and employee costs, minority and women advancement, marketing, policy and administration, and community relations. In 2004 KAT achieved its highest ridership in 20 years at 3.2 million trips. KAT also implemented a Clean Fuels Program to focus on alternative fuels and clean air programs.

KAT Operations

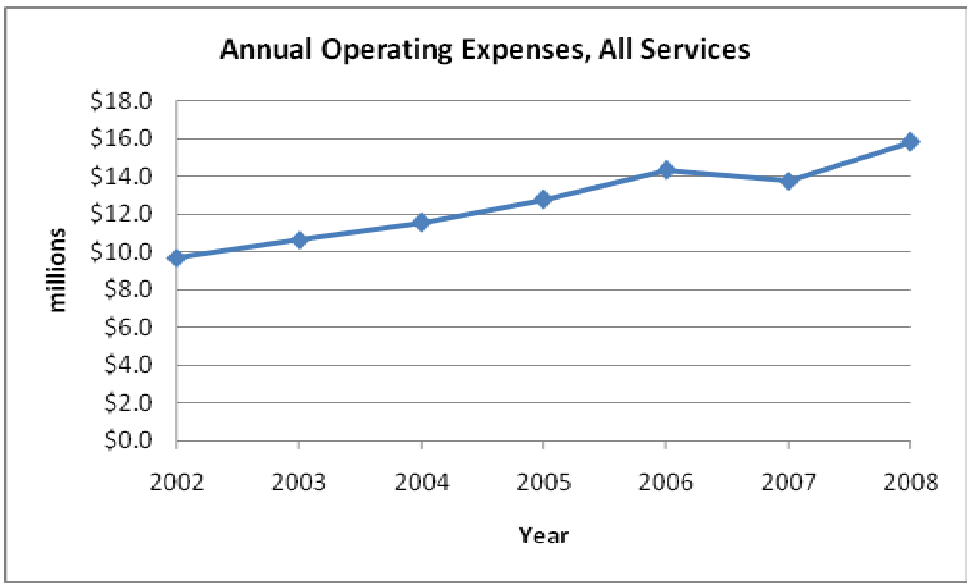
Existing conditions for the KAT system were examined using National Transit Database (NTD) data for the most recently-completed seven years (2002-2008). This data indicates a system that has expanded in recent years, with an increasing operating budget, a growing number of services provided, and ridership gains. The KAT system underwent a number of changes during the 2002-2008 time period, including implementing the "T" service on the University of Tennessee campus in 2003, changes to the fare structure in 2006, the conversion of the demand responsive Call-A-KAT to fixed-route service in 2007, and the loss of CMAQ operating funds in 2008. Externally, the 2002-2008 time period was marked by steadily rising fuel costs, culminating in record high diesel fuel prices in 2008, as well as the rising cost of providing fringe benefits to employees.

As Table 2-1 and Figure 2-1 indicate, annual operating expenses increased from $9.7 million in 2002 to $15.8 million in 2008, an increase of more than 60 percent over the time period. Table 2-1 shows that the rate at which operating expenses are increasing continues to grow. The sharp rise in 2008 operating expenses can be at least partially attributed to the spike in diesel fuel costs in the summer of 2008, but other factors have also contributed to the continued rise in costs. Transit agencies across the country have seen operating expenses increase as a result of the rising cost of labor and fringe benefits, including health care, and the increase in demand for paratransit services. Implementation and expansion of service to the University of Tennessee during the 2002-2008 time period also contributed to the increase in KAT's operating expenses.

Table 2-1
Annual Operating Expenses, All Services

Year	Amount	Percent Change from Previous Year
2008	$15.8	15.0%
2007	$13.8	-3.9%
2006	$14.3	12.0%
2005	$12.8	10.8%
2004	$11.5	8.5%
2003	$10.6	9.9%
2002	$9.7	

Figure 2-1
Annual Operating Expenses, All Services



KAT's farebox recovery ratio as reported to the NTD shows less than ten percent of operating expenses being covered by fare revenue. Typical farebox recovery ratios are in the ten to 25 percent range. KAT's farebox recovery ratio remained fairly steady around eight percent for much of the 2002-2008 time period. It should be noted that UT service is part of the overall expenses reported to NTD but the dollars from the UT contract are not considered fares so the actual ratio of revenues to costs would be more in line with other systems. The farebox recovery ratio increased slightly in 2007 as a result of reduced operating costs with the elimination of Call-A-KAT service. Increased ridership induced by high fuel prices in 2008 allowed KAT to maintain its nine percent farebox recovery ratio even as operating expenses increased. Early 2009 data indicate that the farebox recovery ratio will continue to improve as a result of fare increases implemented in January 2009.

Table 2-2
Farebox Recovery Ratio, All Services

Year	Amount	Percent Change from Previous Year
2008	9.1%	0.1%
2007	9.0%	19.0%
2006	7.6%	1.3%
2005	7.5%	-5.1%
2004	7.9%	-7.1%
2003	8.5%	-2.3%
2002	8.7%	

Tables 2-3 and 2-4 show annual operating expenses for fixed route service and demand responsive service, respectively. As the tables show, the cost of operating fixed route service has been increasing at an average rate of about ten percent per year (as have overall operating expenses—fixed route service represents more than 90 percent of overall operating expenses). Fixed route operating expenses fell slightly in 2007, but rose sharply in 2008 as a result of record high diesel fuel prices. Figure 2-2 indicates that operating costs for demand responsive services followed a similar trajectory for the 2002-2008 time period, with double digit growth rates in all years except 2004 and 2007. As Table 2-5 shows, operating costs for demand responsive service grew slightly as a percentage of total operating expenses over that period. The growth of paratransit-related expenses has been a problem in many transit agencies across the country, both large and small, and will be an important statistic to monitor going forward.

Table 2-3
Annual Operating Expenses, Fixed-Route Service

Year	Amount (millions)	Percent Change from Previous Year
2008	$14.3	15.4%
2007	$12.4	-4.3%
2006	$12.9	11.0%
2005	$11.7	10.6%
2004	$10.5	9.4%
2003	$9.6	9.4%
2002	$8.8	

Table 2-4
Annual Operating Expenses, Demand Responsive Service

Year	Amount (millions)	Percent Change from Previous Year
2008	$1.51	11.1%
2007	$1.36	-0.3%
2006	$1.37	23.0%
2005	$1.11	12.4%
2004	$0.99	-0.8%
2003	$1.00	15.2%
2002	$0.87	

Figure 2-2
Annual Operating Expenses, Demand Responsive Service

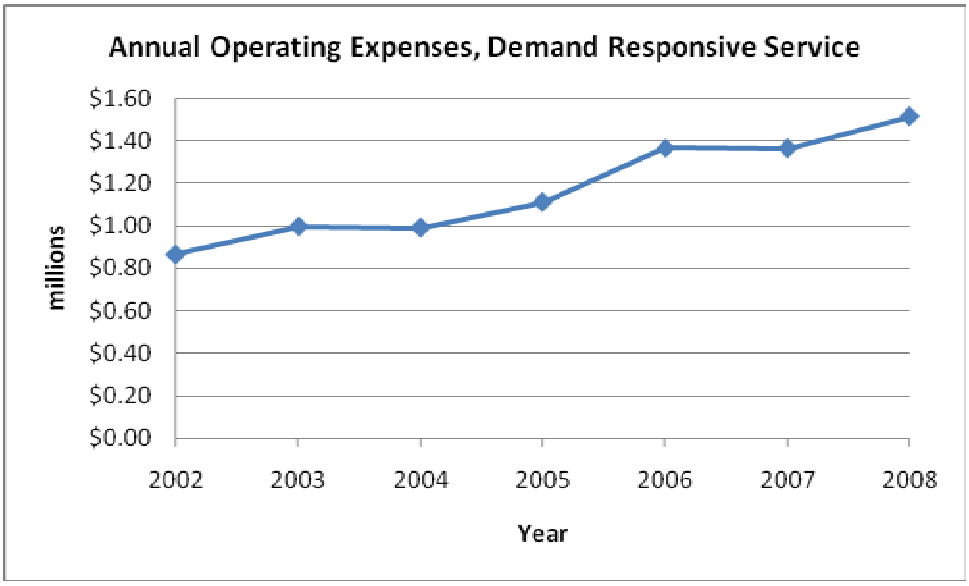


Table 2-5
Annual Operating Expenses for Demand Responsive Service
as Percentage of Total Operating Expenses

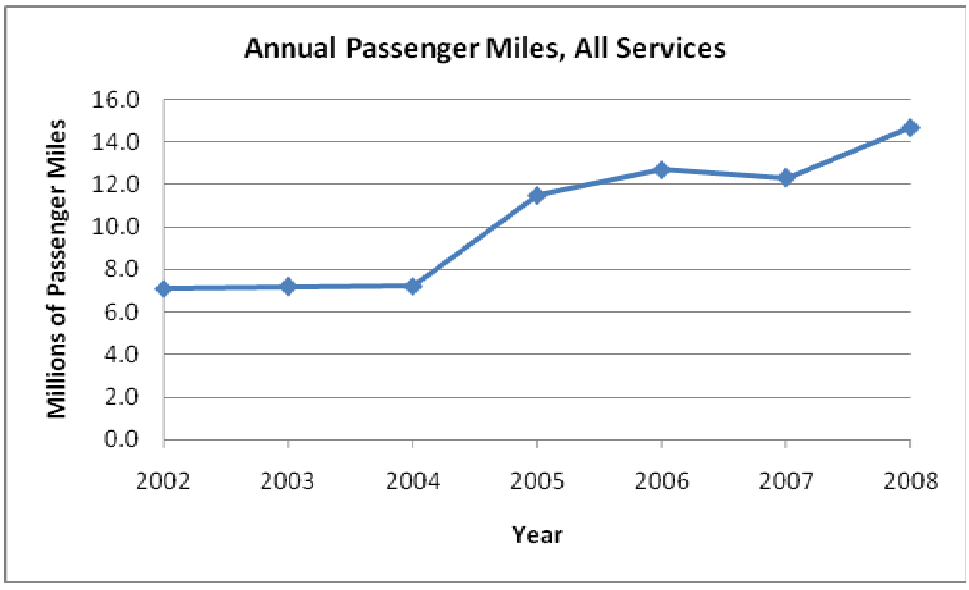
Year	Percent of Total Operating Expenses
2008	9.57%
2007	9.90%
2006	9.55%
2005	8.70%
2004	8.57%
2003	9.37%
2002	8.94%

As Table 2-6 and Figure 2-3 show, annual passenger miles rose sharply between 2004 and 2005, and experienced further gains in 2008. The sharp rise in passenger miles in 2005 is likely the result of a number of new services, including the Congestion Mitigation Air Quality (CMAQ) funding for express routes to Oak Ridge and the Job Access Reverse Commute (JARC) funding for Call-A-KAT program. Notably, annual passenger miles remained high even as these funding sources and services were eliminated in 2007 and 2008, respectively. Passenger mile gains in 2008 mirror patterns experienced by transit agencies across the country, as rising fuel prices made transit a more attractive and cost-effective transportation choice.

Table 2-6
Annual Passenger Miles, All Services

Year	Passenger Miles (millions)	Percent Change from Previous Year
2008	14.7	19.4%
2007	12.3	-3.0%
2006	12.7	10.3%
2005	11.5	59.2%
2004	7.2	0.6%
2003	7.2	1.0%
2002	7.1	

Figure 2-3
Annual Passenger Miles, All Services



Annual passenger miles for demand responsive service (Table 2-7) increased dramatically over the time period, growing by 66 percent between 2002 and 2008. The slower growth rates in demand responsive passenger miles in 2007 and 2008 can likely be attributed to the conversion of the demand responsive Call-A-KAT service to fixed route service in 2007.

Table 2-7
Annual Passenger Miles, Demand Responsive Service

Year	Passenger Miles (thousands)	Percent Change from Previous Year
2008	487.0	0.9%
2007	482.8	5.3%
2006	458.5	10.2%
2005	416.0	12.1%
2004	371.2	16.9%
2003	317.7	8.4%
2002	293.0	

Tables 2-8 and 2-9 show operating expenses per unlinked trip for all services and demand responsive service, respectively. Similar to most transit agencies, the operating expense for demand responsive service is roughly five times that of fixed route bus service. However, within each of the services, this indicator of efficiency remained fairly steady over the period. The expense per unlinked trip for the system as a whole rose slightly from $4.25 in 2002 to $4.36 in 2008. Expense per trip for demand responsive service also increased slightly from 2002 to 2008, with some fluctuation in the interim years. This is another indicator of efficiency gains by steadily increasing ridership on the system to offset the rising operating costs over the period.

Table 2-8
Operating Expense per Unlinked Trip, All Services

Year	Amount	Percent Change from Previous Year
2008	$4.36	5.6%
2007	$4.13	-0.7%
2006	$4.15	1.5%
2005	$4.09	12.2%
2004	$3.65	-11.6%
2003	$4.13	-3.0%
2002	$4.25	

Table 2-9
Operating Expense per Unlinked Trip, Demand Responsive Service

Year	Amount	Percent Change from Previous Year
2008	$27.43	13.1%
2007	$24.25	0.2%
2006	$24.20	11.0%
2005	$21.80	2.5%
2004	$21.27	-16.8%
2003	$25.56	2.1%
2002	$25.03	

Operating expense per vehicle revenue mile and vehicle revenue hour are common measures of operating efficiency. Table 2-10 and Table 2-11 show the trend in operating expense per vehicle revenue hour and per vehicle revenue mile for fixed-route bus service. The number of revenue hours and revenue miles remained fairly stable for fixed-route bus service over the 2002-2008 time period, with only a 2.2 percent overall increase in vehicle revenue hours and 3.6 percent increase in vehicle revenue miles. Consequently, operating costs per hour and operating costs per mile rose at roughly the same rate as operating expenses overall.

Table 2-10
Operating Expense per Vehicle Revenue Hour, Fixed-Route Service

Year	Operating Expense per Vehicle Revenue Hour	Percent Change from Previous Year
2008	$66.02	16.6%
2007	$56.64	-3.3%
2006	$58.60	13.2%
2005	$51.78	1.6%
2004	$50.98	19.1%
2003	$42.79	3.0%
2002	$41.55	

Table 2-11
Operating Expense per Vehicle Revenue Mile, Fixed-Route Service

Year	Operating Expense per Vehicle Revenue Mile	Percent Change from Previous Year
2008	$5.35	17.8%
2007	$4.54	-5.5%
2006	$4.81	10.2%
2005	$4.36	6.6%
2004	$4.09	13.0%
2003	$3.62	5.9%
2002	$3.42	

Operating expense per vehicle revenue hour and vehicle revenue mile for demand responsive service are shown in Tables 2-12 and 2-13. For demand responsive service, vehicle revenue miles increased by 66 percent over the 2002-2008 time period, while vehicle revenue hours more than *doubled*. Consequently, operating expense per revenue mile remained nearly constant, while operating expense per revenue hour actually decreased by 14.7 percent over the time period. These efficiency measures indicate that as KAT has become much more efficient at operating demand responsive service as the amount of service provided has increased over the past seven years. Given projected growth in demand for paratransit services in the future, it will be important for KAT to continue to operate its demand responsive services with similar levels of efficiency.

Table 2-12
Operating Expense per Vehicle Revenue Hour, Demand Responsive Service

Year	Operating Expense per Vehicle Revenue Hour	Percent Change from Previous Year
2008	$38.63	6.0%
2007	$36.45	-7.7%
2006	$39.49	9.3%
2005	$36.14	-2.7%
2004	$37.13	-15.0%
2003	$43.69	-3.5%
2002	$45.29	

Table 2-13
Operating Expense per Vehicle Revenue Mile, Demand Responsive Service

Year	Operating Expense per Vehicle Revenue Mile	Percent Change from Previous Year
2008	$2.74	10.2%
2007	$2.48	-5.4%
2006	$2.62	11.6%
2005	$2.35	0.3%
2004	$2.34	-14.9%
2003	$2.75	6.0%
2002	$2.60	

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3. Fare Analysis

KAT Fare Policy Review and Future Options

The structure of KAT's fare policy is important for generating and maintaining ridership and the overall perception of the agency within the community. Obviously fares must be collected on routes as a way to partially offset the cost of the operations. If the fare is too low then it will not recoup an acceptable percentage of the operating costs. In 2008, KAT recovered only nine percent of its operating expenses from fare collection, a much lower rate than most transit agencies nationwide. However, if fares are set too high, it could dissuade riders from using the service by making other forms of travel more cost effective.

During the course of this study, KAT made several changes to its fare policy. Many of these changes were implemented upon recommendations that arose from this transit development plan, including changes in fare structure and farebox technology. Due to the immediate need to cover the cost of rising fuel prices, regular cash fares for local and express routes were increased in January 2009. The cost of all monthly and UT semester passes, discounted fares, and transfers were also raised at this time. In addition to changes in fare pricing, multi-trip and multi-day passes were added as new components to the fare structure. A new farebox technology was adopted to allow for the use of magnetic fare cards and possible integration with KAT's future AVL system.

Early ridership numbers for 2009 indicate that the new fare structure has had little impact on the ridership gains KAT has made in recent years. While ridership is down from 2008 levels, when rising fuel prices attracted new transit riders nationwide, ridership remains higher than in 2007. Moreover, farebox recovery – or the percent of operating expenses covered by fares – has improved with the new fare structure.

The following section details KAT's existing fare policy (enacted in January 2009) and the fare policies of select peer agencies, many of which also implemented changes to their fare structures while this study was being completed. The economics of fare increases are briefly discussed, followed by the original recommendations about changes to fare structure and technology at the outset of this plan. While many of these recommendations are now obsolete due to recent changes in KAT's fare structure and farebox technology, they indicate how far the agency has come in improving its fare policy and point out ways that it might continue to improve as it moves forward.

KAT's Existing Fare Policy

Currently KAT charges $1.50 per ride on all regular fixed-route bus service and $2.00 for express routes. Discount fares of $0.75 ($1.00 express) per ride are available to disabled persons, seniors, and K-12 students. Children under five and seniors with a Medicare or Seniors FREEdom card ride for free.

KAT also offers a number of passes including a monthly pass ($50.00 for adults, $25 for disabled, K-12 students, and seniors) and a semester pass for UT students for $50.00. Multi-day passes are available in for one day ($4.00 for adults, $2.00 for seniors, students, and the disabled) and seven day ($15 for adults, $7.50 for seniors, students, and the disabled).

Multi-trip passes are available only for express routes in 20-ride quantities. An adult 20-Ride pass costs $35, while K-12 students, seniors, and disabled persons pay $17.50

KAT also charges for transfers, with a regular adult paying $0.50 per transfer and seniors, disabled persons, and K-12 students paying $0.25 per transfer.

KAT also runs a paratransit service, LIFT, which charges $3.00 per ride.

A summary of KAT's current fare policies can be found in Table 3-1.

Table 3-1
Fare Policy Review for KAT and Peer Agencies

Agency	Cash Fare	Discount Fares	Monthly Pass	Other Passes	Multi-Trip Fare	Paratransit	Transfers
KAT	$1.50 $2.00 Express	$0.75/$1.00 (Express)Senior $0.75/$1.00 (Express)Disabled $0.75/$1.00 (Express) Student Children (under 5), Free	$50 Adult $25 Senior $25 Disabled $25 Student	$50.00 UT Semester Pass $4.00 One-Day Pass, Adult $2.00 One-Day Pass, Senior/Disabled/Student $15.00 Seven-Day Pass, Adult $7.50 Seven-Day Pass, Senior/Disabled/Student	$35 Express Route 20-Ride Pass, Adult $17.50 Express Route 20-Ride Pass, Senior/Disabled/Student	$3.00 LIFT	$0.50 Adult $0.25 Seniors $0.25 Disabled $0.25 Students
TARC (Louisville)	$1.50	$1.50 Students (6-17) $0.75 Seniors $0.75 Disabled Children (5 and under), Free	$42.00	$3.00 One-Day Pass	$12.50 TARC3 Five-Ride $12.50 10-Ride $7.50 10-Ride (Discount) $30 Summer Youth Pass	$2.50 TARC3	
Nashville MTA	$1.60 Local $2.10 Express	$1.05 Students (4-19) $0.80 Seniors/Disabled Children (4 and under), Free	$78.00 Adult $55.50 Youth	$4.80 Adult All-Day Pass $3.30 Youth All-Day Pass $3.00 Disabled All-Day Pass $22.00 Adult Seven-Day Pass $14.75 Youth Seven-Day Pass	$28.50 20-Ride Local $38.00 20-Ride Express $60.00 20-Ride (R&R Express) $15.00 20-Ride Disabled $32.00 10-Ride AccessRide	$3.20 AccessRide	
CARTA (Chattanooga)	$1.50	$0.75 Student (K-12) $0.75 Senior (65 and over) $0.75 Disabled	$50.00	$4.00 One-Day Pass $2.00 One-Day Pass Reduced Fare		$2.50 Care-A-Van	
IndyGo	$1.75	$0.85 Seniors (65 & over) $0.85 Students (18 & under) $0.85 Disabled Children under 5, Free	$60 Adult $30 Senior $30 Student $30 Disabled	$4.00 Day Pass, Adult $2.00 Day Pass, Senior/Student/Disabled $20.00 Seven-Day Pass, Adult $10.00 Seven-Day Pass, Senior/Student/Disabled $7.00 Green Line (Airport Express) $3.00 ICE (Commuter Express Routes) $30 Summer Youth Pass	$17.50 10-Trip Pass, Adult $8.50 10-Trip Pass, Senior/Student/Disabled	$3.00 Flexible Services	
Greenlink (Greenville, SC)	$1.25	$1.00 Student (free school trips) $0.60 Senior (65 & over) $0.60 Disabled Children (under 6), Free			$22.50 20-Ride Pass	$2.50 GAP	$0.50 Adult $0.25 Student $0.25 Senior $0.25 Disabled

Peer Fare Policy Review

Several peer transit agencies were selected to compare fare policies with KAT's policy. The peer agencies were selected based on size of metropolitan area, size of transit services, and general geographic proximity to Knoxville. Peers selected included TARC in Louisville, KY, MTA in Nashville, TN, CARTA in Chattanooga, TN, IndyGo in Indianapolis, IN, and Greenlink in Greenville, SC.

Table 3-1 also summarizes the current fare structure and policies for each of the peer agencies.

The peer review revealed some interesting observations when compared to KAT's fare policy. The agency with the highest fares for a single ride ($1.75) was IndyGo in Indianapolis. Greenlink in Greenville, SC was the peer agency with the lowest fare for a single ride ($1.25), which was the cost of KAT's single ride fare prior to the January 2009 fare increase. The other three peers had a fares of $1.50 and $1.60. Greenlink and KAT were the only agencies reviewed that charged for transfers.

Prior to the January 2009 changes in fare structure, KAT did not offer a multi-day or multi-ride pass. The new fare structure, which includes a seven-day, one-day, and 20-ride express route pass, is more in line with its peer agencies. Four of the peer agencies reviewed offer some variety of a day pass, in either one-day or seven-day quantities, and a multi-ride pass, usually for ten or 20 rides.

Additionally, it was found that several of the peer agencies have agreements with local universities to offer free rides system wide to college students. In Indianapolis IUPUI students can ride for free by showing their student ID and a special pass that they obtain on campus. In Louisville students of the University of Louisville can ride for free by showing their student ID card. In Nashville, Vanderbilt University students, faculty and staff ride free. In the case of Nashville, Vanderbilt pays a lump sum amount for their students, faculty and staff, who use their IDs as fare cards.

Review of paratransit fares for each of the peer agencies revealed that KAT's LIFT program charges a fare in line with all other peer agencies, with fares ranging from $2.50 and $3.20 per ride.

Notably, several of the peer agencies reviewed also enacted fare changes during the course of this study. TARC and Nashville MTA enacted fare changes during the summer of 2008, while IndyGo raised fares in conjunction with KAT in January 2009. Fare increases may have been tied to the new fiscal year that occurs on July 1 for some agencies. However, changes more likely came about due to increases in costs, fuel and otherwise, that transit agencies are experiencing. Given the trends in fuel and other operating costs, transit agencies must increase fares in order to increase revenue and maintain the current relationship between farebox collection and overall costs. As the analysis showed, three peer agencies, in addition to KAT, have already done so.

Fare Economics

Fare elasticity is important to the overall discussion of transit fare policy when fare increases are being considered. In economic terms elasticity refers to the amount of change in demand for a good or service with a change in price. Goods with high elasticity are susceptible to high

fluctuations in demand when the price is changed, while goods with low elasticity typically will see minimal change in demand even with fluctuation in price.

Traditionally transit service has an accepted elasticity value of -0.3. This number means that a ten percent increase in the price would result in a three percent drop of riders. However, a look at the current environment suggests that an increase in fares at this time would not necessarily result in such a significant reduction in ridership. Estimates of price elasticity of demand assume that all other things will be equal, that the price of transit fare is rising in an environment in which the price of competing services (such as driving) and the prices of other consumer items stay the same. However, in the case of public transit, the price of motor fuel is making the cost of driving rise very rapidly—indeed, the perceived cost of driving has approximately doubled in the last four years. The price of fuel going forward is uncertain. In addition, the prices of other consumer products, including food and home utilities are also increasing. In this context, members of the public are seeking to reduce their costs by substituting lower-priced goods and services for higher priced ones. Transit, which is a lower-cost alternative to driving, is a beneficiary of this trend. The higher price of driving cancels out some of the convenience and time savings advantages of driving, and makes transit more competitive. Uncertainty in the market means the reduction in ridership that would result from a fare increase cannot be predicted with certainty. The only thing that can be said with certainty about fare elasticity is that it is lower now than it has been in the past.

Uncertainty in oil prices is a double edged sword for transit agencies. Increases in gasoline price means that more and more commuters are turning to transit as a low-cost way of getting to work and school. However, KAT and other transit agencies also must contend with the higher diesel fuel prices, which have increased operating costs.

Suggestions for Fare Structure and Policy

This section contains suggestions made to KAT prior to the recent changes in fare structure and farebox technology. Many of these suggestions were implemented as part of the January 2009 changes in KAT's fare policy.

Increase the Base Fare

As noted in the peer review section, KAT's base fixed route fare is lower than four of the five peer agencies reviewed. Two of the selected peer transit agencies have recently increased their fares, most likely due to rising fuel prices. A increase in the base fare price is necessary to provide additional revenue in the face of rising fuel costs. A fare increase, however, will help but not solve KAT's budgetary problems, particularly at the rate that operating costs continue to rise.

Increase the Price of a Monthly Pass

Along with the increase in base fare, KAT should consider increasing the price of a monthly pass. The peer agency review showed that all agencies had a higher price for a monthly pass (except for Greenlink which does not offer a monthly pass).

Typically a monthly pass replaces 44-46 regular fixed route fares for a typical commuter (the average month has 22 or 23 working days). So, if the price of a monthly pass is less than the price of 44-46 single fares, buyers of monthly passes are getting a discount. Currently the price of KAT's monthly pass is the equivalent of the price of 32 trips ($40/$1.25 per ride). This is a substantial discount off the base fare. The price of this fare instrument could be increased significantly, and would still offer a discount off the base fare.

Heavily discounted monthly passes and fare media have raised environmental justice concerns in some cities. Typically middle-class choice riders purchase monthly passes because the slight discount (as well as the convenience of using a fare card rather than handling cash) is worth the investment to them, and the overall price of the ticket is not high relative to their incomes (indeed, the current price of a monthly KAT pass is less than the price of a tank of gasoline in most vehicles). Working class and low income riders sometimes find it more difficult to accumulate the money required to purchase a monthly ticket or other multi-ride fare media, and thus cannot receive the volume discount, even though many lower-income people use transit far more frequently than twice each weekday. For this reason, some transit systems offer day passes and multi-ride tickets for as few as five rides, to provide lower income frequent users of the system a volume discount similar to those enjoyed by monthly pass holders.

Multi-trip Tickets and Weekly Passes

Another area where KAT could improve their fare structure is by offering multi-trip tickets and weekly passes. Currently KAT offers no multi-trip fare media, discounted or otherwise. Customers who do not pay to purchase a monthly pass must then pay a cash fare on a per-ride basis, which lengthens boarding time.

If a rider does not buy a pass at the beginning of the month, after six working days it becomes more economical to just pay the cash fare than to buy a monthly pass. A ten-ride ticket (which covers a five day work week) could be ideal for those who ride occasionally or who would not ride enough to make a monthly pass economical.

A ten-ride or five-ride ticket works best with the use of fareboxes with magnetic card readers. The magnetic card reader deducts a trip from the ticket on each ride. Using a magnetic card for a multi-trip ticket will also speed boarding.

Typically a small discount is given on multi-trip tickets to make them a better value than paying the cash fare. For instance, in Louisville a ten ride ticket is $12.50, or $1.25 a ride, which saves $0.25 on the cash fare.

Coordinate with University of Tennessee to Offer Free Rides to Students and/or Faculty and Staff

As noted above, several of the peer agencies have arrangements with local universities that purchase the privilege of using the transit system—often at a significant discount on a per-trip basis—for their students, faculty and staff members. Given the importance of UT in the Knoxville Community, pursuing such an arrangement between KAT and UT has obvious benefits to both entities. College campuses are a great place for transit ridership because many students either cannot afford to operate a car, or to use a car for all of their trip purposes. Others, including faculty and staff, choose to live a car-free lifestyle or to use transit for some of their travel purposes out of environmental concerns, thrift or other factors. Many college campuses also face parking and housing shortages. They are reluctant to turn over large swaths of land to parking, partly because parking can destroy the vibrancy of a college campus, and partly because many college campuses are land locked.

KAT currently operates fare-free service on the UT campus, and students are able to purchase a semester pass at a significant discount to access KAT's off-campus services. KAT could pursue an agreement with UT to offer free service to all students on the entire system – and not just on campus – in exchange for a fee collected from all students at the time of registration. Offering free rides system wide could reduce parking demand because some students, faculty, and staff would choose to come to campus on a bus instead of by car. It would encourage some students to consider living off-campus, alleviating housing shortages. From KAT's perspective, it would offer a substantial source of funding while adding tens of thousands of potential new riders. Free rides on KAT would also open up some new areas of Knoxville to carless students.

Free Transfers

A review of the peer agencies revealed that four of the five did not charge for transfers between routes. The removal of paid transfers could be a possibility for the KAT system, but would require additional study of the benefits and costs of such a move.

This review should include an assessment of route structure, as some route formats lend themselves to transfer better than others. The review should also consider how much money is generated by the transfer fare and whether this is worth the administrative costs and service delays associated with collecting the transfer fare. The ability of KAT's current or future card reader technology to print and read transfers is also an issue to be addressed.

Trolley/Circulator Fares

Currently KAT operates four trolley lines that circulate passengers throughout downtown, the UT campus, and several close-in historic neighborhoods. These routes distribute passengers from longer-haul bus routes throughout the downtown, and provide circulation through the downtown and nearby neighborhoods. These routes currently operate free of charge to all passengers, but free service can also attract some passengers who have no destination and are just using the service to pass time.

One way to remove patrons who are not using the trolley for travel-related purposes would be to add a nominal fee to ride. KAT attempted to collect fares on trolleys in the past, but this resulted in a loss of about half of the ridership, indicating that the fare was set too high. This fare needs to be high enough to deter non-travel related boarding, but low enough that legitimate trolley users would not be deterred from taking the service. Finally, the amount should be a convenient one, such as a dime or a quarter, which does not require making complicated change.

Other Fare Structure Opportunities

There are other opportunities to change KAT's fare structure, specifically with preference to certain routes, fare zones, or policies.

One way to organize fare structure is with a Peak/Off-peak structure. In this structure there would be one price for riders during peak operations – say 7-9 AM and 4-6 PM, and then another fare during off-peak operations. The benefit of such a policy would be that KAT would benefit from higher fares when they have the most buses on the road, which would pay for the higher cost of peak operations. The drawback to this fare structure is that the higher peak fare could induce some riders back to their automobiles and may be considered unfair for working class transit riders who need transit to access jobs.

Another way to organize fares is by Local/Express fares. In this structure local routes that make all stops would have one fare while express routes that make fewer stops or travel on the freeway, and thus generally serve longer distance travelers with faster service, would pay a premium fare. As with a Peak/Off-peak structure, there are environmental justice issues with giving a benefit to riders willing to pay a higher fare.

A third way to structure fares is to enact a zonal system. In this arrangement fares would be linked to zones, which are typically set up along city, county, or topographical boundaries. For instance, riders within the City of Knoxville would pay one fare, while routes that originate outside the city's boundaries would pay a higher fare.

Another variation would be to make downtown a fare-free zone. In this case routes that run through downtown or near UT's campus would be free of charge for all riders, but a fare would be enforced once the routes leave the downtown area. This policy can eliminate short car trips in the downtown area while getting some downtown workers comfortable with the idea of taking transit. It also has the effect of turning all of the buses serving the downtown area into circulators for the downtown portion of their trips.

Technology Assessment

In the last decade new fare technology has focused on the use of either magnetic strip cards or smartcards for customers to pay fares. Both of these types of cards can store fare information, including how much value is on the card, when and where the customer boarded the vehicle, and whether the customer receives a discounted fare.

The employment of this new technology has done a number of things. It speeds up the boarding process by reducing the number of cash fares. It reduces the role of the operator in interpreting the validity of fare media, reducing potential conflict with passengers and further speeding up the boarding process. It increases convenience for passengers, giving them a wider range of fare media options and, in the case of declining balance or smart cards, gives them more opportunities to add value to their cards. It allows for the use of fare vending equipment. And it makes it easier for transit agencies to implement more complicated fare structures, such as zone or distance-based fares. Some of the ideas and concepts listed above – zonal fares or peak/off-peak fares – are much easier to utilize when patrons use magnetic strip or smart cards. The use of cards means the burden is off the driver to ensure the correct fare is assessed.

There are drawbacks to a card-based fare system, of course. As mentioned previously, many working class transit riders pay for fares on a day to day basis because they cannot afford to spend a large amount of money at one time on a multi-ride or monthly pass. The benefit of using magnetic strip cards would be lost to these riders. There are also issues with cards losing value or being lost or stolen. Smartcards can overcome this because their stored information is tied to a system database. Magnetic strip cards do not typically store rider information in a database, mostly because the cards are seen as disposable.

Another issue with using permanent or semi-permanent fare media is the means used to put money on the card and where vending machines are located. In larger cities these machines are typically found at larger transit stops (like train stations) and downtown transit centers, such as the planned transit center in downtown Knoxville and in busier commercial locations downtown and in neighborhoods. Deployment in other areas of the city, however, could be problematic due to the potential for theft or vandalism. One solution to this is to locate fare vending machines in supermarkets and corner stores to give access throughout the city, but this would require some negotiation with local businesses.

New technology should be embraced, because it can allow KAT to employ new and creative fare solutions. However, deployment of this technology should be considered thoughtfully, as it can also create many new problems.

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4. Technology Assessment

A technology study for KAT was prepared in 2005. That work provides the basis for this chapter as much of the information is germane and tied to the construction of Knoxville Station. One of the projects recommended in the plan was the installation of automatic vehicle locater technology on throughout the system. A Request for Qualifications (RFQ) has been issued and a vendor and final technology is anticipated to be determined by the end of 2009.

Overview

Intelligent Transportation Systems as applied to transit represents a comprehensive approach to applying information technologies to transit to improve customer service and reduce system capital and operating costs. A good source of information about the range of ITS technologies for transit can be found at the Transit ITS Impacts Matrix Web site (http://web.mitretek.org/its/aptsmatrix.nsf/framemain/OpenFrameSet) (Figure 4-1). Typically, ITS includes the following technologies related to transit:

- Automatic Vehicle Location (AVL);
- Communication Systems;
- Geographic Information systems (GIS);
- Automatic Passenger Counters (APC);
- Operational Software and Computer Aided Dispatching Systems (OS/CAD);
- Advanced Traveler Information Systems (ATIS):
- Electronic Fare Payment Systems (EFP);
- Traffic Signal Priority (TSP); and,
- Vehicle Diagnostics and Intelligent Vehicle Initiative (IVI).

Most bus-only transit systems are "inching" their way forward in application of ITS because of the costs and variability of the technologies. Nevertheless, with the rapid increase of technological capabilities in all areas (phones, PDAs, voice actuation, etc.), it is important that transit systems take advantage of these capabilities where possible to improve their customer service and operational efficiency.

Figure 4-1
Transit ITS Matrix

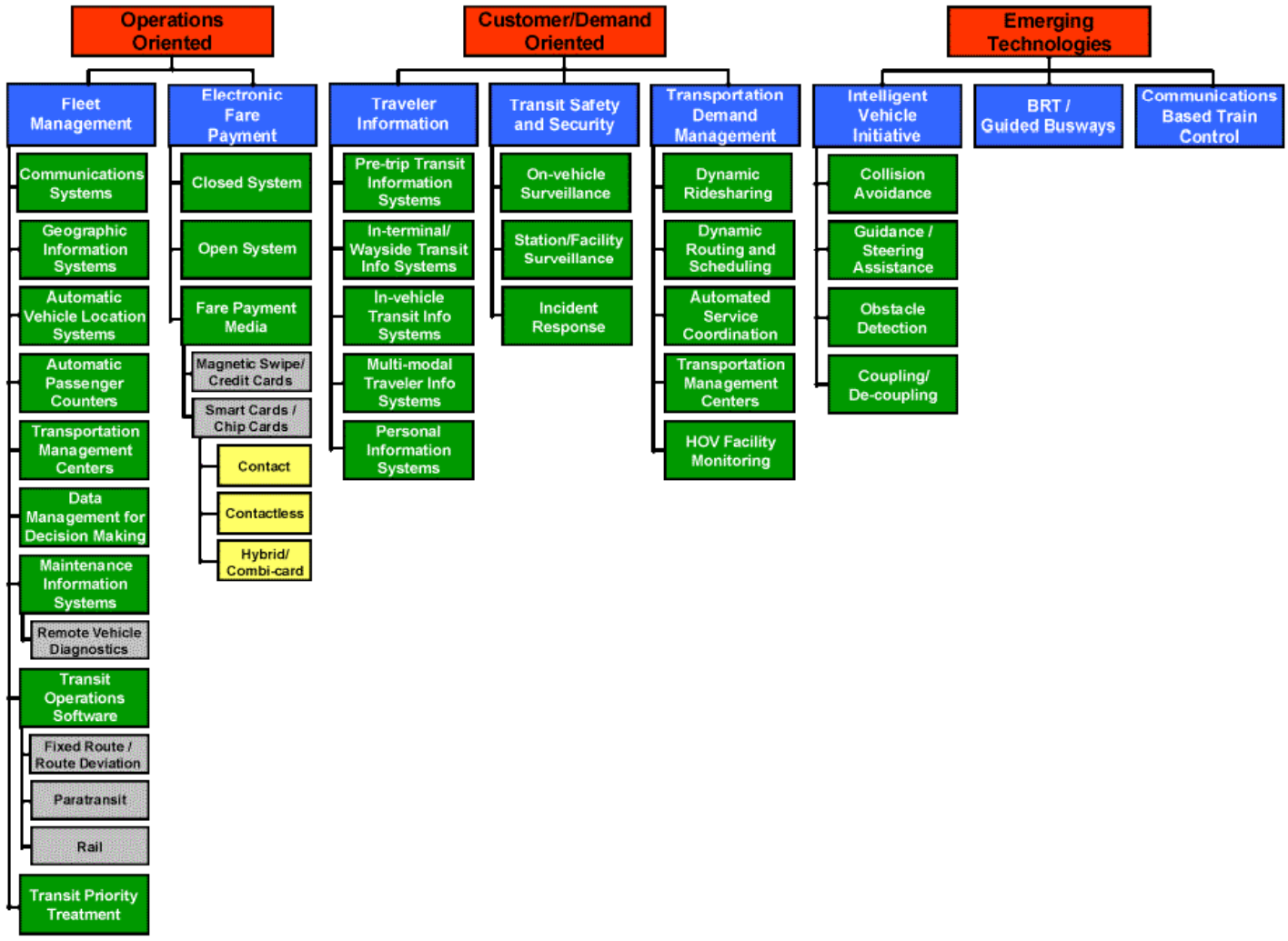

Table 4-1 provides a narrative assessment of typical ITS technologies related to transit.

Table 4-1
Typical ITS Technologies Related to Transit

Technology	Functions	Benefits
Automatic Passenger Counter	Collects data on time and location of passenger boardings and alightings.	Useful in service planning, which may increase operating efficiency of the system.
Automatic Vehicle Location (AVL)	Tracks the real-time location of vehicles using mobile data terminals (MDT) and a global positioning system (GPS).	Accurately shows location of all equipped vehicles in fleet. Easily identifies location of vehicle in event of emergency. Can assign vehicle for pick-up that is closest to requested trip.
Communications	Voice and/or digital communication between drivers and dispatch.	Provides communication between the drivers and central dispatch.
Customized Spreadsheets/Databases	Stores information on clients, trips, schedules, and other business operations.	Increase in efficiency and reliability of data collection. Improved maintenance and record keeping.
Demand-Responsive Transit Software	Expedites call-taking, collects and maintains client and vehicle data, and generates reports.	More efficient service coordination, improved staff performance, more effective dispatching and increased safety.
Transit Operations Software	Automates transit functions, including scheduling/dispatch (assigns trips to vehicles), route planning, service monitoring, and data acquisition.	More efficient service coordination, improved staff performance, more effective dispatching and increased safety.
Electronic Payment Systems	Passengers pay for trips with electronic cards (smart cards).	Speeds up boarding and collects passenger and trip data.
Geographic Information Systems (GIS)	Displays fleet/route information on a map on a computer screen.	More efficient trip request processing and improved security and schedule productivity.
Maintenance Software	Stores and reports vehicle maintenance and repair data.	Effective maintenance tracking.
Silent Alarm System	Vehicle driver can silently notify central dispatch of an accident, crime or emergency.	Increases passenger and driver safety.
Mobile Data Terminal (MDT)	On-board computer that communicates with central dispatch the locations of passenger boarding/alighting.	More efficient service coordination, improved staff performance, improved service quality.
Palmtop Electronic Device	Electronically stores/updates vehicle schedules and provides the updated manifests to the drivers.	Eliminates faxing of paper manifests.
Personnel Management Software	Stores, processes, and reports payroll benefits, hours worked, and personnel information.	Reduces data-entry and paperwork.
Traveler Information Systems	Provides pre-trip and in-vehicle information.	Informs passengers of delays or other trip related information.

As noted in Chapter 1, KAT provides over 3.2 million passenger trips per year in Knoxville. Table 4-2 presents an overview of KAT. Table 4-3 presents other organizations with which KAT may coordinate.

Table 4-2
KAT Overview within Context of ITS Assessment

Category	Quantity or Cost	Comment
Annual ridership	3.2 million	Up from 2.2 million in 2001
Annual total operating cost	$12.54 million (FY2004)	
Number of fixed routes	25	
UT Service Ridership	1.1 million (FY2004)	Up from 572K in FY2003
UT Service Budget	$1.2 million (FY2004)	
Night/Sunday service	77k trips (FY2004)	Down three percent from FY2003
The Lift (paratransit service)	46,463 (FY2004)	Up 19.5 percent from FY2003
The Lift (paratransit service)	$1.01 million (FY2004)	
Downtown trolley ridership	471K (FY2004)	Down eight percent from FY2003
Downtown trolley cost	$494K (FY2004)	
Downtown trolley routes	4 + night route + campus apts. (campus to nearby neighborhood)	Added fully subsidized route for local student private housing in August 2004
Existing AVL	None	
Existing APC	None	
Type of farebox	GFI Cents-a-bill	Plans are to purchase electronic/card reading fareboxes
Existing maintenance software	Fleetmate (parts, work orders) and works with Gas Boy (fueling software)	Plans are to purchase advanced maintenance software
Customer information	Phone based	
Trip planning software	None	
Employees	262	
Organization	City Service/Has nine-member board appointed by the Mayor of Knoxville	
Coordination with other Agencies	Coordinates with ETHRA and CAC when possible. Under contract to provide bus service to UT.	

Source: KAT ITS Assessment, prepared for the Knoxville Knox County Metropolitan Planning Commission and Knoxville Area Transit, prepared by The Corradino Group, 2005

Table 4-3
Other Agencies with ITS Involvement

City of Knoxville (IT Department)	Currently have mobile data terminals and cameras on all police cars. Planning to install AVL on some cars.	The City of Knoxville IT department is responsible for KAT's computer hardware, software, and maintenance.
East Tennessee Human Resource Agency (ETHRA) (serves 16 counties)	Approximately 80 vans equipped with AVL	Representatives of ETHRA participated in the stakeholder workshop held for the study.
Knoxville Knox County Community Action Committee (CAC)	Approximately 21 vans equipped with AVL	Representatives of CAC participated in the stakeholder workshop held for the study.
Tennessee Department of Transportation (TDOT)	TDOT's new Transportation Management Center expected to open in 2005.	The Transportation Management Center will operate TDOT's Smart Way System, which will feature 70 cameras, 16 dynamic message boards, and a highway radio advisory system.

Recommended ITS Applications/Technologies for KAT

Based on collected information regarding KAT's needs and existing conditions, the recommended ITS applications/technologies that will assist KAT meet its objectives could be prioritized as follows:

- Automatic Vehicle Location (AVL): AVL is considered the backbone of all other ITS technologies discussed in this document and would provide KAT with several benefits including customer satisfaction. As discussed in this document, AVL provides real time vehicle locations that are used by almost all other applications. Without AVL, almost all other applications would be considered non-effective. As noted earlier, KAT is currently (Fall 2009) procuring AVL through an RFQ process.

- Emergency Alarm: While ideal implementation of emergency alarm technology should be implemented concurrently with AVL, this technology could conceivably be implemented independent of any other ITS technology and would provide some level of notification in cases of onboard emergencies. In a situation where no other ITS technology is implemented, especially AVL, activation of an emergency alarm on board the vehicle would alert dispatch center of a potential emergency situation on board the vehicle but locating the vehicle would require dispatchers to predict probable location of the vehicle based on its schedule rather than actual location.

- Mobile Data Terminal (MDT): In conjunction with AVL, this technology would enable text messages between operators and dispatch center and interface with other onboard ITS applications.

- Stop Announcement: This technology would assist KAT in its on-going difficulty of operator training and enforcement of announcing stops to passengers.

- Schedule Adherence: This technology would enable KAT to determine vehicle status and provide such information to its passengers and use it internally for effective route planning and scheduling. KAT should ensure that this technology is provided to its customer service personnel who typically answer customers' calls asking about vehicle status.

- Video and Voice Recording: While video recording could be postponed at this time, voice recording and transmission should be implemented concurrently with AVL because of its benefits in ensuring operator and passenger security and relative ease of implementation without overburdening the radio communications bandwidth.

- Destination Sign: KAT's staff indicated that almost all of their buses are currently equipped with destination signs. Efforts should focus on examining technical aspects of these signs to determine if they could interface with AVL for ease of programming and utilization. If not, destination sign utilization could remain as it exists today.

- Trip Planning: This technology will contribute to overall customer satisfaction. KAT should ensure that this technology is provided to its customer service personnel who typically answer customers' calls asking about trip planning.

- Geographic Information System (GIS): Because the City of Knoxville already uses a GIS, KAT could utilize this existing technology to interface with its ITS applications. Currently, the Metropolitan Planning Commission (MPC) and Knoxville GIS (KGIS) operate in a partnership and share resources with KAT. A good example is the current (Fall 2009) implementation of the TDP recommendations outlined in this report. As KAT staff fine tune and begin the scheduling of the route modifications the KGIS system is being used to provide the updated routes.

- Automatic Passenger Counting (APC): This technology would enable KAT to determine passenger loading at each stop for effective planning of routes and schedule.

- Incident Report: This technology is relatively easy to implement and it provides benefits to KAT's efficient staff operation.

- Way-side Variable Message Signs: Because KAT is implementing a downtown transit center, this technology would be useful to passengers connecting to other routes or services at the center.

Human Resources

Human resources required to support ITS include trained personnel during the implementation and operation of the system. Implementation typically involves a project manager and an engineer to coordinate the project and verify compliance with specifications. Implementing ITS applications in transit agencies have traditionally resulted in more effective utilization of existing human resources. Examples include training road supervisors to utilize the system to effectively accomplish their duties in managing the vehicle's movement. Most of the benefits are realized by the agency's

management because of their ability to monitor and manage the operation and maintenance of vehicles in a more effective method. Dispatchers and operators also realize great benefits in performing their duties in a more effective manner.

Operations and maintenance of the systems require human resources that may not have been available to the transit agency prior to implementing ITS. Examples could include a full time network and system administrator. Such a person's responsibilities include the daily operation of the system programming, database management and maintenance. At the vehicle level, there might not be a need to add personnel if the maintenance personnel are trained to maintain the on-board equipment. The agency's existing infrastructure maintenance personnel also may cover infrastructure maintenance if they receive proper training.

Depending on funding and other logistical constraints, some transit agencies elect to purchase a service agreement from equipment vendors or other specialized private firms to handle all maintenance issues.

Some transit agencies are associated with another public entity, e.g. The City of Knoxville, and receive all maintenance support from this government body. The government body may be able to provide maintenance support to ITS applications as described above. However, from the perspective of KAT and how KAT operates as a unique entity, although part of the overall City government, it is felt that a dedicated employee on site at KAT would best address KAT's ITS needs. In addition, to take full advantage of the planning capabilities associated with ITS and GIS as mentioned above, it will be important that either KAT or the TPO have a staff person skilled in GIS who handles the GIS/ITS interface for planning purposes on a regular basis.

Because existing dispatchers and vehicle operators will be the users of the ITS system, they should not be considered as additional resources needed to operate the system. ITS systems have not contributed to any significant reduction or increases in dispatchers or vehicle operators at most of the transit agencies that have implemented ITS.

In summary, the human resource requirement for KAT to effectively support ITS applications should include a full time system administrator. The administrator should be experienced in the Information Technology (IT) area especially in the operating system and software associated with the ITS applications. The System Administrator duties will include the daily operation and maintenance management of the hardware and software. Examples of such duties include database updates, downloads, archiving, report design, handling of maintenance issues, programming of system parameters, importing/exporting of schedules, uploading and installing software upgrades and patches, and interfacing issues with external hardware/software. The System Administrator duties should also be complemented by a part-time position(s) to cover System Administrator responsibilities in cases of emergencies where the Administrator is temporarily not available (i.e. after hours, sick, vacation, etc). Although not necessarily an employee of KAT, there should be a staff resource at either KAT or the TPO to do planning level work with the data generated by ITS technologies.

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5. Route Analysis and Recommendations

The consultant team and staff conducted two planning workshops to review the route structure for KAT with the primary purpose to identify operational efficiencies while trying to provide the most effective service possible to KAT riders.

The analysis was based on the following:

- Results of a 100 percent boarding and alighting survey conducted on the system routes;
- Results of an on-board survey of riders;
- Input from drivers and staff (obtained by posting maps of individual routes in common areas for several days to allow for comment);
- Peer analysis with other communities; and,
- Information about running time, schedule adherence, and other factors developed during the study.

Following is a discussion of each of the tools used to develop the KAT recommendations.

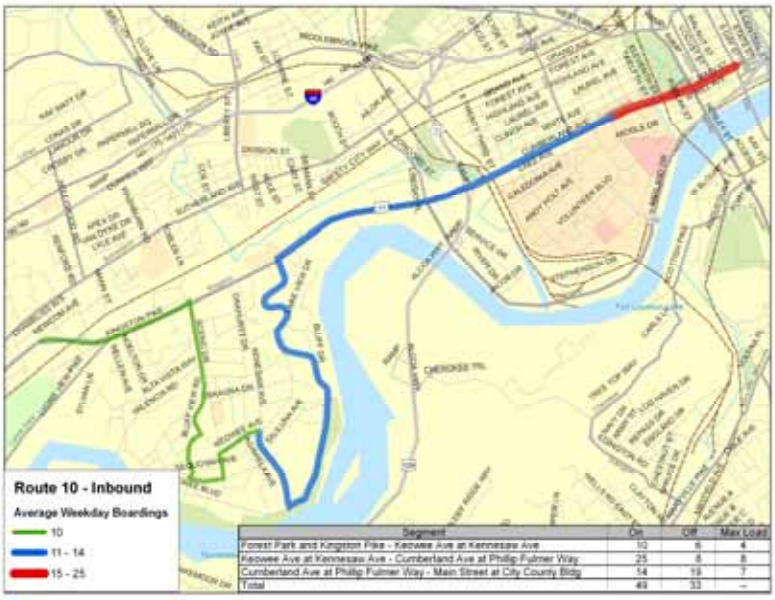
Boarding/Alighting Survey

A 100 percent boarding and alighting survey of KAT routes was conducted in the fall of 2008. The survey was conducted by Data Smarts, a data collection firm specializing in surveys under subcontract to Corradino. Figures 5-1 and 5-2 present examples of the graphics prepared for each route.

To review the complete set of boarding and alighting graphics prepared as a result of the survey, please refer to Appendix A.

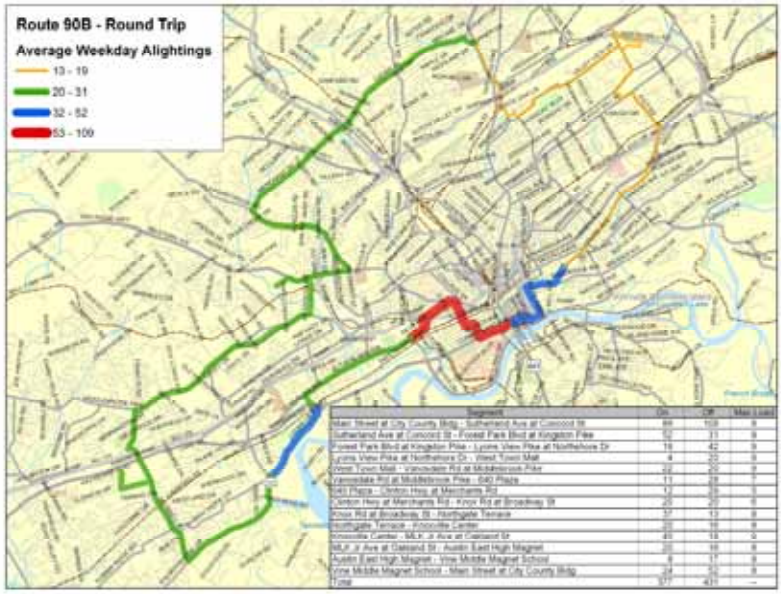
Graphics for each route are presented in the appendix. Overall, like most transit system, the analysis shows distinct travel patterns based on generators. KAT does have a number of routes with large segments that have very little ridership. In addition, Route 90, while the most used route in the system, represents a disproportionate percentage of KAT's operating budget.

Figure 5-1
Sample Boardings Graphic



Segment	On	Off	Max Load
Forest Park and Kingston Pike - Keowee Ave at Kennesaw Ave	10	6	4
Keowee Ave at Kennesaw Ave - Cumberland Ave at Phillip Fulmer Way	25	8	8
Cumberland Ave at Phillip Fulmer Way - Main Street at City County Bldg	14	19	7
Total	49	33	--

Figure 5-2
Sample Alightings Graphic



On-board Survey

In September 2008, the consultant team conducted an on-board survey of KAT riders. The survey was conducted by intercepting and interviewing bus passengers on their trips. The complete survey results are presented in Appendix B. Four-hundred and seventy one surveys were collected for the fixed route survey representing most routes in the KAT system. Most trips (about 70 percent for both questions about where are you "going to" or "coming from") were associated with home or work. Shopping and school together were the second largest response. About 35 percent of the respondents reported boarding the bus at the downtown transfer point. An additional 26 percent indicated they would get off the bus at the transfer point. Based on that information, over 60 percent of all KAT riders use the downtown transfer point. Approximately 46 percent of the riders indicated that they had gotten on the bus after transferring from another KAT bus.

Of those responding to the question about how they got on the bus 66 percent reported walking with the only other mode (besides transferring from another bus) of significance was driving a car, which likely indicates the increase in use of express bus and park-and-ride options. Over seventy percent of the riders use the bus several times a week with over fifty percent using it daily. Thirty percent reported using cash to pay their fare while about 40 percent used a monthly pass. Fifty-five percent of the respondents reported that they were licensed drivers and able to drive while 44 percent said they could not drive. Over fifty percent of the respondents did not have access to vehicles in their household while less then 25 percent of households reported having access to two or more vehicles. In terms of evaluation of KAT services, about 57 percent rated the system as "good" while 23 percent rated it as "excellent." Two percent of the respondents rated the system as "poor."

Seventy percent of respondents felt that KAT buses usually ran "on time" with twenty percent saying they always ran on time. This response is unusual when viewed at in light of the schedule adherence data developed in the boarding and alighting survey. This survey was conducted in September 2008 when the fuel markets were in upheaval and the effects of the global recession were beginning to appear. In response to a question whether raising a fare to $1.50 would affect their use of KAT, most riders (81%) said no.

In general, KAT's riders are for the most part in the transit dependent category. Only ten percent reported household incomes over $50,000 and, as noted above, nearly half the respondents are not able to drive. It is likely that KAT has addressed and should continue to address the needs of this market. Those needs can likely be addressed most by adding frequency on key routes such as Magnolia. This will give them better and more frequent access to jobs and schools and improve their quality of life and transportation. A second goal should be attracting the suburban market. With the opening of the transit center and possibility of an increased sense of security about riding the bus, along with an aggressive outreach campaign, more suburban riders from the downtown worker market could be attracted to KAT.

Input From Drivers and Staff

Input from drivers and staff was gathered through a variety of means. Corradino presented the TDP plan and process during meetings that included drivers, maintenance employees, and others

involved in KAT operations. One of the unique things done as part of this plan was an idea of KAT staff. Corradino developed large posters of each route which were then placed on boards located in common areas. Drivers and staff could take pen and marker and mark up the various maps. These proved very valuable during the route analysis process.

Peer Analysis

The consultant conducted a number of peer analyses for KAT through the TDP process. The most telling is passengers per hour. As shown in Table 5-1, KAT does not appear to carry as many riders per hour as its peers.

Table 5-1
Peer Analysis – Passengers Per Hour

Unlinked Passenger Trips per Revenue Hour	
Nashville MTA	28.47
TARC (Louisville)	24.67
IndyGo	20.80
Greenlink (Greenville, SC)	19.49
CARTA (Chattanooga)	16.14
KAT	14.98

The passengers per hour number shown for KAT includes UT ridership. Excluding UT ridership, KAT totals are even lower with the system averaging about 12 passengers per hour. The reasons for KAT's lower productivity in terms of passenger per hour are unclear. The system has levels of service comparable to other systems in terms of frequency (headways), coverage, hours of service, and demographics.

Schedule Adherence Data

KAT has significant on-time performance problems. This affects the system interlining and overall operation. The move to Knoxville Station offers an opportunity to address these deficiencies, as does the implementation of this plan. Addressing schedule adherence either requires adding more vehicles, which requires additional funding, or adjusting or cutting portions of routes. Table 5-2 presents data on schedule adherence for weekday and Saturday service. The data was gathered during the fall 2008 on-off survey conducted as part of this plan.

Table 5-2
Schedule Adherence Summaries
(On time is zero minutes to five minutes late)

Route	Late				Early			
	AM Peak	Midday	PM Peak	Saturday	AM Peak	Midday	PM Peak	Saturday
10	81.3%	86.0%	100.0%	83.1%	6.3%	5.8%	0.0%	7.7%
100	0.0%	0.0%			57.1%	44.4%		
101	57.1%	50.0%	20.0%		0.0%	11.5%	60.0%	
102	54.5%	54.8%	57.9%		27.3%	16.1%	10.5%	
11A		0.0%				0.0%		
11	44.4%	49.7%	51.3%	76.9%	15.6%	11.1%	7.7%	3.7%
12	30.8%	63.9%	84.1%		14.3%	7.5%	2.3%	
12C		84.7%	87.5%	37.4%		6.9%	12.5%	11.0%
13	6.5%	27.6%	28.2%		12.9%	19.1%	28.2%	
14	47.5%	46.2%	46.4%		10.0%	17.3%	10.7%	
20	33.3%	48.2%	33.3%	48.6%	28.6%	22.6%	36.1%	9.3%
21	82.8%	81.0%	100.0%	66.9%	3.4%	0.8%	0.0%	1.5%
22	54.0%	55.4%	50.9%	88.2%	10.0%	10.9%	17.0%	1.3%
23	25.0%	43.4%	23.5%	31.5%	28.6%	20.0%	26.5%	12.1%
30	5.9%	14.7%	0.0%	31.6%	23.5%	15.4%	22.2%	1.3%
31	29.4%	44.8%	29.6%	69.8%	22.1%	11.0%	5.6%	10.1%
32	22.4%	19.6%	12.5%	25.0%	18.4%	24.4%	35.4%	1.9%
33	29.7%	51.0%	80.0%	18.6%	32.4%	19.1%	0.0%	14.2%
40	42.9%	44.2%	45.2%	59.0%	26.2%	22.1%	19.0%	3.0%
41	0.0%	58.5%	70.8%	25.0%	22.2%	5.2%	4.2%	15.4%
42	10.5%	17.4%	14.3%	15.0%	31.6%	20.9%	19.0%	11.7%
43	77.8%	51.4%	47.1%		11.1%	29.7%	47.1%	
44	75.0%	40.8%	33.3%		0.0%	31.6%	55.6%	
80	70.1%	57.6%	18.0%		12.1%	14.5%	16.9%	
82	55.2%	77.3%	85.5%		6.9%	8.2%	8.1%	
84	3.8%	43.2%	100.0%		96.2%	45.5%	0.0%	
86		75.8%	46.4%			10.8%	17.9%	
90A	43.9%	39.8%	55.0%	43.8%	12.2%	27.2%	30.0%	11.7%
90B	5.6%	35.4%	50.0%	64.5%	33.3%	25.5%	25.0%	5.0%

Source: KAT Fall 2008 Boarding/Alighting Survey (The Corradino Group, Inc.)

Route Planning Workshops

Using the various data described above the consultant engaged a project steering committee in workshops to review the KAT operations. The objective of the work was to:

- Identify modifications to reduce inefficient and redundant service;
- Identify improvements that would support better schedule adherence throughout the system, including building time into the schedules for transfers; and,
- Minimize looping and other inefficient routing.

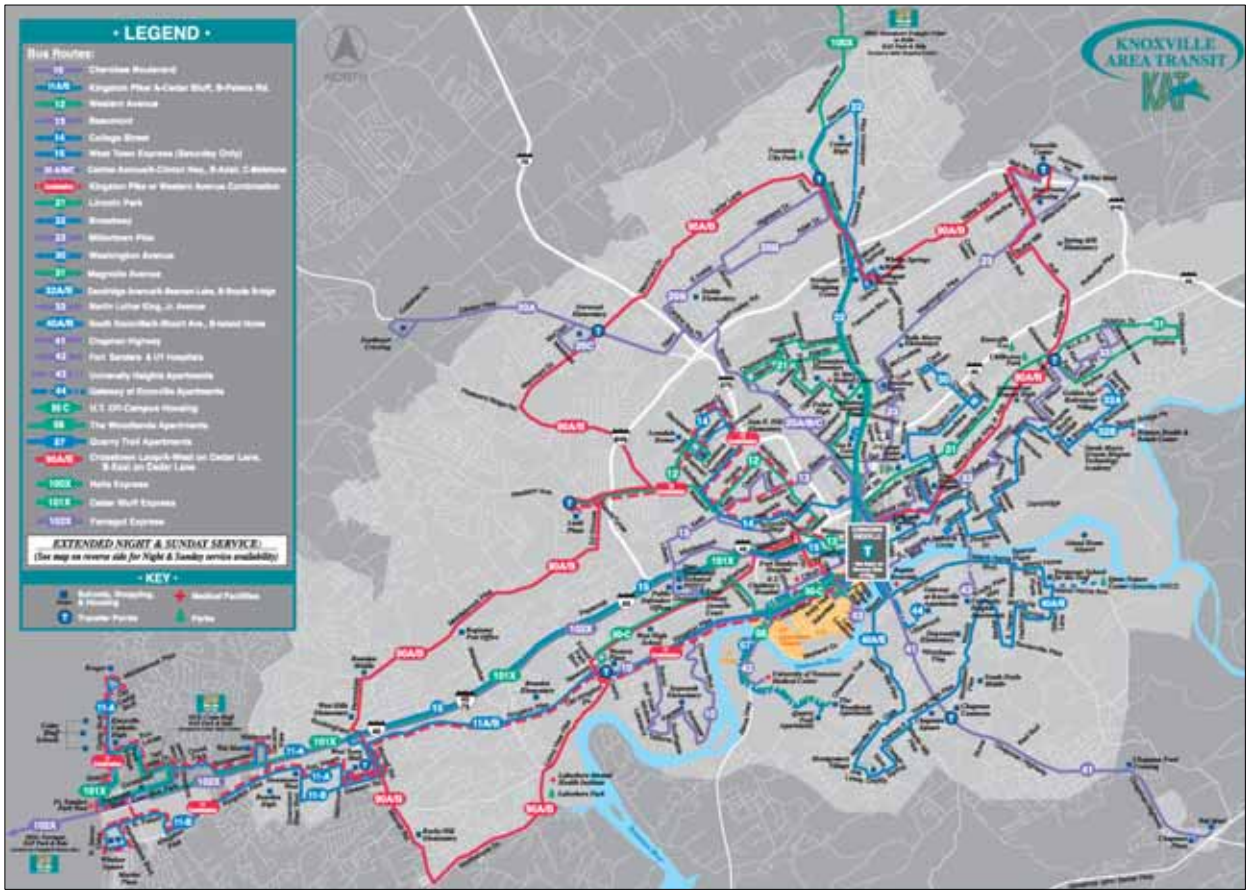
As a result of the workshops and subsequent refinements, the following routing changes are recommended as shown in Table 5-3.

Table 5-3
Route Change Recommendations

Route	Changes	Issues	Ridership Impacts	Cost Impacts	Schedule Adherence
10	■ Terminates at Kingston-Scenic ■ Restructuring of route in Sequoyah Hills ■ Optional extension to Lakeshore Mental Health Hospital	■ Low ridership ■ Schedule adherence issues with interline with Route 21 ■ Realigned portion in Sequoyah Hills ■ Extension to Lakeshore Mental Health Hospital to cover eliminated portion of Route 90	Low	Could increase costs	Improvement
11	■ Consider using circulator (small bus) past West Towne Mall; create super stop on Kingston Pike at the end of the route.	■ Schedule adherence on the Kingston Pike route is a continuing problem	Increase	Neutral	Improvement
12	■ Combined with Route 14, named Route 14	■ Three routes in area (12, 13, 14) have similar alignments, mid-range ridership ■ Simplifies routes, saves one vehicle during weekday operation	Possible	Savings	Improvement
14	■ Combined with Route 12, named Route 14				
15	■ Proposed for elimination as part of KAT's Saturday service proposals	■ Low ridership			
19	■ Route 20B becomes Route 19		Possible	Savings	NA
20A/C	■ Combined 20A and 20C, all trips make 20C route pattern; renamed Route 20.	■ Simplify routes, eliminate confusion	Increase	Increase	Improvement
21	■ Terminate at Broadway at Oglewood	■ Low ridership on northern portion of route; schedule adherence issue	Possible	Savings	Improvement
22	■ Add additional vehicle to route operation	■ Schedule adherence issue; indirect route alignment on north end of route	Increase	Increase	Improvement
30	■ No alignment change recommended; may consider elimination of interline with Route 42.	■ Use interline with route 42 to improve on-time performance of another route.	NA	NA	Improvement
31	■ Consider using circulator (small bus) on Skyline Drive; create super stop on Magnolia at the end of the route.	■ Would provide more neighborhood friendly service on Skyline Drive. ■ Would reinforce Magnolia trunk line as a primary route.	Increase	Increase	Improvement
32	■ Eliminate 32A; expand 32B (rename 32).	■ Route Simplification; eliminate redundant service	Possible	Savings	NA
33	■ Eliminate portion of alignment east of Kirkwood; extend to Knoxville Center on existing 90A/B alignment	■ Replace 90A/B in this area	Possible	Increase	Improvement
90A/B	■ Eliminate southern segments of 90A/B between Knoxville Center and Westown Mall	■ Route consumes too high a proportion of system resources (15% of total budget); lower ridership in this segment; duplication of service.	Possible	Savings	Improvement

The changes proposed for KAT are illustrated in the following maps. Figure 5-3 shows the existing system. Figures 5-4 through 5-12 show the various route changes with the areas where service is proposed to be eliminated shown as a shaded color.

Figure 5-3
Existing KAT Service Map



The KAT system shown in Figure 5-3 last went through a major refinement in the mid-1990's. Since that time there have been minor changes but the basic system remains today. As can be seen the Route 90 (the red loop that circles the area) provides the strongest connection in the outer areas of the community. However, the southern part of the route duplicates other service in a number of locations. This route consumes about 20 percent of KAT's resources and it is suggested that restructuring the route is vital to KAT's efforts to become more efficient.

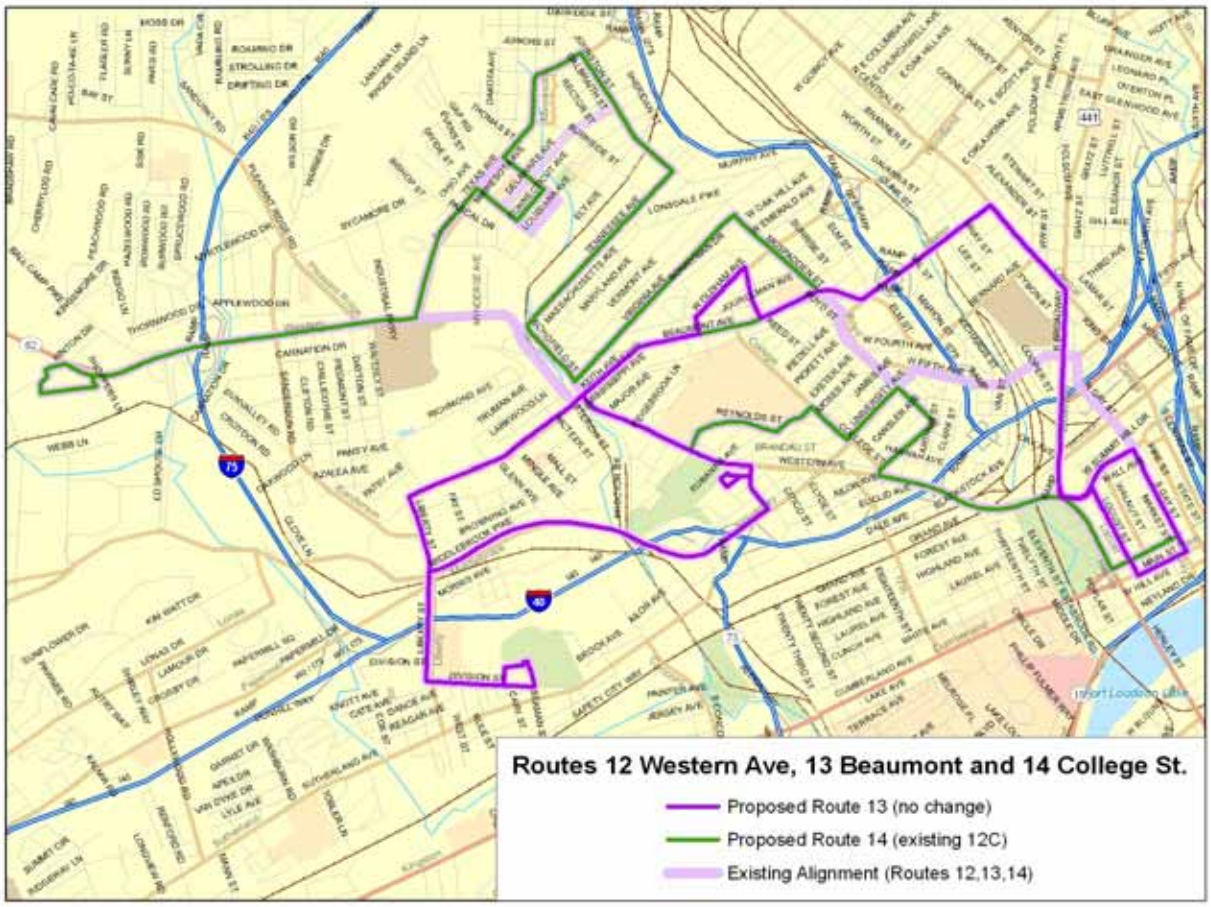
Figure 5-4
Route 10 (Cherokee Boulevard)

The Route 10, Cherokee, shown above, has for years been among the lowest performing routes in the system. The primary recommendation for this route is removal of part of the loop (shown in the shaded purple) on the outer edges of the Sequoyah Hills neighborhood. This would allow the route to still serve the village center at the intersection of Keowee and Kenesaw. As shown the route would return downtown upon connecting to Kingston Pike but there could be an extension to Lakeshore Mental Health to the west if demand warrants. The timing of this route will need to be monitored during implementation because of the move further east to the Knoxville Station transfer center.

Figure 5-5
Route 11 (Kingston Pike)

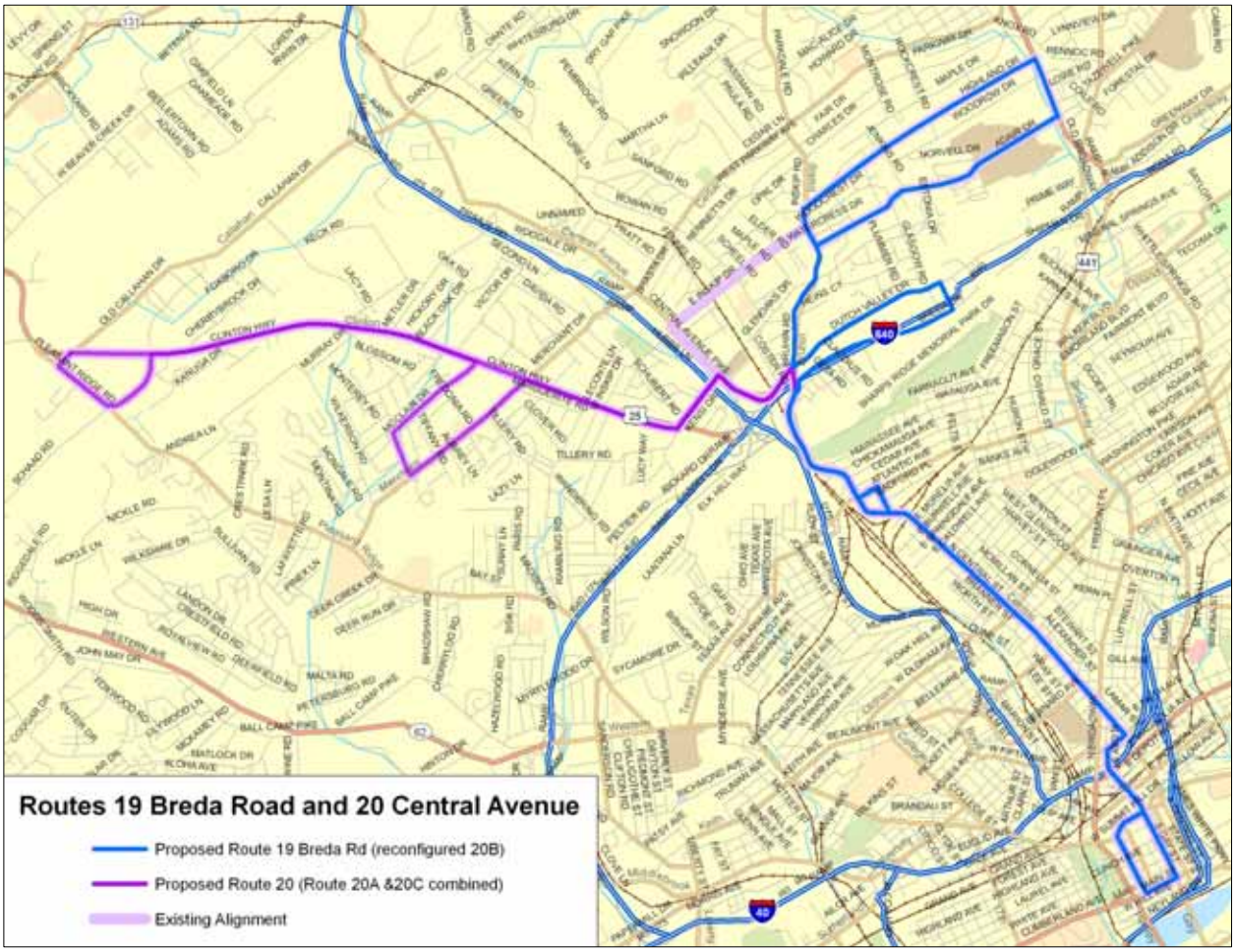
The primary recommendation on this route is putting in place a circulator on the west side of the route beginning at Wal-Mart. This would allow the main trunk of the route to avoid the heavy traffic in the commercial area and allow it to operate on a more regular basis. It currently has significant problems with on-time performance. This recommendation could have a byproduct of encouraging more park and ride if people could park at West Town Mall and then ride into downtown to the new transit center. An arrangement with the mall would have to be put into place.

Figure 5-6
Routes 12 (Western Ave), 13 (Beaumont), 14 (College St.)



Routes 12, 13, and 14 have quite a bit of duplicative service. The primary recommendation here is to modify the routes so that they operate like Saturday service. Essentially, Route 12 goes away and Routes 13 and 14 operate as shown. This change will reduce some service but essentially maintain good coverage throughout the area.

Figure 5-7
Routes 19 (Breda Road) and 20 (Central Avenue)



These routes were modified slightly to provide better coverage to apartment buildings along Breda Road while maintaining essentially the same coverage. It is believed that this small change will increase ridership without impacting existing riders.

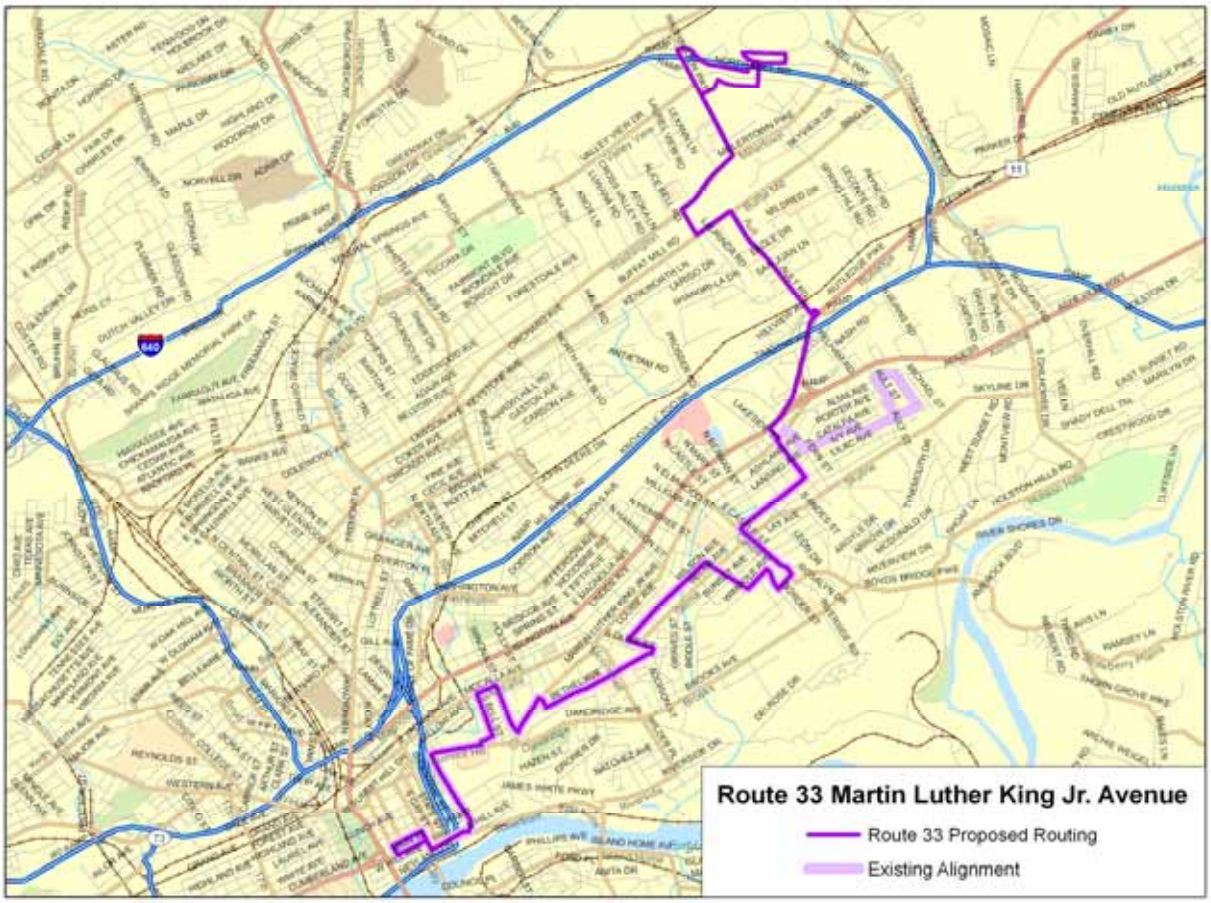
Figure 5-8
Route 21 (Lincoln Park)

On the Lincoln Park route, there is a very lightly used area north of St. Mary's Hospital. Overall, this route has also been one of the poorer performing routes in the system and has significant schedule adherence issues. This change should not have a major impact on ridership and will improve overall system operation and productivity.

Figure 5-9
Route 31 (Magnolia Avenue)

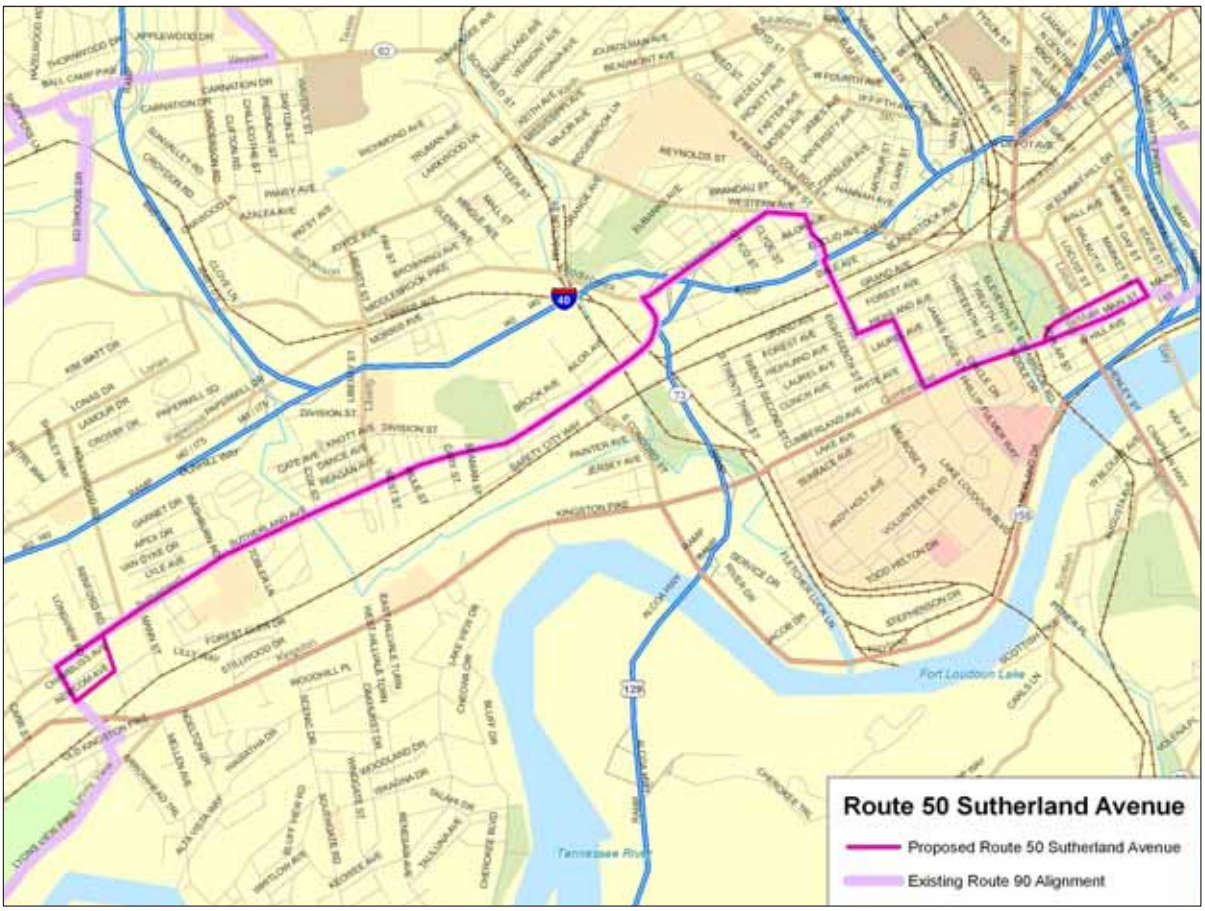
This route is one of the highest performing routes in the system and has been identified as a possible corridor for future high capacity transit. The primary recommendation is to create a shuttle extending from a superstop at the end of the route and having a shuttle operate on Skyline Drive, which is not appropriate for large buses. This would be a Neighborhood Service Operated (NSO) cutaway type bus as opposed to KAT's larger buses. This vehicle would be more suitable for operation on Skyline Drive.

Figure 5-10
Route 33 (Martin Luther King Jr. Avenue)



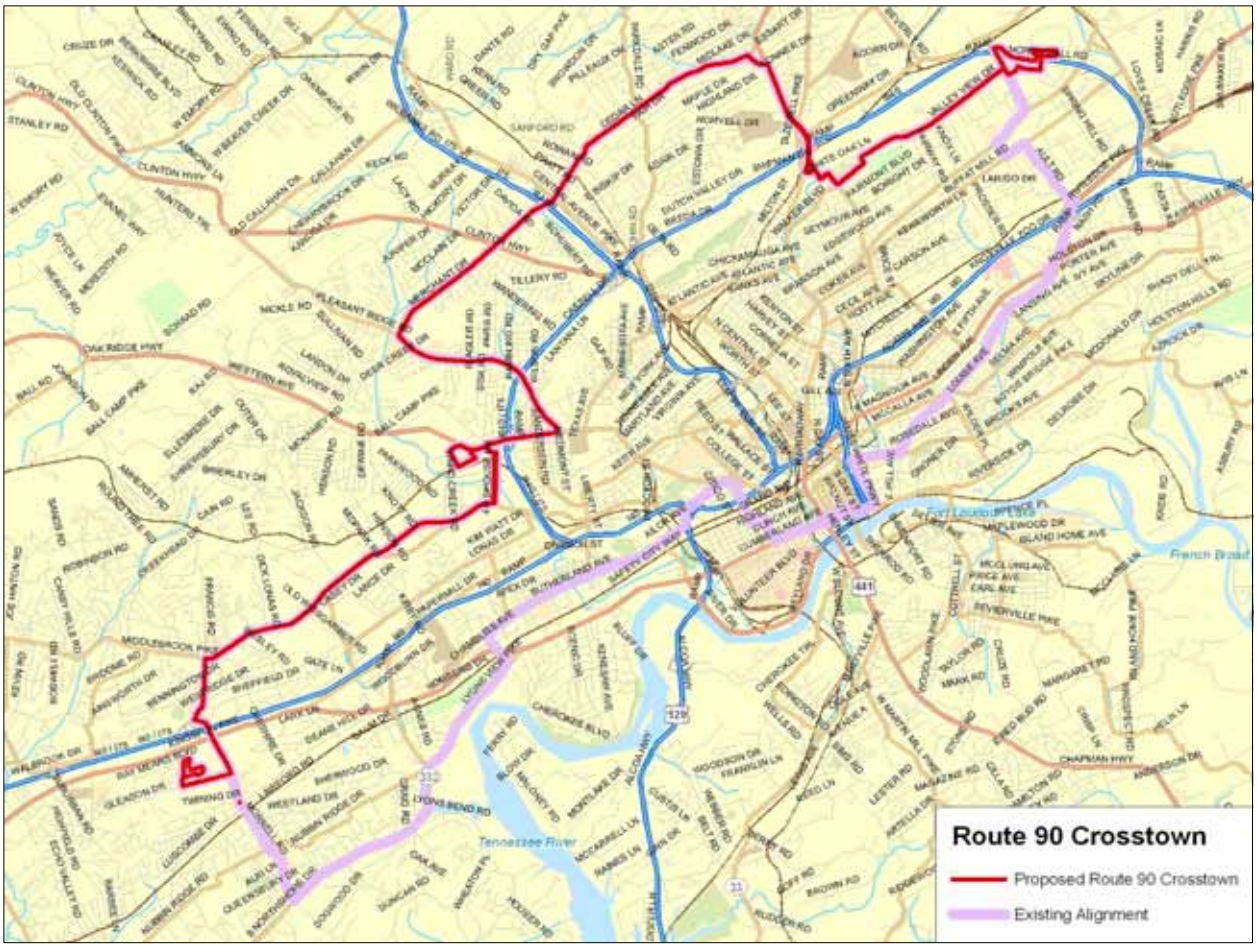
On this route a minor elimination of a deviation is recommended to help the route maintain its schedule. Based on the data and analysis during the workshops, this recommendation will not unduly affect riders in this area and there will still be good service coverage .

Figure 5-11
Route 50 (Sutherland – New Route)



A new route serving Sutherland Avenue is proposed as shown above. This will increase transportation services available for the University of Tennessee and complement both KAT's line service and its UT service.

Figure 5-12
Route 90 (Crosstown)

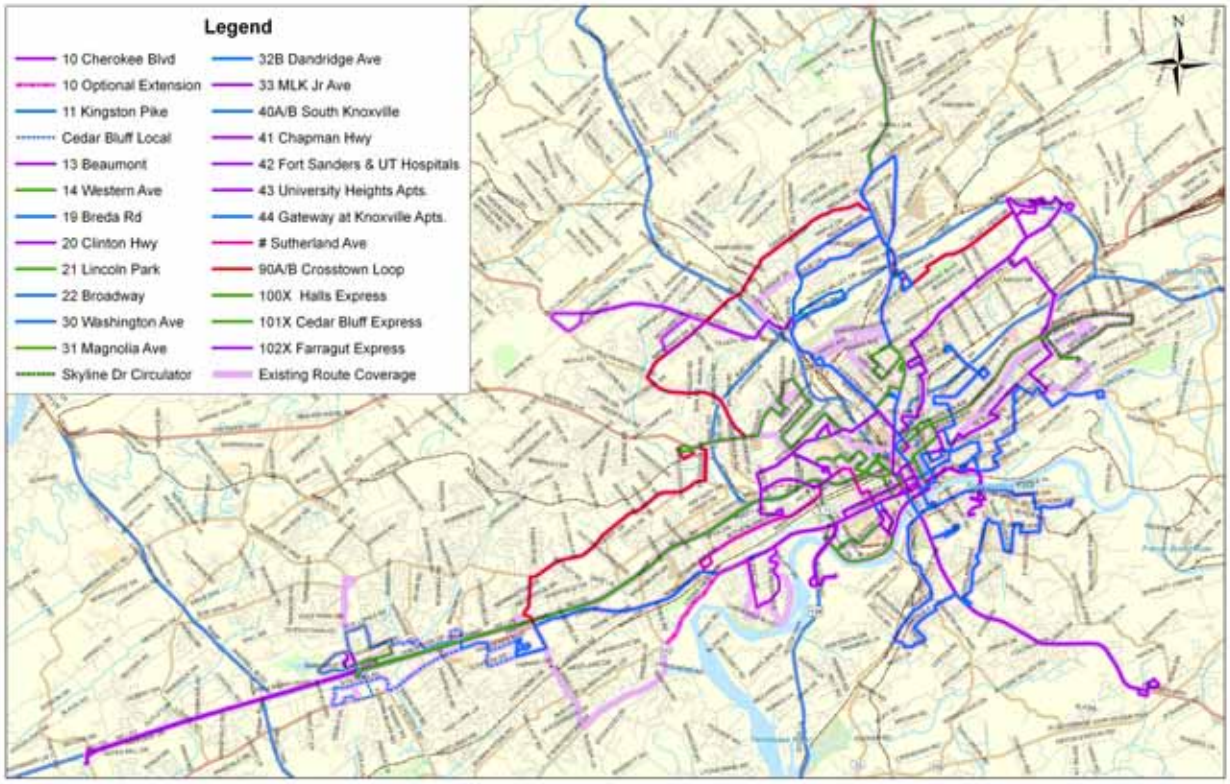


The Route 90 Crosstown Route is carries the most passengers but also consumes the most resources of any route in the system. The proposed recommendation for this route is to eliminate the southern portion of the route so that the route essentially is traveling from Knoxville Center Mall to West Town Mall as shown on the map above. The portions of the route eliminated (shown in the shaded line) would be covered by existing service or the new Route 50 – Sutherland Avenue.

Knoxville Area Transit Revised System Map

With the proposed recommendations, the revised system is shown in Figure 5-13.

Figure 5-13
Revised KAT System Map



The overall impact of the proposed recommendations is a revenue neutral plan (i.e., operating costs will remain about the same) and a more efficient, customer friendly system. Any savings that may result from this plan should be used to address on-time performance issues. This amount could be absorbed into operations through service frequency improvements on the systems best performing routes (as recommended in the 2010 Action Plan produced in 2002) or to cover additional unforeseen operating expenses that occur with the transition to Knoxville Station in August 2010.

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6. Implementation Plan

This chapter summarizes the impacts of the service recommendations, in terms of service hours and operating costs, and presents the steps required to implement the service recommendations concurrent with the move to Knoxville Station.

Service Recommendations

The estimated changes in annual revenue hours associated with the TDP recommendations and the resulting operating and maintenance (O&M) cost estimates by route are presented in Table 6-1. No capital cost estimates for vehicles are included, as the proposed service modifications result in a net decrease to the peak requirement. Seven less regular and neighborhood service buses would be required in peak service. There would be no increase in the maximum number of trolley buses required.

The projected O&M costs per revenue hour have been developed using KAT's FY 2008 National Transit Database (NTD) report and FY 2009 operator wage rates for each fixed route service classification. Given the nation's current economic downturn, these FY 2008 and FY 2009 costs are assumed to remain constant prior to the opening of Knoxville Station (i.e., no inflation has been assumed).

KAT has four classifications of wage rates for bus operators with adjustments in pay scale for four different route classifications. Total costs per revenue hour ($66.02), were adjusted to account for the variations in the wage rates. The resulting rounded costs per revenue hour by route classification are as follows:

- Regular Service Routes: $72.40
- Trolley Service Routes: $52.75
- T Operator: $49.75
- Neighborhood Service Operator: $48.60

Table 6-1 presents the annual estimated revenue hours and estimated O&M costs by route for the proposed TDP route modifications and proposed changes to the downtown trolley system. It should be noted that KAT is refining the actual scheduling of the routes for the August 2010 opening of the transit center and that there may be some change to the overall costs.

Table 6-1
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		
Route		Annual Service Hours	Annual Direct O&M Cost	Route		Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost	Comments
10	Cherokee	3,410	$165,705	10	Cherokee	3,078	$149,567	(332)	($16,138)	Route 10 is shortened.
11	Kingston Pk.	17,531	$1,339,342	11	Kingston Pk.	11,991	$916,112	45	($151,799)	Route 11 is shortened to terminate at West Town Mall. The western sections of the route eliminated will be served by the Cedar Bluff Local.
					Cedar Bluff Local	5,585	$271,431			The Cedar Bluff Local operates as a shuttle serving the portions of Route 11 that were eliminated.
12	Western Ave	7,480	$571,487	12	Combine with 14	-	$0	(7,480)	($571,487)	Route 12 is replaced by Route 14, operating on the existing 12 C alignment.
13	Beaumont	3,641	$278,203	13	Beaumont	3,641	$278,203	-	$0	
14	College St.	4,654	$355,599	14	College St.	7,125	$544,350	2,471	$188,751	Existing 12C becomes Route 14 and maintains the existing Route 12 weekday headways and Saturday headways.
15	West Town Direct	508	$38,805	15	Eliminate	-	$0	(508)	($38,805)	
20	Central Ave.	7,937	$606,378	19	Breda Rd	5,020	$383,528	5,033	$384,530	Route 19 is the existing Route 20B with some modifications and the same headways.
				20	Clinton Hwy	7,950	$607,380			Route 20 is the existing Routes 20A and 20C combined. Same headways.
21	Lincoln Pk.	3,696	$179,626	21	Lincoln Pk.	3,333	$161,984	(363)	($17,642)	Route is shortened.
22	Broadway	9,733	$743,592	22	Broadway	9,733	$743,592	-	$0	Vehicle on-time performance improved.
23	Millertown Pk.	4,883	$373,076	23	Millertown Pk.	4,883	$373,076	-	$0	
30	Washington Ave.	3,592	$274,417	30	Washington Ave.	3,592	$274,417	-	$0	
31	Magnolia	8,659	$661,580	31	Magnolia	6,668	$509,416	(1,992)	($152,163)	Assumed 23 percent of existing hours are devoted to what will be the Skyline Drive Circulator.
					Skyline Dr. Circulator	1,992	$96,795	1,992	$96,795	Skyline Dr Circulator will operate 23 percent of the previous Route 31 hours.

Table 6-1 (continued)
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		Comments
Route		Annual Service Hours	Annual Direct O&M Cost	Route		Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost	
32	Dandridge	7,685	$587,103	32	Dandridge	7,685	$587,103	-	$0	
33	MLK	5,749	$439,199	33	MLK	10,682	$816,105	4,933	$376,906	Route nearly doubles in length to serve Knoxville Center and replace existing 90A/B service.
40	South Knox	7,061	$539,485	40	South Knox	7,061	$539,485	-	$0	
41	Chapman Hwy.	6,963	$531,969	41	Chapman Hwy.	6,963	$531,969	-	$0	
42	Ft. Sanders/ UT Hospital	7,350	$561,540	42	Ft. Sanders/ UT Hospital	7,350	$561,540	-	$0	
43	University Heights Apts.	1,829	$139,697	43	University Heights Apts.	1,829	$139,697	-	$0	
44	Gateway at Knox Apts.	1,749	$133,624	44	Gateway at Knox Apts.	1,749	$133,624	-	$0	
50	UT Services	54,218	$2,697,349	50	UT Services	54,218	$2,697,349	-	$0	
80	Blue Line Trolley	8,253	$435,346	80	Blue Line Trolley	5,300	$279,575	(2,953)	($155,771)	Blue Trolley is realigned, making a more efficient route.
82	Orange Line Trolley	11,962	$631,019	82	Orange Line Trolley	13,600	$717,400	1,638	$86,381	Orange Trolley is realigned to allow passengers to get to other downtown locations without going to UT first.
84	Green Line Trolley	1,749	$92,260	84	Green Line Trolley	-	$0	(1,749)	($92,260)	Green Trolley is eliminated.
86	Late Line Trolley	1,383	$72,964	86	Late Line Trolley	1,383	$72,964	-	$0	
				87	Red Line Trolley	5,300	$279,575	5,300	$279,575	Red Trolley is added.
90	Crosstown	17,358	$1,326,133	90	Crosstown	10,752	$821,453	(6,606)	($504,680)	Route 90 is shortened and converted to an east/west route that operates between Knoxville Center and West Town Mall without going downtown.
#	Sutherland Ave.	-	$0	#	Sutherland Ave.	3,584	$273,818	3,584	$273,818	The Sutherland Ave. route replaces service eliminated on the south portion of Route 90A/B.
100	Halls Express	461	$35,233	100	Halls Express	461	$35,233	-	$0	

Table 6-1 (continued)
Service Hour and Operating Cost Impacts of Route Recommendations

Current				Future				Change		Comments
Route		Annual Service Hours	Annual Direct O&M Cost	Route		Annual Service Hours	Annual Direct O&M Cost	Annual Service Hours	Annual Direct O&M Cost	
101	Cedar Bluff Express	1,492	$113,977	101	Cedar Bluff Express	1,492	$113,977	-	$0	
102	Farragut Express	1,948	$148,824	102	Farragut Express	1,948	$148,824	-	$0	
	Total	212,934	$14,073,530		Total	215,947	$14,059,540	3,013	($13,990)	

Discontinued Routes			
87	Red Line Trolley	2,419	127,612.80
103	Oak Ridge Express	2,016	154,022.40
104	Dtwn/Oak Ridge Express	799	61,031.38
		218,168	14,416,196
vs. FY 2008 KAT Report		218,176	

TDP Next Steps

In August 2010, KAT is scheduled to open Knoxville Station, its new off-street transit center in downtown Knoxville. The move to the new station will involve the re-routing and scheduling of more than 20 routes. Concurrently, the TDP service recommendations, including regular service, neighborhood service, and trolley service routes, are also proposed for implementation. These combined activities will warrant a significant change in scheduling structure, likely resulting in new interlining strategies.

The move to Knoxville Station will be a complex and challenging process over the next 13 months. To ensure a successful move, a schedule of activities has been developed, as shown in Table 6-2.

Table 6-2
Timeline for Implementation of TDP Recommendations

2009	
July	■ Run all routes from TDP recommendation for timing and mileage
August	■ Design routes and schedules based upon KTA guidelines ■ KTA committee updates of progress
September	■ Cost analysis of routes and revisions
October	
November	■ Finalize route proposals ■ Run proposed routes to confirm viability
December	■ Prepare information for public and board
2010	
January	■ Schedule public meetings and outreach ■ Meet with all operators ■ Introduce routes to board
February	■ Public meetings ■ Schedule board workshop, if necessary
March	■ KTA public hearing
April	■ Final public meeting ■ KTA vote
May	■ Schedule revisions
June	■ Run cut
July	■ Run cut ■ Operator pick
August	■ Begin operations from Knoxville Station August 16, 2010

The schedule begins with a route-by-route analysis requiring the following steps:

1. Run all routes per the TDP recommendations in the appropriate vehicle (some with both bus and van to determine an average percent difference in run time) during peak congestion to determine run time and mileage, taking into consideration stop time, estimated number of stops, etc.

2. Using the running time analysis, develop interlining strategies for weekday (including evening), Saturday and Sunday service schedules that allow for prescribed layover and recovery times. Route streamlining will also be considered as an alternative to achieve desired running times where feasible.

3. Assess cost impacts of the proposed routes and revisions.

4. Finalize proposals, including interlines, based on KAT's fiscal constraints, and run all routes to confirm viability.

5. Compile route information for presentation to the KAT Board and public and make any final changes to the plan.

The remaining activities are standard processes that are engaged in a typical service change. It will be critical that KAT adhere to the recommended timeline to ensure the successful opening of Knoxville Station, as well as the multiple service changes that are scheduled to occur concurrently.

Beyond Knoxville Station

Following the opening of Knoxville Station, route adjustments should be held to a minimum for at least one year, to allow sufficient time for passengers to adjust to the changes and for ridership levels and patterns to mature. Regular service monitoring will be particularly important during this time period.

Future service changes will be largely dictated by passenger needs and revenue projections, including farebox revenues and federal, state, and local funding levels. Rather than route alignment adjustments, priorities for future service changes may include frequency improvements from hourly to half-hourly service on select routes, span of service expansion, and expansion of weekend service.

Additionally, the Downtown Transit Plan identified a possible future trolley route along Gay Street, connecting Broadway-Central Emory Place, historic Gay Street, and the Knoxville South Waterfront area. Timing and exact route alignment of this route will be dependent on the proposed reconstruction of the Henley Street bridge, as well as the proposed redevelopment of the South Waterfront.

7. Service Guidelines

The way KAT is organized currently many relatively minor route planning decisions must be approved by the Knoxville Transportation Authority (KTA) Board. It is recommended that the Board adopt a set of guidelines that will enable KAT staff to make minor route planning decisions without taking them to the Board. This will facilitate more efficient response to changing service situations and allow the Board to focus on larger issues. These guidelines are presented below.

Proposed Service Guidelines

- Routes should get to Knoxville Station efficiently, and time should be allowed to reach their particular bus bay (one to two minutes of total run time).
- All bus routes should have a five-minute layover at Knoxville Station (bus bay arrival time) to allow passengers to make transfers. This five-minute layover also acts as a buffer for on-time performance, in case a bus is delayed along the route.
- All bus routes longer than one hour and 15 minutes in run time should have an additional five-minute layover at the furthermost point of the route.
- The maximum headway for a bus is one hour. This should be the exception, rather than the rule.
- Average headways should be every 30 minutes. A goal for major corridor routes is every 15 minutes during peak.
- Eighty percent of transfers should be during the five-minute layover. No transfer wait should be longer than 15 minutes, although 30 minutes may be inevitable in some cases, given the current system. Currently, some 45-minute transfers exist.
- Routes should be as direct as possible with a schedule that is easy to understand.
- Routes should avoid loops and A/B/C sections.
- Any route carrying less than 50 percent of the systemwide average in passengers per hour should be considered for major restructuring or elimination, although any elimination would require the approval of the KTA Board.
- Routes carrying between 50 percent and 80 percent of the systemwide average in passengers per hour should be examined and possibly modified for improvement.

With the exception of elimination of parts or an entire route KAT staff should have the ability to execute these changes without formal Board approval. All appropriate public information actions should be taken with any proposed changes. In addition, impact on residents in the areas being changes should be assessed within the context of Environmental Justice.

8. Marketing Plan

KAT has embarked on an ambitious campaign to rebrand itself. The new KAT logo shown in Figure 8-1 has been rolled out and is accompanied by a new look for the KAT fleet (Figure 8-2). The green represents "green" and the new slogan "Ride for Change" is a double entendre referencing both the economic and environmental benefits of transit for riders and the community as a whole.

Figure 8-1
The New KAT

KAT is also in the process of seeing construction completed on its $29 million transit center that will be known as Knoxville Station on Church Street. The transition represents a major marketing opportunity as experienced recently by METRO in Akron, Ohio. METRO opened it new transit center near downtown in January 2009. The opening was extensively covered by the Media and included a wide range of activities. One of the focal points of the media (both local and national) since the METRO center opened has been the various "green" initiatives which include solar panels, geothermal wells, waterless urinals and other features. Like the METRO facility, the Knoxville Station facility has significant "green" characteristics which should be referenced as community benefits in KAT's various public communications.

Knoxville Station will also be a marketing opportunity to both current and potential KAT riders as KAT uses the media to publish information about new routes, how to use the transit center, and related matters. KAT's literature should reflect how the transit center will make using KAT easier, safer, and more fun. Features of the transit center such as wireless internet, an easy shuttle ride to downtown, and others should be prominent in anything printed about the center.

Figure 8-2
KAT Bus – A New Look and a New Slogan

KAT currently has very little funding available for marketing activities beyond printing of maps and schedules and related activity. In addition, KAT does not have a staff person solely devoted to marketing. Given the current budgetary climate, it is not recommended that a full time position be established. KAT's traditional marketing activities should be continued (including partnerships with Smart Trips and exploration of other "green" or alternative travel behavior programs. KAT should consider some non-traditional marketing initiatives such as a social networking internet site (Facebook, Twitter) that could be used to issue updates, email blasts to employers and government workers (if approval can be obtained) to help market KAT's services, and continuing to expand its website to offer assistance to riders and those nonriders who want to use KAT.

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9. Downtown Transit Plan

As part of the planning process for the TDP, an examination of downtown transit operations was conducted. The Downtown Transit Plan[1] is an important and fairly unique element of the KAT Transit Development Plan (TDP). KAT recognized, even before beginning a full TPD effort, that a downtown trolley study and bus routing analysis is needed to support the impending opening in 2010 of a new downtown transfer point, Knoxville Station. This report presents a Downtown Transit Plan that focuses on both the local/express fixed route and trolley route configurations. Conceived as a stand-alone document from the TDP, it focuses on KAT's existing route structure. It does not attempt to incorporate modifications to local and/or express routes outside the downtown area that are being contemplated as part of the TDP.

Trolley Recommendations

The downtown Knoxville trolley system has been in place since 1986 and has grown to serve downtown Knoxville, UT and its off-campus student housing, and the Fort Sanders neighborhood. Travel patterns have changed immensely over these past 20 years. Trolley service has been incrementally modified over this time period in response to these changing travel patterns.

KAT's trolley system serves a changing and different market from the local and express routes in the system. The market changes based on the time of day much more than the local routes serving downtown. In the morning and afternoon peak periods, trolleys are used to help downtown workers get from where they park, such as at the Coliseum Parking Garage, or from another bus route ending at the Downtown Transfer Point, to their work destinations. Downtown residents, such as people who live in Summit Towers and downtown apartment/condominium buildings, use the trolleys as then would any other bus route to get to work or shopping or to access other routes at the Downtown Transfer Point. During the midday, trolleys are used for quick trips to lunch or on personal errands. Throughout the day, trolleys may be used by visitors to get to tourist destinations or convention facilities. UT students, faculty, and staff also make use of the trolleys to travel between UT and Fort Sanders, downtown UT facilities, and downtown entertainment venues.

KAT's trolley system currently consists of four routes. Each of these routes is briefly described below.

- Route 80 – Blue Line: This trolley route operates from the Coliseum Parking Garage and connects the core of downtown south of Clinch Avenue, including the Downtown Transfer Point, and the attractions surrounding the Knoxville Civic Coliseum. It operates year-round on weekdays.

[1] Downtown Transit Plan Technical Memorandum, prepared for Knoxville Knox County Metropolitan Planning Commission, prepared by Connetics Transportation Group, subconsultant to The Corradino Group for the Transit Development Plan, prepared May 2009.

- Route 82 – Orange Line: This trolley route operates from the Downtown Transfer Point and connects downtown and the UT area along Cumberland Avenue. It operates year-round on weekdays.

- Route 84 – Green Line: This trolley route operates from UT's student center and connects the UT campus, the Cumberland Avenue Strip, and the off-campus housing and hospital in the Fort Sanders neighborhood. This route operates on weekdays during UT's Fall and Spring Semesters.

- Route 86 – Late Line: This route operates from the Historic Old City district and connects the restaurants and entertainment venues there with the downtown and UT. It operates on Friday and Saturday nights during UT's fall and spring semesters.

This section presents recommendations for KAT's trolley routes. Changes to the current system are proposed to address connections to Knoxville Station, respond to findings from the ridecheck survey and public comments, and better structure the trolley routes to serve as downtown circulators.

As discussed in the Downtown Transit Plan Technical Memorandum,[2] a trolley stop on Church Avenue near the main entrance is part of the Knoxville Station design. Proposed trolley routes serving the station have been designed to travel westbound on Church Avenue, so that all station boardings and alightings take place at the trolley stop. Three access movements have been identified as follows:

- Westbound on Howard Baker/Church Avenue from the Civic Coliseum area;
- Northbound on Hall of Fame Drive and westbound on Church Avenue; and,
- Southbound on Hall of Fame Drive and westbound on Church Avenue.

The downtown core has been defined in previous studies as being bounded by Interstate 40 on the north, the Civic Coliseum area on the east, the Tennessee River on the south, and Henley Street on the west. The preferred alternative discussed in the previous chapter would restructure local bus service to serve Knoxville Station and significantly reduce the level of local service within Knoxville's traditional downtown area. Thus, the trolleys will need to play a larger role as transit circulators in the downtown core once KAT's main transfer point moves from Main Street to Knoxville Station.

Circulator type transit services are those designed to complement the regular local bus network by featuring specialized services to smaller markets. Most circulator services are designed to connect to one or more transit centers where passengers can transfer to local transit services.

Fixed route circulators are differentiated from the regular local bus network by their configuration and purpose. The routes are generally shorter than regular route services and are non-linear, connecting multiple origins and destinations in the localized area and penetrating into the activity area where regular local routes often cannot physically travel. Often, smaller buses or vans are used to provide this degree of penetration and accessibility. Headways are frequent to ensure that the service is convenient to use, especially for midday trips among workers. Fares for these services are kept low to increase attractiveness and may be subsidized by employers or retail establishments.

[2] Ibid.

With short headways and running times and competitive pricing, these services are attractive alternatives to the short automobile trip with which they compete.

The current KAT trolley routings are proposed to be modified as shown in Figures 9-1 and 9-2. With the exception of the Late Line Trolley and future Gay Street Trolley, these routes would serve Knoxville Station and provide for timed transfers between local routes and the trolley routes.

Two issues should be noted. The work for the redesign included efforts to simplify the trolley route structure with a relatively simple east/west and north/south grid. The plan includes a grid like extension south of downtown via the Henley Street bridge as part of future trolley expansion. The overall design has been simplified but maintains some of its current features because of the network of one-way streets and other issues that exist in downtown. A second point of emphasis is that the route design emphasizes frequent service between Knoxville Station and downtown. Over the years the city examined multiple locations for the transit center and at least three locations in the core of downtown were given serious consideration, including preliminary engineering work. For a variety of reasons, each of these locations was eventually eliminated. Upon the selection of the Church Avenue site many people voiced concern about the location not being on the west side of the Church Street bridge. People also were concerned that, as currently scheduled, the trolley would not be operating during the evening hours while the transit center operates. During the public participation process, a commitment was made to provide frequent trolley service connecting the transfer center with downtown.

The cost to expand trolleys service to match that of the hours the Knoxville Station are open or to provide more frequent service throughout the day were not included in this report.

The trolley routing will undergo further review, including public meetings in early 2010. Therefore, further changes to the service could occur.

Figure 9-1
Proposed Weekday
Trolley Routes

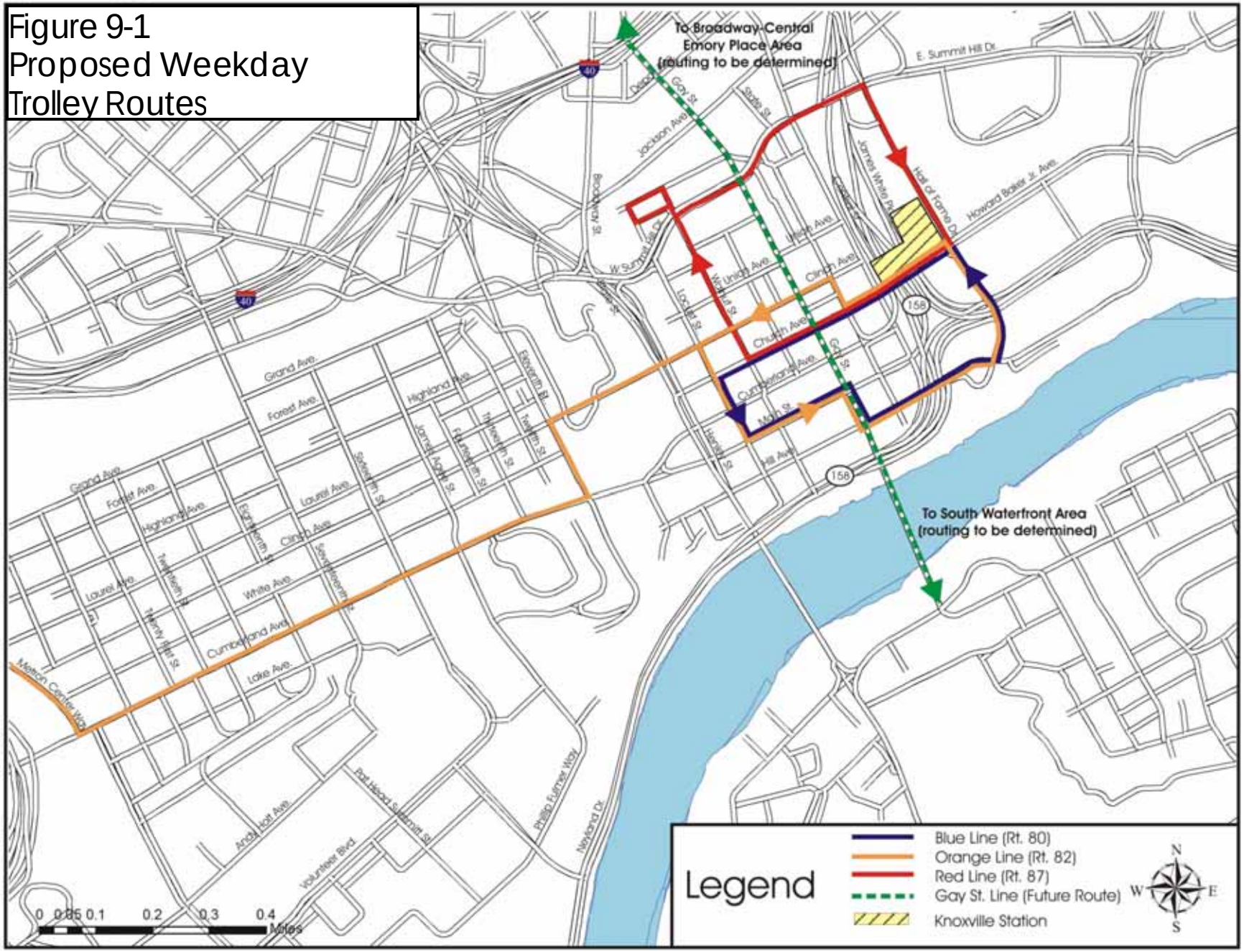
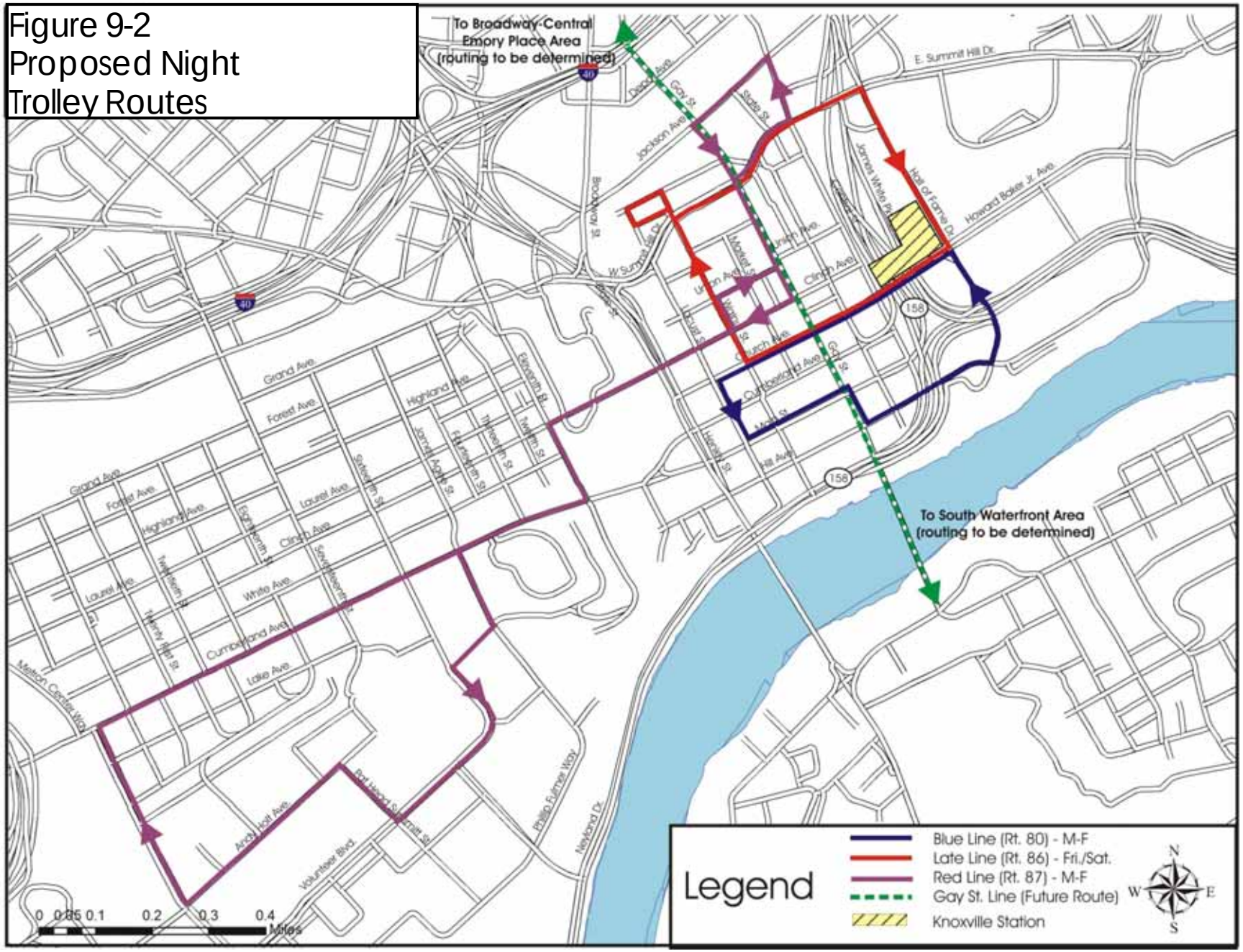


Figure 9-2
Proposed Night
Trolley Routes



Downtown Fixed-Route Operational Recommendations

Knoxville Area Transit (KAT) currently operates fixed route bus operations within downtown Knoxville to and from the Downtown Transfer Point located along Main Street between Locust Street and Gay Street, primarily in front of the City County Building. Amenities at the existing Downtown Transfer Point are limited, and consist of several covered shelters along the south side of Main Street. Buses operate on Main Street in mixed traffic and load and unload passengers along the curb.

KAT moved its on-street transfer operations to this location in 2004 after the Market Street Garage was constructed. However, it was never intended to be KAT's permanent downtown transfer point location, due to operational problems and potential safety hazards. Studies had been underway since the early 1990s to identify an appropriate site for a permanent central transit center that would house passenger waiting and transfer facilities for existing and future buses. These efforts are now coming to fruition with the construction of Knoxville Station on Church Avenue above the James White Parkway.

Bus service to and from the Downtown Transfer Point is currently operated using a pulse schedule with buses departing and arriving every 15 minutes throughout the day. Buses depart the Downtown Transfer Point on the hour (:00), quarter past the hour (:15), half past the hour (:30) and quarter to the hour (:45). Most inbound buses do not have layover time at the Downtown Transfer Point, allowing very little time for patrons to transfer between buses.

Several alternatives were examined. These included an alternative that routed the buses around downtown to the extent possible, an alternative that functioned much like the system does today, and finally a third alternative that combined elements of both.

After reviewing the alternatives presented above, City of Knoxville, TPO, and KAT staff indicated a preference for Alternative B-1[3] with some modifications, as shown in Figure 9-3.

The recommended modifications to Alternative B-1 are as follows:

- Keep buses off of Gay Street to the greatest extent possible. To accomplish this, two of the routes from the northwest would access Knoxville Station via Summit Hill Drive and Hall of Fame Drive. As shown in Figure 9-4, buses currently coming into downtown from the north on Gay Street would be rerouted in the vicinity of the I-40 and James White Parkway interchange to Hall of Fame Drive. Similarly, routes from the west coming into downtown via Cumberland Avenue (i.e., Routes 10, 11, and 90) would turn south on Gay Street and access Knoxville Station via Hill Avenue and Hall of Fame Drive.

- Maintain some east-west coverage through the center of downtown via Church Avenue and Clinch Avenue to provide direct access to destinations in this area. To avoid having large buses pass by First Presbyterian Church on Church Avenue, the three routes providing this "through service" are ones which use small 20-passengers vehicles and do not operate on

[3] Please refer to Technical Memorandum: Downtown Transit Plan, prepared for the Knoxville Knox County Metropolitan Planning Commission by Connetics Transportation Group (subconsultant to The Corradino Group) for detail on the downtown routing alternatives.

Sundays. Route 42 would utilize Clinch Avenue westbound and Church Avenue eastbound, while Route 13 and 21 would utilize Church Avenue in both directions through downtown. Westbound, Route 42 would avoid Gay Street by turning north onto State Street and west onto Church Avenue. Northbound and southbound, Routes 13 and 21 would operate on Walnut Street and Locust Street, respectively.

With this preferred configuration, Knoxville Station access/egress for these local routes would be as follows.

- Routes 13 and 21 from the northwest and Route 42 from the west:
  - Access – Left turn from Church Avenue into Knoxville Station; and,
  - Egress – Right turn from Knoxville Station onto Hall of Fame Drive and right turn onto Church Avenue.

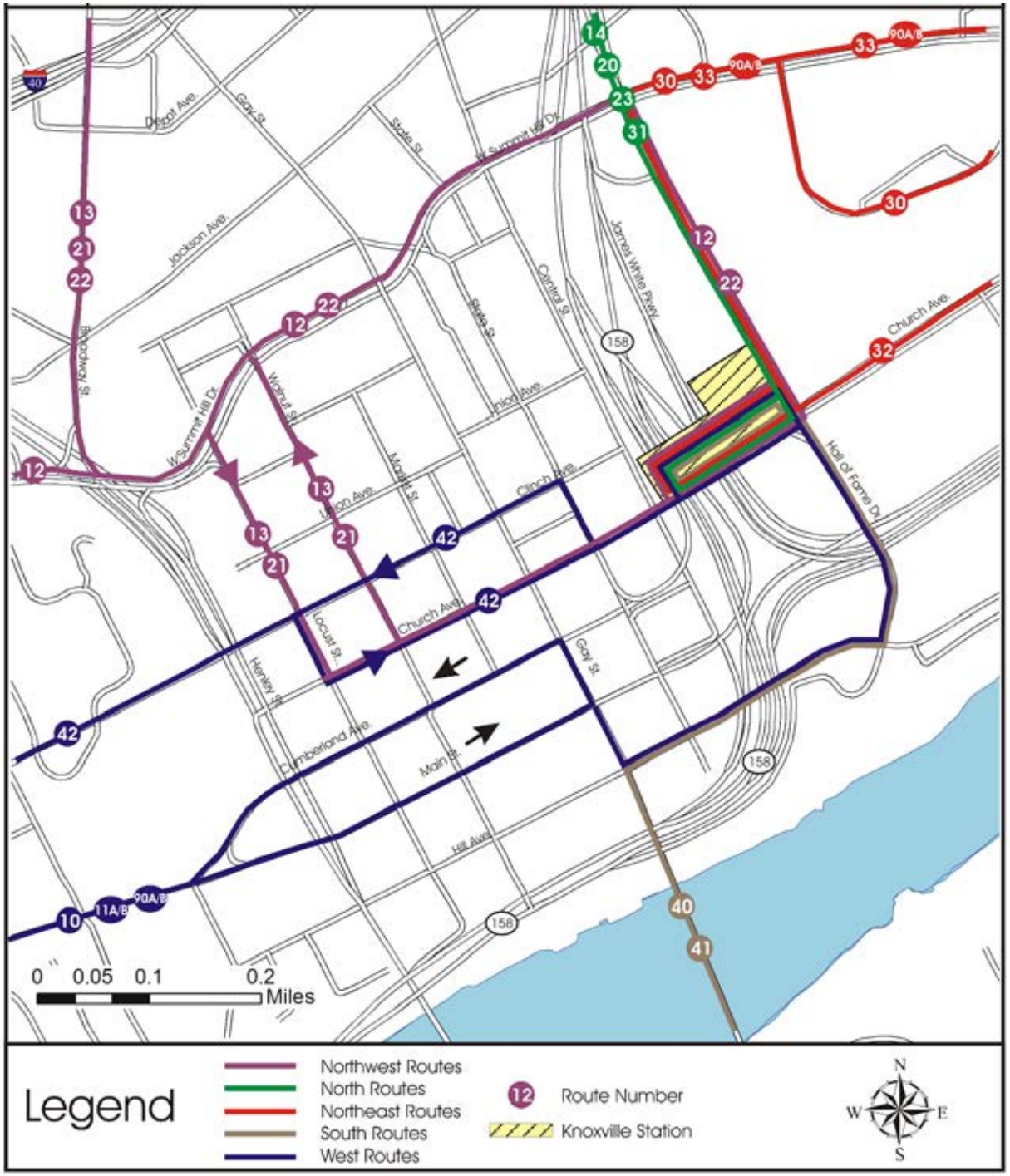
- Routes 12 and 22 from the northwest, Routes 14, 20, 23, and 31 from the north, and Routes 30, 33, and 90 from the northeast:
  - Access – Right turn from Hall of Fame Drive into Knoxville Station; and,
  - Egress – Left turn from Knoxville Station onto Church Avenue and left turn onto Hall of Fame Drive.

- Routes 10, 11, and 90 from the west and Routes 40 and 41 from the south:
  - Access – Left turn from Hall of Fame Drive onto Church Avenue and right turn into Knoxville Station; and,
  - Egress – Right turn from Knoxville Station onto Hall of Fame Drive.

- Route 32 from the northeast:
  - Access – Right turn from Church Avenue into Knoxville Station; and,
  - Egress – Right turn from Knoxville Station onto Hall of Fame Drive and left turn onto Howard Baker Avenue or left turn from Knoxville Station onto Church Avenue.

Further evaluation of the routes is underway. The consultant is assisting in the timing, modification, and interlining of the routes. Plus, all routes will undergo further scrutiny during public meetings in early 2010. Therefore, recommendations in this report may be modified.

Figure 9-3
Proposed Local Route Bus Patterns
Weekday Service



10. Corridor Analysis

As part of the Transit Development Plan planning process, the consultant team was asked by the Knoxville Knox County Metropolitan Planning Commission to review the potential of various transportation corridors in Knoxville for high capacity transit. Several studies in recent years have focused on possible regional rail service and previous studies have identified corridors where increased frequencies for bus service were recommended. Technical Memorandum 3[4] was prepared to evaluate these corridors and is summarized in this chapter. In addition, the chapter concludes with an overview of the federal funding programs that likely would be most appropriate for Knoxville.

The purpose of this task was to identify transportation corridors in the Knoxville Area that would be most suitable for the implementation of fixed-guideway, high capacity (rail or bus rapid transit) service and for Transit Oriented Development (TOD) to support higher capacity transit service. Transit oriented development (TOD) is mixed use, compact development that is meant to favor pedestrians and transit over automobile use. It includes a mix of housing, commercial office, retail, entertainment and even light industrial uses in a compact package that balances transit, auto, pedestrian and bicycle use.

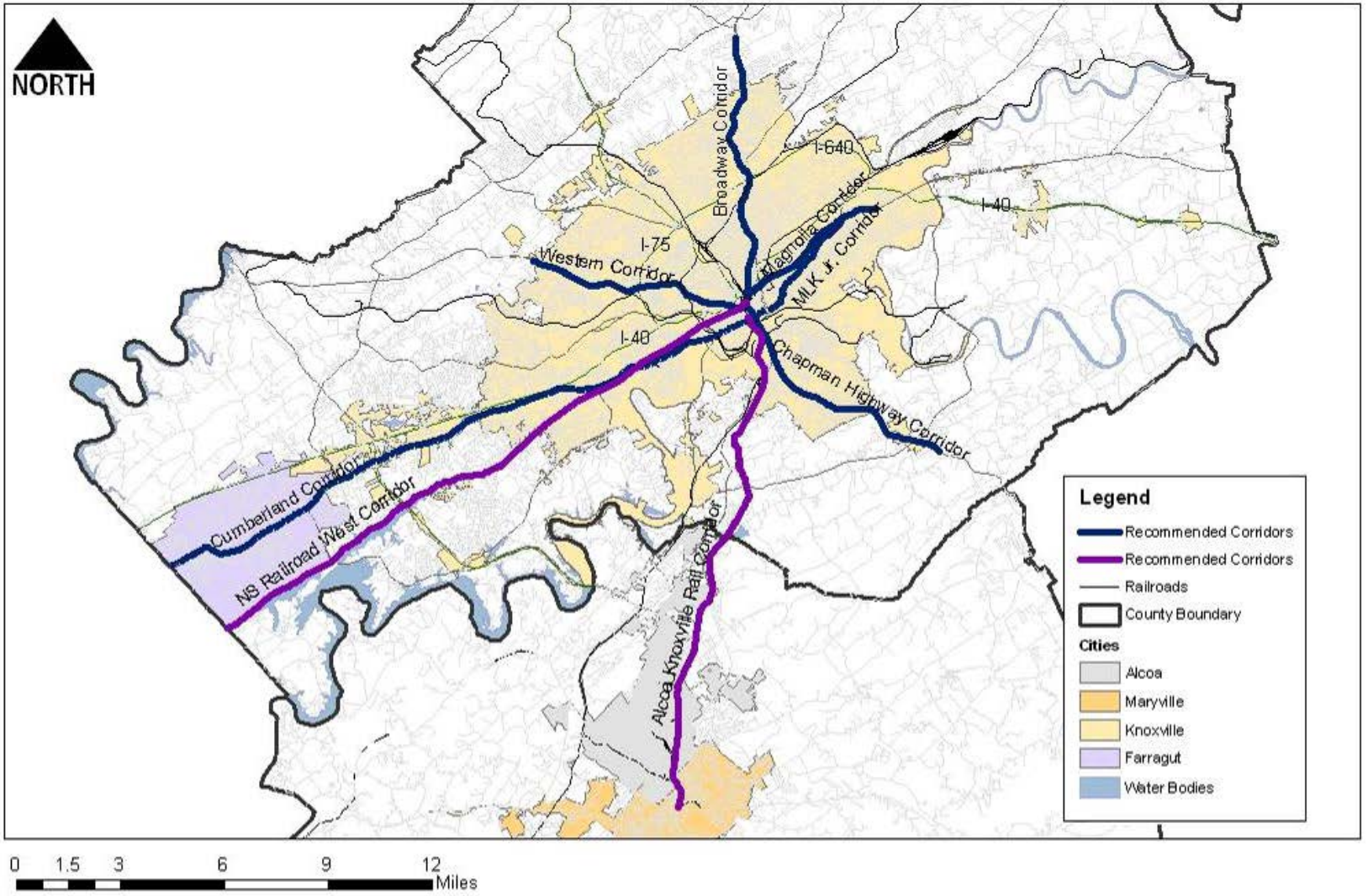
A series of factors were analyzed to determine the most likely corridors for TOD and supporting higher frequency transit. Factors included: existing transit service performance and characteristics; existing land use; population and employment density; ability to provide a connection between downtown and emerging areas such as South Waterfront, Cherokee Farms, and Cumberland Avenue; prevalence of sidewalks/trails; ridership on existing transit routes; and, general commuting patterns.

Based on the analysis, several corridors were identified as having the greatest potential for increased transit and TOD. Figure 10-1 shows the locations of these corridors. These corridors include:

1. Cumberland Avenue Corridor;
2. Norfolk Southern Railroad West Corridor;
3. Western Avenue Corridor;
4. North Broadway Street Corridor;
5. Magnolia Avenue Corridor
6. Martin Luther King, Jr. (MLK) Avenue Corridor;
7. Chapman Highway-James White Parkway; and,
8. Alcoa-Knoxville Rail Corridor.

[4] Technical Memorandum 3: Corridor Analysis, prepared for the Knoxville Knox County Metropolitan Planning Commission, prepared by PB Americas a subconsultant to The Corradino Group on the Transit Development Plan.

Figure 10-1
Corridors with Greatest Potential for High Capacity Transit



Two evaluation matrices were prepared for the eight corridors assessed: one for both quantitative and qualitative issues. Those matrices are shown in Tables 10-1 and 10-2, respectively. The matrices summarize the relative merits of the corridors examined.

Based on the analysis, the Cumberland Avenue alignment has the greatest potential for enhanced transit service to facilitate transit oriented development, particularly in the area of the corridor east of Alcoa Highway. The corridor connects directly to downtown Knoxville, serves the densely populated University of Tennessee area and could facilitate further TOD development in that corridor. The Cumberland corridor has fewer obstacles to service development than many of the other corridors and has high transit ridership on existing routes. The corridor would allow easy connections to the proposed Cherokee Farms development. The major challenges to the corridor come in the residential areas west of Alcoa Highway, as well as the current development plan for the corridor, which proposes to reconstruct the roadway with one fewer lane in each direction, with the lanes replaced by parking and streetscape improvements. These improvements would improve the quality of the streetscape in the corridor but would preclude development of premium transit service in the corridor.

Magnolia Avenue has high existing transit ridership, high residential and employment densities, and a relatively flat alignment over its western areas nearer to downtown. Perhaps most importantly, the wide right of way on Magnolia would make implementation of premium transit service in the corridor relatively simple. Magnolia's connection to downtown is indirect but the connection to the downtown transit center is adequate. This corridor would make an excellent location for transit improvements, either instead of or in addition to improvements along Cumberland Avenue. Martin Luther King Avenue, which runs approximately parallel to Magnolia, is also a viable option and would allow for significant redevelopment of under-utilized property in the corridor.

Western Avenue also has relatively high transit ridership and higher than average population and employment density. The connection to downtown via Summit Hill Drive is good. The terrain of some of the surrounding areas could make development/redevelopment difficult.

Most of the other corridors that were examined have multiple flaws or issues that would make them less desirable choices for development of premium transit service. Most of the other corridors have significantly lower population and employment densities and existing transit ridership. Several of the corridors – particularly the rail corridors to the south – are not served by existing transit service, making it difficult to determine the potential market for upgraded transit service. In these corridors, implementation of express or local bus service would be an important first step in developing the corridors as potential sites for premium bus or rail transit. A number of the other corridors have issues relating to the rugged terrain that surrounds downtown Knoxville, that would it difficult to develop rail lines, or to develop the critical higher-density housing, commercial and mixed-use development that would be necessary to support a major investment in a premium transit system.

Nationally, more emphasis is being placed on developing passenger rail corridors. Therefore, corridors in Knoxville should continue to be studied to determine future potential.

Table 10-1
Quantitative Evaluation Table

Corridor	Guideway Miles	Existing Annual Ridership		Average Population Density (people per square mile)	Average Employment Density (jobs per square mile)	Capital Cost Estimate	Annual Operations and Maintenance Cost Estimate
1. Cumberland Avenue/ Kingston Pike	15	Route 10 Route 11 A/B Route 50C Route 90 A/B	19,013 216,617 143,671 165,296	1,610	2,300	BRT Low – $84.3 million BRT High – $384.3 million LRT – $711.5 million	BRT - $1.9 million LRT - $3.7 million
2. Norfolk Southern Rail Corridor	N/A	Route 10 Route 11 A/B Route 50C Route 90 A/B	19,013 216,617 143,671 165,296	1,404	1,000	Commuter Rail – $12 million	Commuter Rail - $2.3 million
3. Western Avenue	16.6	Route 11 A Route 15 Route 101x Route 102x	216,617 3,133 11,371 19,960	2,200	2,100	BRT Low – $93.7 million BRT High – $425.7 million LRT – $730 million	BRT - $2.0 million LRT - $4.9 million
4. North Broadway Street	15.4	Route 22	172,591	1,830	2,100	BRT Low – $86.6 million BRT High – $394.6 million LRT – $399.1 million	BRT - $1.9 million LRT - $4.7 million
5. Martin Luther King Jr. Avenue	8.4	Route 31 Route 90 A/B	194,166 165,296	2,680	3,300	BRT Low – $47.5 million BRT High – $215.5 million LRT – $399.1 million	BRT - $1.0 million LRT - $2.5 million
6. Magnolia Avenue	9	Route 31 Route 90 A/B	78,971 92,555	2,600	2,400	BRT Low – $75.3 million BRT High – $343.3 million LRT – $634.8 million	BRT - $1.5 million LRT - $3.7 million
7. Chapman Highway/ James White Parkway	13.4	Route 40 A/B Route 41	78,971 92,555	1,000	1,400	BRT Low – $95.7 million BRT High – $435.7 million LRT – $806.6 million	BRT - $2.0 million LRT - $4.9 million
8. Alcoa-Knoxville Rail Corridor	N/A	Route 40 A/B	78,971	1,275	1,550	Commuter Rail – $24.3 million	Commuter Rail - $4.2 million

Table 10-2
Qualitative Evaluation Matrix

Corridor	Predominate Land Uses	Pedestrian Conditions	Connectivity to Downtown	Connectivity to South Waterfront Development	Connectivity to Cherokee Farms Development	Connectivity to Cumberland Avenue Corridor	TOD Potential
Cumberland Avenue/Kingston Pike	Mid-to-high density mixed use downtown and along Cumberland Avenue. Lower-to-mid density residential and commercial/retail along Kingston Pike	Sidewalks generally available in downtown and near downtown. Sidewalks intermittent or non-existent along outer portions of the corridor.	Excellent, connects directly to heart of downtown via Cumberland, Main Street	None	Yes	Yes	Cumberland east of Alcoa Highway has highest potential for TOD development. Occasional redevelopment and many infill opportunities west of Cherokee Country Club.
Cumberland Avenue/Kingston Pike Rail	Light to medium industrial uses between downtown and Third Creek, Low to mid density commercial between Third Creek and Morrell Road	Rail corridor has few areas for pedestrian access. The corridor is isolated, with either wooded areas or industrial uses lining most of the corridor length	Fair to poor, Connects north of downtown, approximately 0.5 miles from the heart of the central business district	None	Posible	Operates parallel to Cumberland Avenue, approximately 0.4 miles from the corridor	Some potential for TOD around downtown terminal Some redevelopment potential along corridor between Kingston Pike and Royal Crown Drive
Western Avenue	Industrial, public housing, cemetary near downtown. Underutilized land in retail section mid-corridor. Lower density beyond Hinton Road.	Sidewalks generally available in downtown and near downtown. Sidewalks intermittent or non-existent along outer portions of the corridor.	Good, connects to downtown via Summit Hill	None	None	None	Some redevelopment of public housing has occurred near downtown. Some potential for redevelopment of older commercial/retail centers, or infill development, is possible in mid corridor. Topography could limit redevelopment potential.
Broadway (North)	Industrial, institutional, cemetary and small-scale commercial near downtown. Some Infill occuring in this area. Lower density commercial/retail further north, with lower density housing behind retail, except in area between I-40 and I-640, which has some higher density areas.	Sidewalks generally available in downtown and near downtown. Sidewalks intermittent or non-existent along outer portions of the corridor.	Good to excellent, connects via Broadway	None	None	None	Some redevelopment potential in older neighborhoods, particularly in areas just north of downtown (south of I-640). Possible redevelopment or infill development north of I-640. Topography could limit development potential in northern portion of corridor.
Martin Luther King Avenue	Medium density light industrial and residential, including public housing, near downtown. Small single family houses, institutional and commercial further east. Many locations ripe for redevelopment. Density somewhat higher and more varied along Magnolia Avenue.	Sidewalks generally available throughout most of the corridor, intermittent or non-existent in short segment at north-eastern end.	Good, connects to downtown via Summit Hill	None	None	None	Significant redevelopment potential at under-utilized sites throughout corridor
Magnolia Avenue	Medium density light industrial and residential, including public housing, near downtown. Transitions to a mixed use corridor of single family homes and commerical development from Summit Hill to east end of corridor	Sidewalks generally available throughout corridor	Good, connects to downtown via Church Avenue	None	None	None	Some redevelopment potential at commercial sites throughout corridor
Chapman Highway	Suburban commercial corridor, with lower density commercial development to Sevier Hwy. Transitions to mostly rural development south of Sevier Highway	Sidewalks exist only along east side of Chapman between Tennessee River and Moody Avenue. There are few barriers of protection between pedestrians and traffic.	Good to excellent, connects directly to downtown via Henley Street bridge	Yes	None	None	Some redevelopment potential, especially between downtown and Sevier Hwy. Topography may limit the amount and type of development at some points
Chapman Highway+James White Pkwy	Suburban commercial corridor, with lower density commercial development to Sevier Hwy. Transitions to mostly rural development south of Sevier Highway	Sidewalks mostly do not exist along corridor south of Moody Avenue. James White Pkwy is limited access with no pedestrian access	Fair to Good, connects directly to downtown via James White Pkwy	None	None	None	Some redevelopment potential, especially between downtown and Sevier Hwy. Topography may limit the amount and type of development at some points
Alcoa/Knoxville Rail Corridor	Lower density suburban and rural residential development along most of the alignment. Land use intensity is greater at southern end of line in town of Alcoa.	Little or no pedestrian facilities or access.	Fair to good, could connect to downtown via rail alignment near World's Fair Park	Possible	None	None	TOD would require development of new towns around rail stations in corridor.

There appear to be two distinct possibilities for high capacity transit in Knoxville. One would be a commuter or light rail project using local funding or through a New Start process or Small Start federal funding process. A second option would be development of bus rapid transit either using local funding or funding through the federal government's Very Small Starts program. Corridors with average daily ridership over 3,000 riders per day can be eligible for this program, which is restricted to projects with an initial capital cost of less than $50 million. A good example of a Very Small Starts program is the Kansas City Max Bus Rapid Transit project. This is the type of system that could be appropriate for Cumberland Avenue because it mixes separate guideway operations and on-street operations (where right-of-way is not sufficient to allow a separate lane). Currently none of the corridors reviewed has average daily ridership over 3,000 riders but if a preferred corridor can be identified, strategies including increasing bus frequencies and encouraging transit-friendly land use and zoning policies would position Knoxville to begin a process of creating high capacity transit operations.


Cleveland Euclid Corridor Bus Rapid Transit Vehicle


Cleveland Euclid Corridor Bus Rapid Transit Station

The following discussion provides an overview of the current state of federal transit programming for high capacity transit projects focusing on Small Starts and Very Small Starts.

The significant difference between New Starts projects and Small Starts and Very Small Starts projects is the size, scope, and cost of the project. New Starts projects involve new fixed guide-way transit systems through new corridors, which immediately make these projects very expensive and therefore associated with significant risk in terms of the relationship between their cost and their actual community benefit. Small Starts projects, in comparison, are smaller in scope, and less expensive. Specifically, Small Starts grants are capped at $75 million with total project costs of no more than $250 million. While no specific grant cap is given for Very Small Starts, total project costs for these projects cannot be more than $50 million, suggesting that the grant itself cannot be more than approximately $40 million, or 80 percent of the total project cost. Given the smaller federal investment, the degree of FTA involvement and the threshold for demonstrating the cost effectiveness of the project is much lower for Small Starts, and actually presumed for Very Small Starts projects.


Kansas City MAX Bus Rapid Transit Vehicle

Table 10-3 contains the basic technical prerequisites for BRT projects to be considered as Small Starts or Very Small Starts. As the table shows, for the most part, the prerequisites between the two categories are the same, with the cost of the project being the primary distinction between the two. While there is a distinction between the two categories regarding transit stations, the basic service requirements of ten- to 15-minute headways for 14 hours a day, perhaps the most challenging operational criteria that must be met, are the same for either category. The Very Small Starts category must demonstrate at least 3,000 daily boarding in the proposed corridor, whereas Small Starts projects are subject to a more rigorous cost benefit analysis.

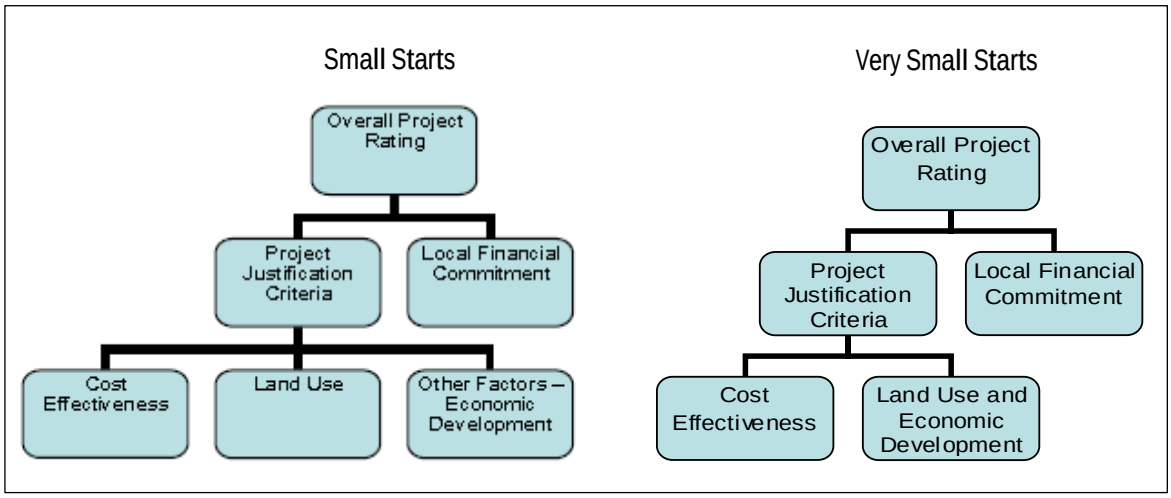
Kansas City MAX Bus Rapid Transit Station

Table 10-3
Technical Prerequisites

Small Starts	Very Small Starts
$250 maximum project cost/ $75 million maximum grant	$50 maximum project cost/less than $3 million per mile (not including cost of buses)
Substantial Transit Stations	Transit Stations
Signal Priority/Pre-emption	
Low Floor/Level Boarding Vehicles	
Special Branding of Service	
Frequent Service – ten-minute peak/15-minute off-peak headways	
Service offered at least 14 hours per day	
Demonstrated cost effectiveness in terms of user benefit	Existing corridor ridership exceeding 3,000 boardings per day

Figure 10-2, also provided by FTA, illustrates the basic structure for evaluating Small Start and Very Small Start projects. While the basic criteria categories are similar, the evaluation processes for each are different in one important way. While the criteria threshold for judging Small Starts projects is less than that for New Starts projects, Small Starts project still must perform the same basic evaluations for cost effectiveness, land use compatibility, economic development impacts, and local financial commitment as a part of their Alternatives Analysis in order to receive ratings in each category. These categories are *High, Medium-High, Medium, Medium-Low,* and *Low.* In order to be certified as a Small Start project and given approval to move forward to the project development phase, Small Start projects must receive an overall project rating of *medium*.

Figure 10-2
Evaluation Rating Structure



In contrast, due the small size of Very Small Starts projects, the FTA presumes that the project cost benefit, land-use compatibility, and economic development impact are neutral, and automatically assumes a medium rating for these projects. Further, as long as a Very Small Start project can demonstrate a legitimate local financial commitment, the FTA presumes a medium rating for this evaluation measure as well. The criteria for local financial commitment are:

- Funds are identified and available for the local share of the capital cost (at least 20 percent of total capital cost);
- The additional operating and maintenance costs of the project must be less than five percent of the agency's total operating budget; and,
- The agency is in reasonably good financial condition.

In essence, the FTA will automatically certify a project as a Very Small Starts project and allow it to proceed to the project development phase as long as it meets the technical prerequisites in Table 10-3 and can demonstrate the local financial commitment. In fact, FTA has identified these technical criteria for Very Small Starts because they ensure that projects produce "significant transportation benefits at a very low cost." Therefore, FTA has already determined that projects meeting these technical criteria are cost-effective and no further analysis is required. However, achieving the Very Small Starts designation does not imply a funding grant, but simply the ability to continue through the project development phase. Their funding will be determined primarily at the discretion of the administration and Congress as a part of the enactment of the President's budget.

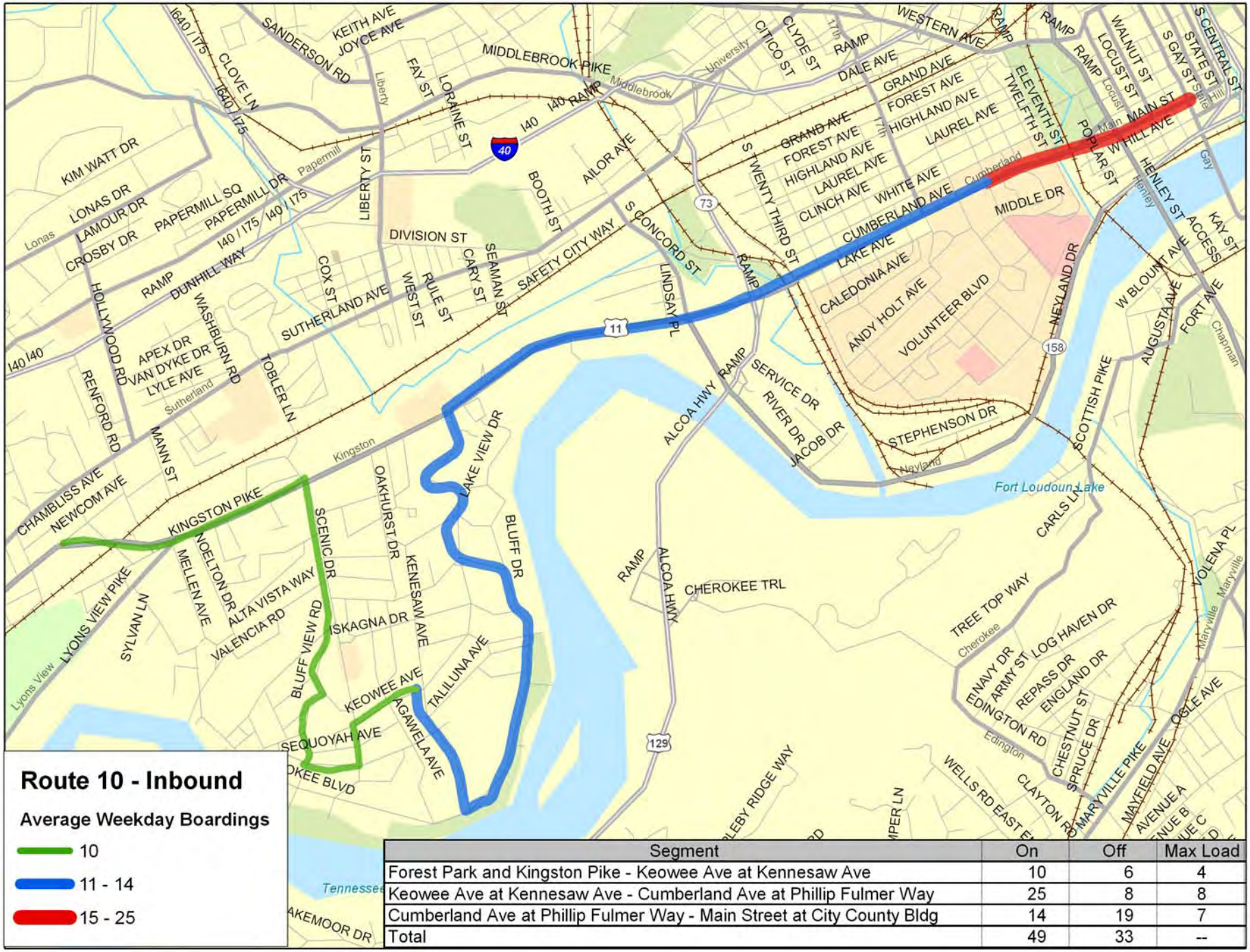
Once a project has been designated as Small Starts or Very Small Starts, the project enters into the project development phase, which combines both preliminary engineering and final design. During this phase, the FTA and project sponsor develop a financial assistance package. This package, referred to as the Project Construction Grant Agreement (PCGA), defines the project, including cost, scope, and schedule; establishes the maximum level of federal financial assistance; and, defines the terms and conditions of that assistance. However, firm funding commitments, embodied in the

PCGA, will not be made until the project's development and design has progressed to the point where its scope, costs, benefits, and impacts are considered firm and final.

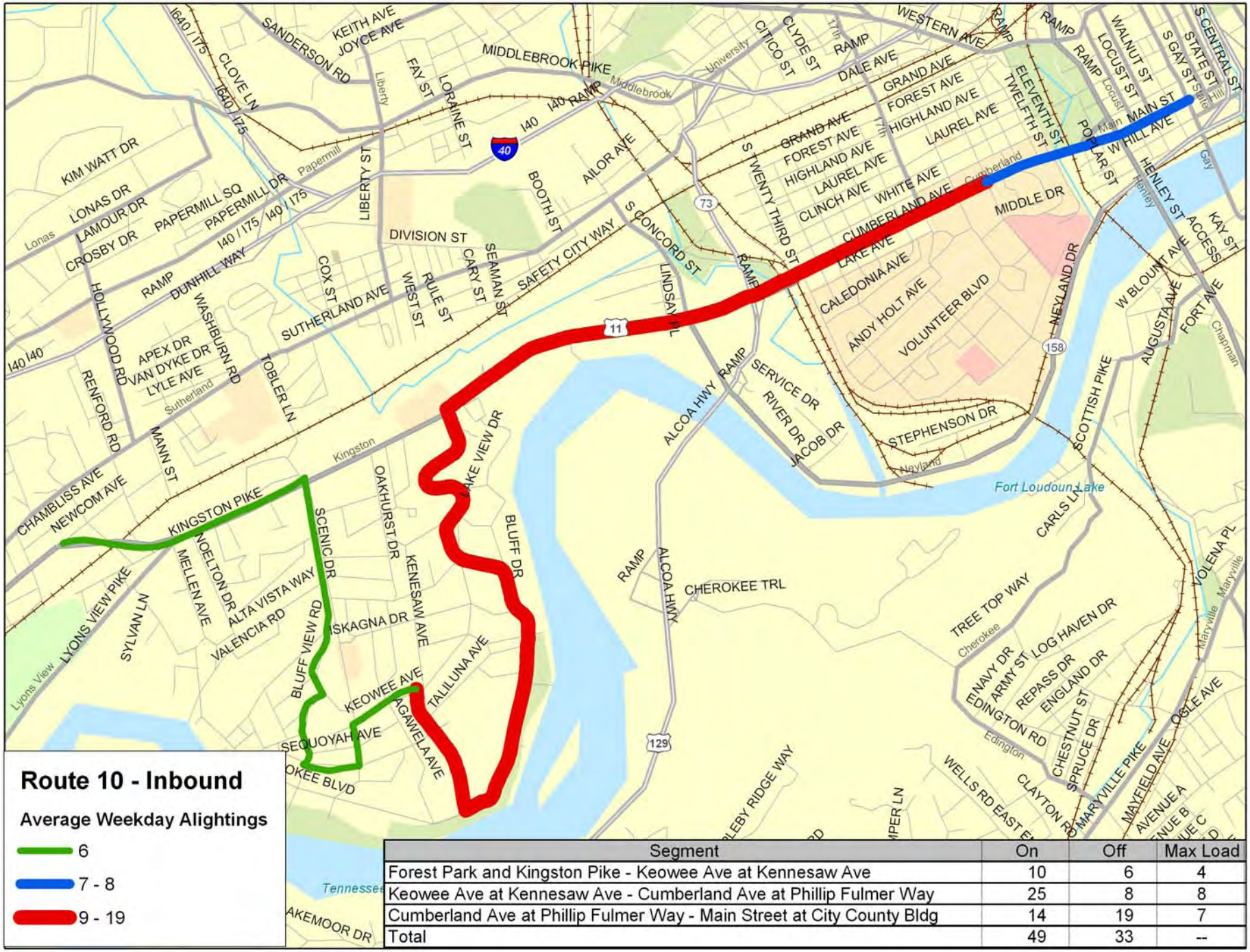
Small Starts projects must be ready to be implemented within the fiscal year that the project is recommended for funding and included in the President's budget, while Very Small Starts projects cannot be recommended funding until they are ready to be implemented. For almost all projects, specific funding recommendations and grants occur over several years, although projects with total costs under $25 million can be funded in one year. Again, as the Section 5309 grant program is discretionary, final decisions regarding which eligible projects are included in the President's enacted budget are made by the administration and Congress through the legislative process. A recommendation for funding in no way guarantees funding.

Appendix A

Fall 2008 Boarding and Alighting Survey

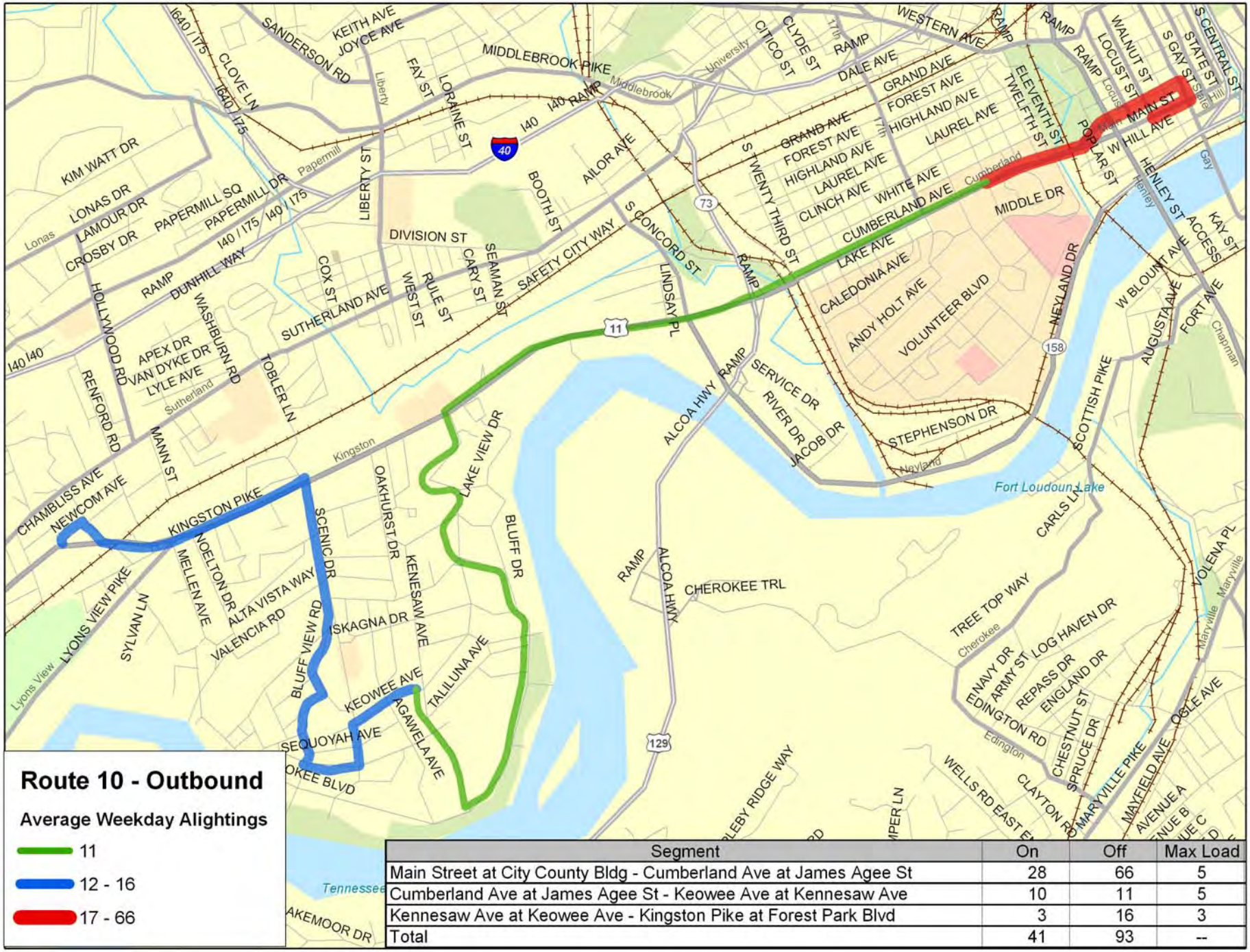


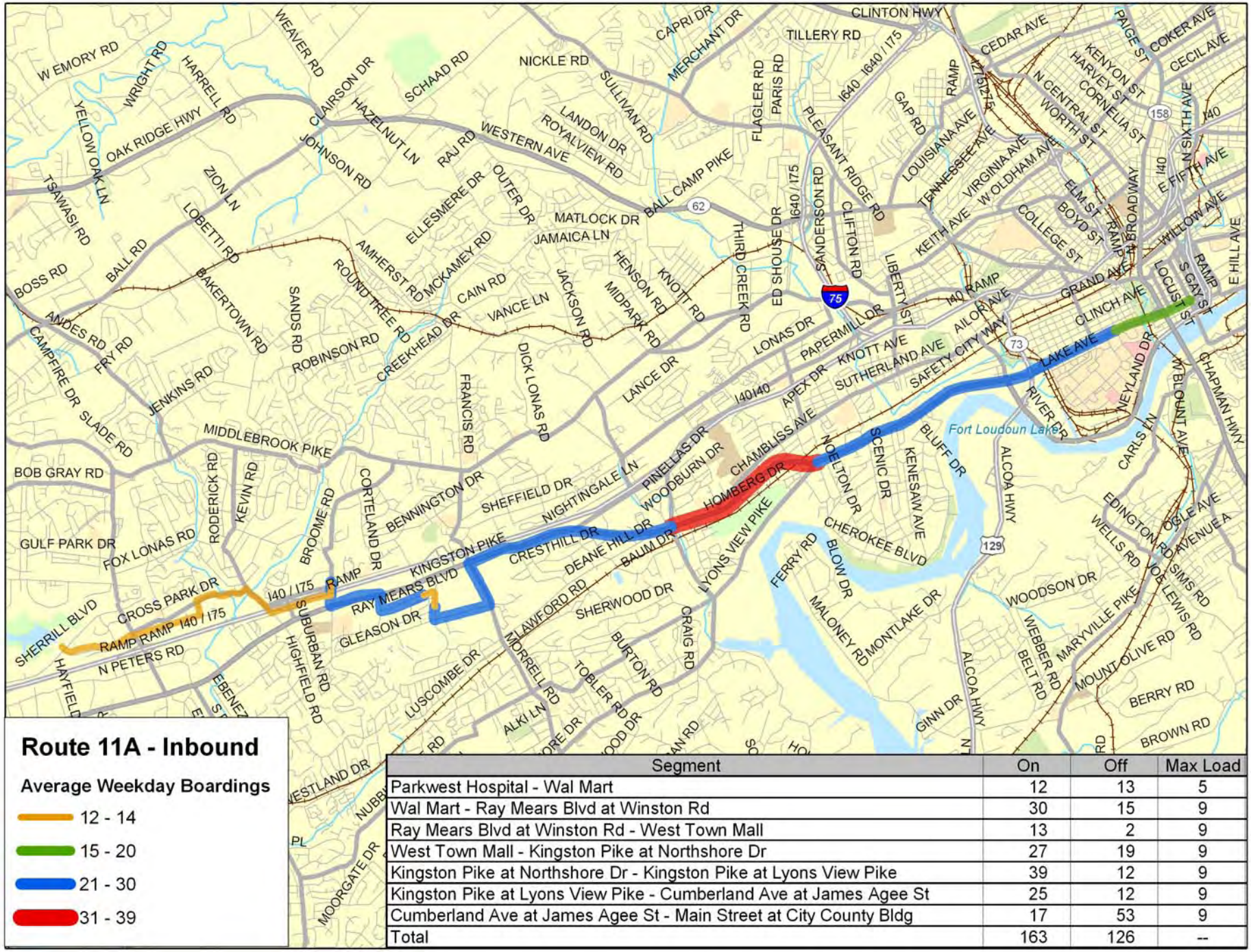
Segment	On	Off	Max Load
Forest Park and Kingston Pike - Keowee Ave at Kennesaw Ave	10	6	4
Keowee Ave at Kennesaw Ave - Cumberland Ave at Phillip Fulmer Way	25	8	8
Cumberland Ave at Phillip Fulmer Way - Main Street at City County Bldg	14	19	7
Total	49	33	--



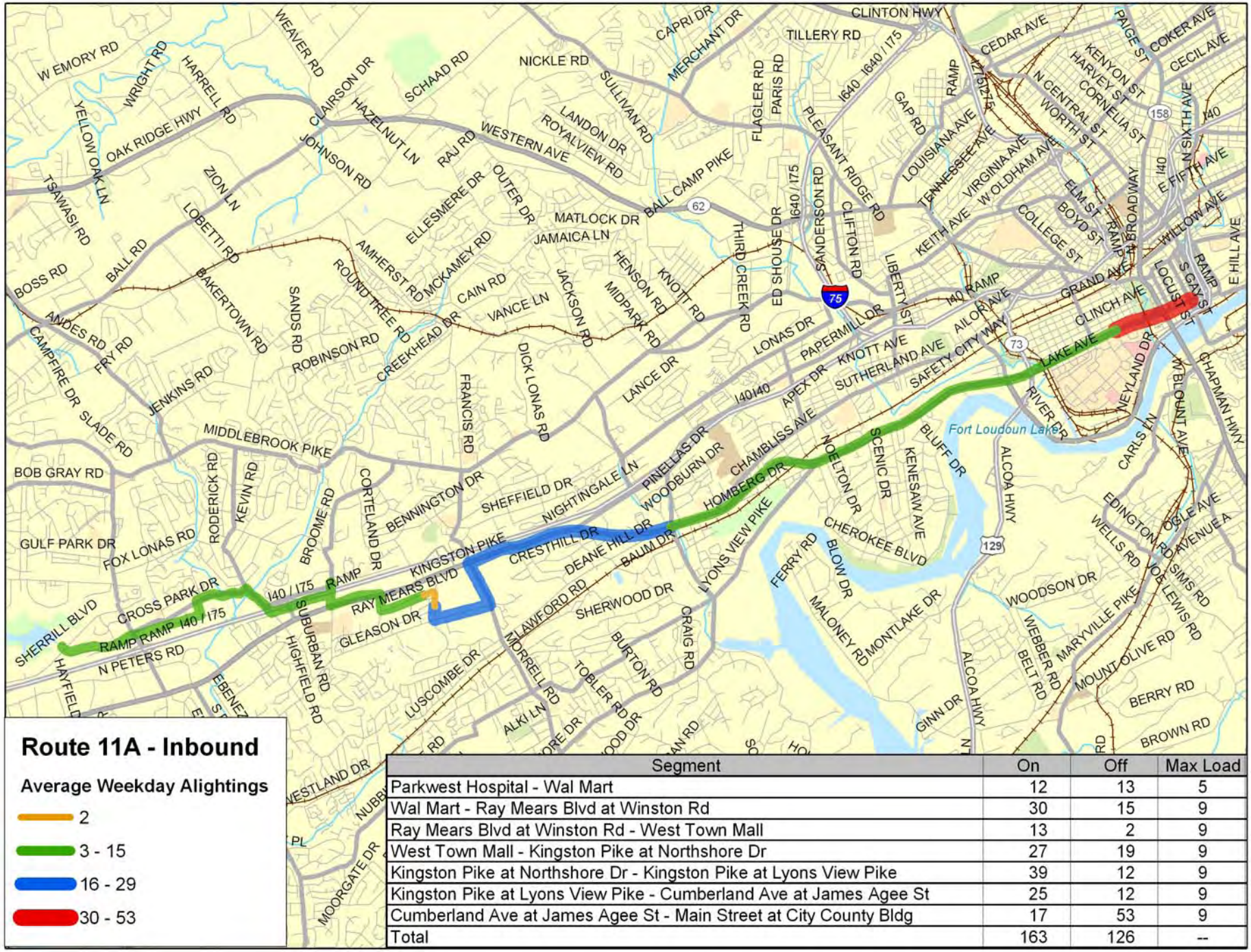
Segment	On	Off	Max Load
Forest Park and Kingston Pike - Keowee Ave at Kennesaw Ave	10	6	4
Keowee Ave at Kennesaw Ave - Cumberland Ave at Phillip Fulmer Way	25	8	8
Cumberland Ave at Phillip Fulmer Way - Main Street at City County Bldg	14	19	7
Total	49	33	--

Segment	On	Off	Max Load
Main Street at City County Bldg - Cumberland Ave at James Agee St	28	66	5
Cumberland Ave at James Agee St - Keowee Ave at Kennesaw Ave	10	11	5
Kennesaw Ave at Keowee Ave - Kingston Pike at Forest Park Blvd	3	16	3
Total	41	93	--

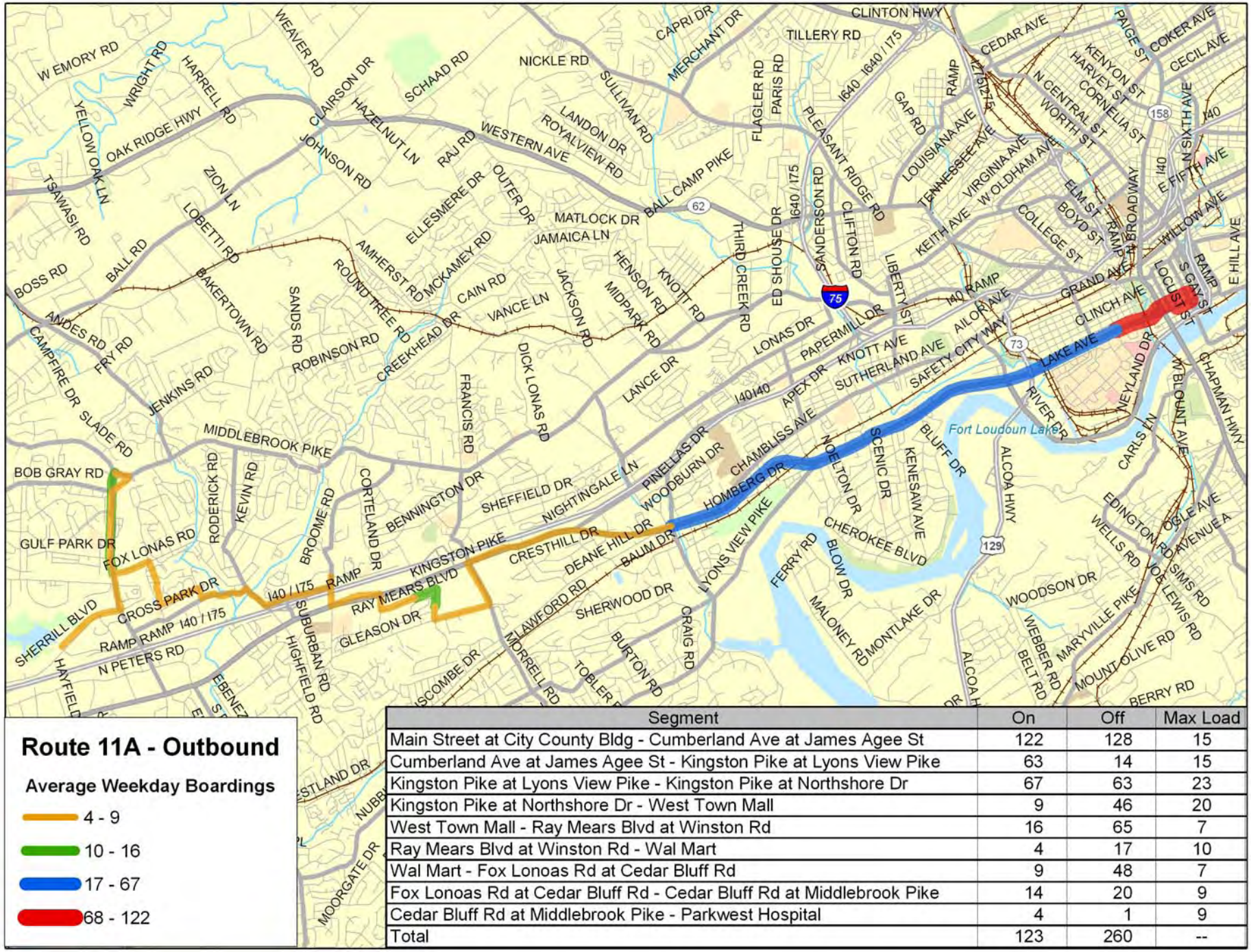

Route 10 - Outbound
Average Weekday Alightings
11
12 - 16
17 - 66
I640 / I75
CLOVE LN
SANDERSON RD
KEITH AVE
JOYCE AVE
MIDDLEBROOK PIKE
FAY ST
LORAINE ST
I40
I40 RAMP
CITICO ST
CLYDE ST
RAMP
DALE AVE
WESTERN AVE
GRAND AVE
FOREST AVE
HIGHLAND AVE
LAUREL AVE
CLINCH AVE
WHITE AVE
CUMBERLAND AVE
TWELFTH ST
ELEVENTH ST
S GAY ST
STATE ST
S CENTRAL ST
WALNUT ST
LOCUST ST
POPLAR ST
MAIN ST
W HILL AVE
HENLEY ST
ACCESS
KAY ST
KIM WATT DR
LONAS DR
LAMOUR DR
CROSBY DR
PAPERMILL SQ
PAPERMILL DR
I40 / I75
LIBERTY ST
BOOTH ST
AILOR AVE
DIVISION ST
S CONCORD ST
SAFETY CITY WAY
SEAMAN ST
CARY ST
RULE ST
WEST ST
COX ST
SUTHERLAND AVE
DUNHILL WAY
HOLLYWOOD RD
WASHBURN RD
APEX DR
VAN DYKE DR
LYLE AVE
TOBLER LN
RENFORD RD
MANN ST
CHAMBLISS AVE
NEWCOM AVE
KINGSTON PIKE
LYONS VIEW PIKE
SYLVAN LN
NOELTON DR
MELLEN AVE
ALTA VISTA WAY
VALENCIA RD
SCENIC DR
BLUFF VIEW RD
OAKHURST DR
KENESAW AVE
ISKAGNA DR
KEOWEE AVE
SEQUOYAH AVE
TALILUNA AVE
AGAWELA AVE
OKEE BLVD
LAKE VIEW DR
BLUFF DR
LINDSAY PL
ALCOA HWY
SERVICE DR
RIVER DR
JACOB DR
STEPHENSON DR
CHEROKEE TRL
LAKE AVE
CALEDONIA AVE
ANDY HOLT AVE
VOLUNTEER BLVD
MIDDLE DR
NEYLAND DR
W BLOUNT AVE
AUGUSTA AVE
FORT AVE
SCOTTISH PIKE
CARLS LN
Fort Loudoun Lake
TREE TOP WAY
LOG HAVEN DR
NAVY DR
ARMY ST
REPASS DR
ENGLAND DR
EDINGTON RD
CHESTNUT ST
SPRUCE DR
MARYVILLE PIKE
MAYFIELD AVE
OGLE AVE
VOLENA PL
AVENUE A
WELLS RD EAST
CLAYTON RD
CLEBY RIDGE WAY
Tennessee
AKEMOOR DR
Segment | On | Off | Max Load
Main Street at City County Bldg - Cumberland Ave at James Agee St | 28 | 66 | 5
Cumberland Ave at James Agee St - Keowee Ave at Kennesaw Ave | 10 | 11 | 5
Kennesaw Ave at Keowee Ave - Kingston Pike at Forest Park Blvd | 3 | 16 | 3
Total | 41 | 93 | --



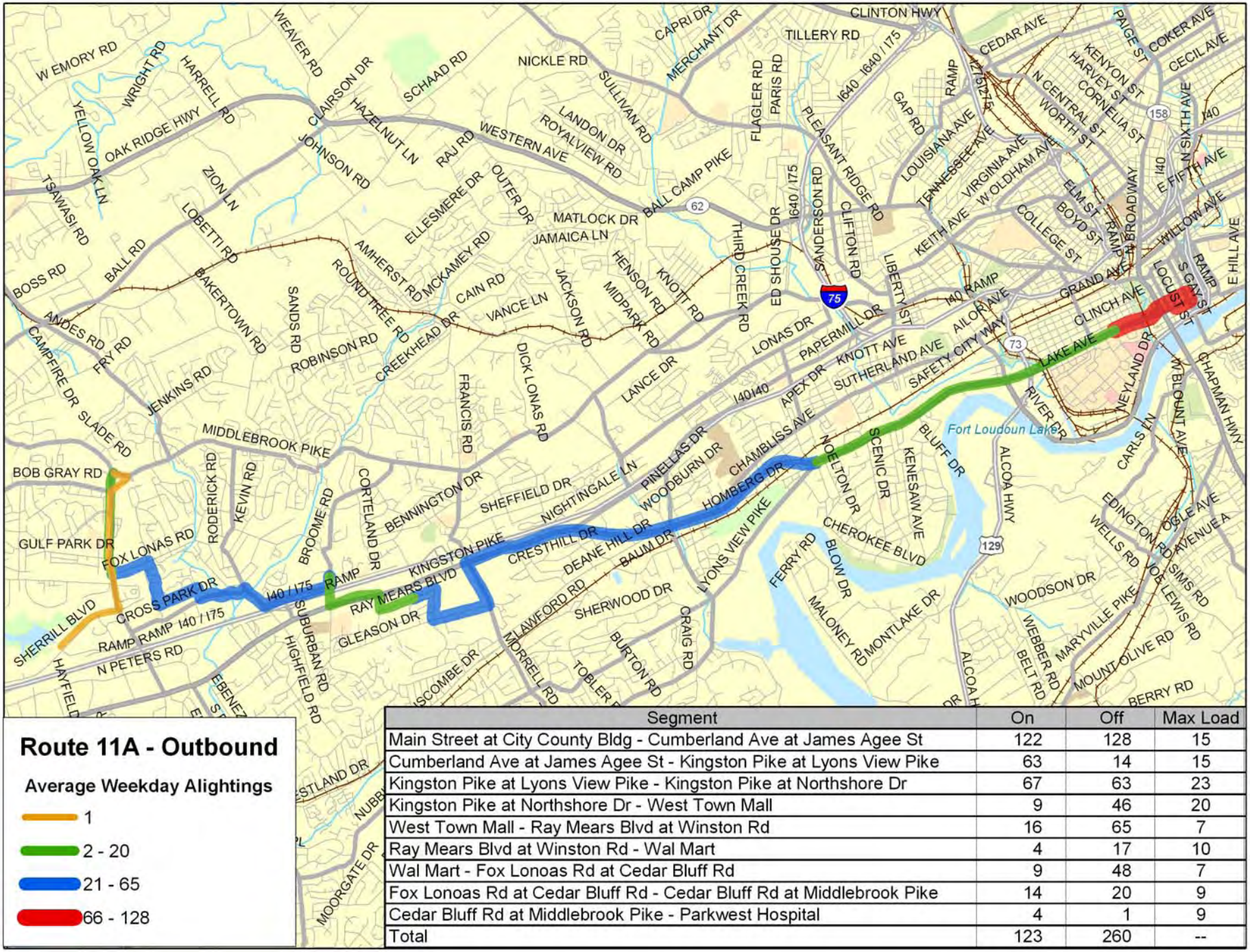
Segment	On	Off	Max Load
Parkwest Hospital - Wal Mart	12	13	5
Wal Mart - Ray Mears Blvd at Winston Rd	30	15	9
Ray Mears Blvd at Winston Rd - West Town Mall	13	2	9
West Town Mall - Kingston Pike at Northshore Dr	27	19	9
Kingston Pike at Northshore Dr - Kingston Pike at Lyons View Pike	39	12	9
Kingston Pike at Lyons View Pike - Cumberland Ave at James Agee St	25	12	9
Cumberland Ave at James Agee St - Main Street at City County Bldg	17	53	9
Total	163	126	--



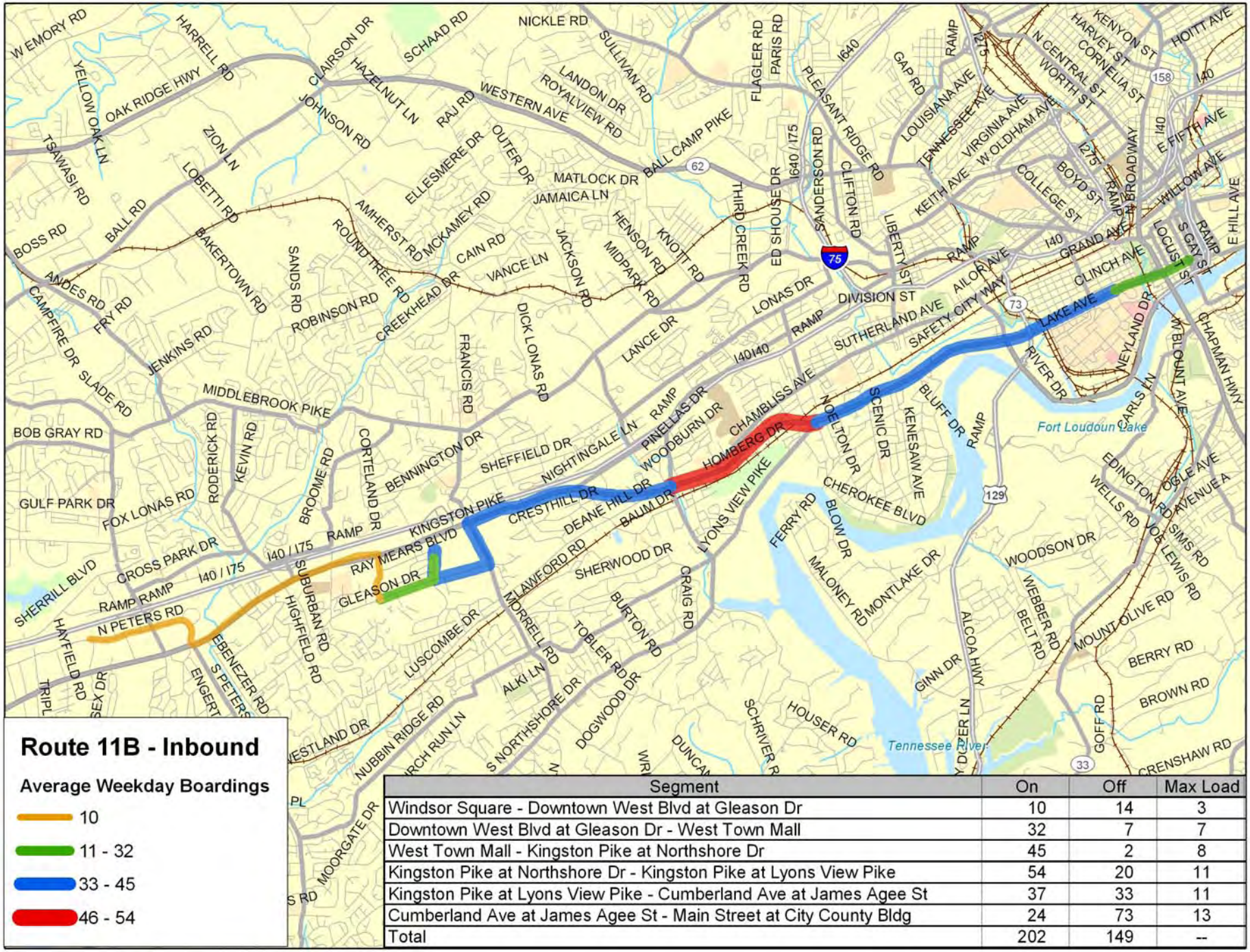
Segment	On	Off	Max Load
Parkwest Hospital - Wal Mart	12	13	5
Wal Mart - Ray Mears Blvd at Winston Rd	30	15	9
Ray Mears Blvd at Winston Rd - West Town Mall	13	2	9
West Town Mall - Kingston Pike at Northshore Dr	27	19	9
Kingston Pike at Northshore Dr - Kingston Pike at Lyons View Pike	39	12	9
Kingston Pike at Lyons View Pike - Cumberland Ave at James Agee St	25	12	9
Cumberland Ave at James Agee St - Main Street at City County Bldg	17	53	9
Total	163	126	--



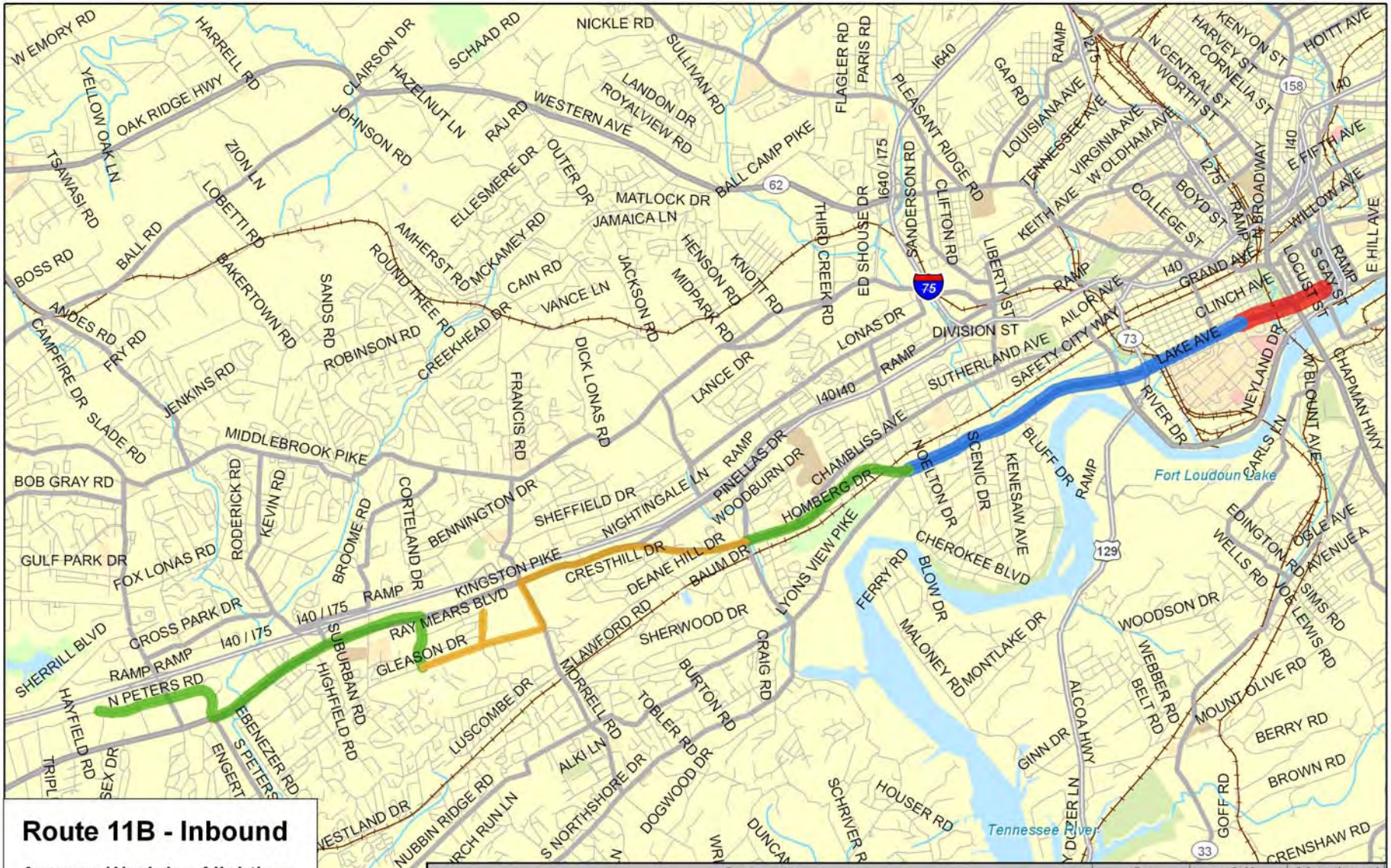
Segment	On	Off	Max Load
Main Street at City County Bldg - Cumberland Ave at James Agee St	122	128	15
Cumberland Ave at James Agee St - Kingston Pike at Lyons View Pike	63	14	15
Kingston Pike at Lyons View Pike - Kingston Pike at Northshore Dr	67	63	23
Kingston Pike at Northshore Dr - West Town Mall	9	46	20
West Town Mall - Ray Mears Blvd at Winston Rd	16	65	7
Ray Mears Blvd at Winston Rd - Wal Mart	4	17	10
Wal Mart - Fox Lonoas Rd at Cedar Bluff Rd	9	48	7
Fox Lonoas Rd at Cedar Bluff Rd - Cedar Bluff Rd at Middlebrook Pike	14	20	9
Cedar Bluff Rd at Middlebrook Pike - Parkwest Hospital	4	1	9
Total	123	260	--



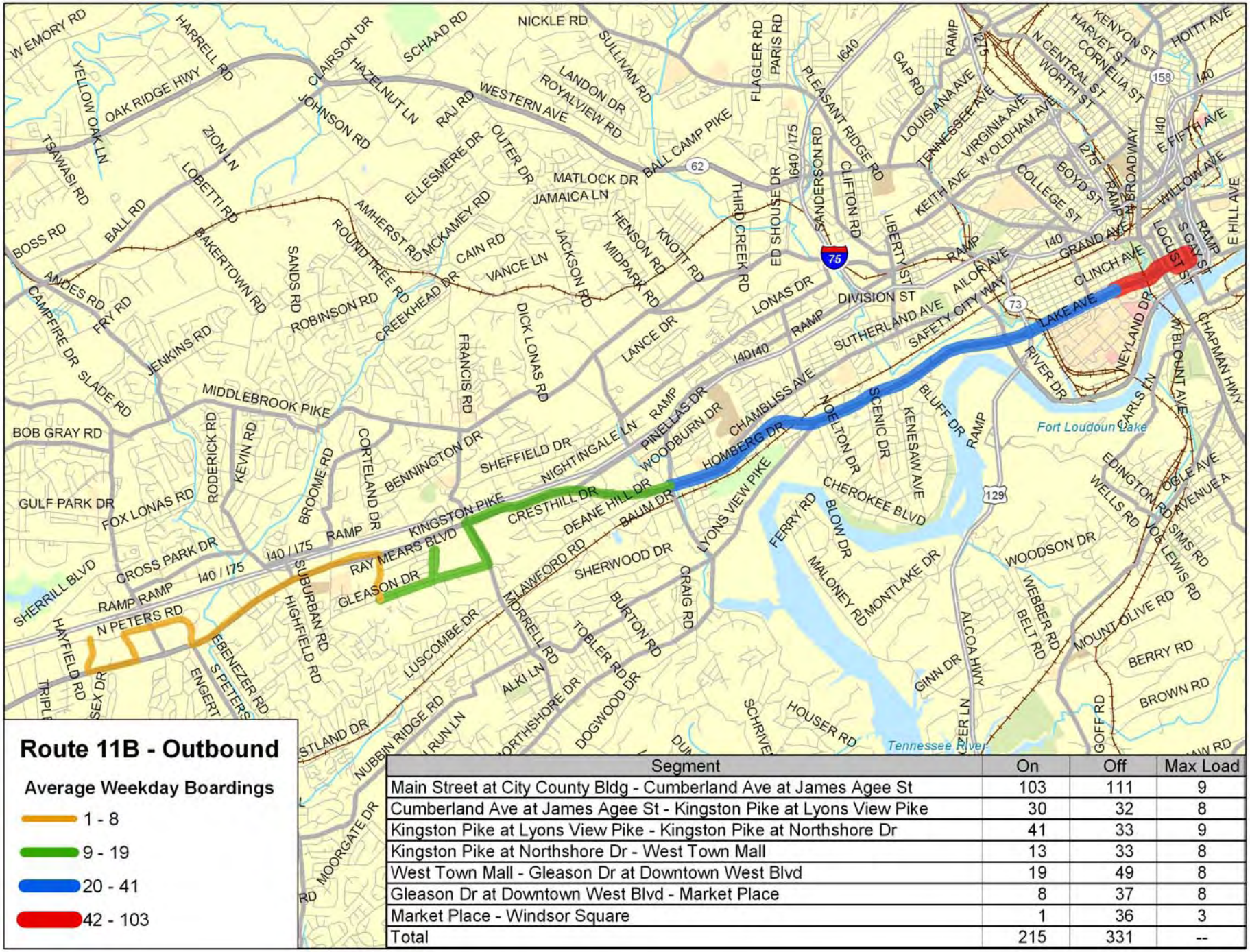
Segment	On	Off	Max Load
Main Street at City County Bldg - Cumberland Ave at James Agee St	122	128	15
Cumberland Ave at James Agee St - Kingston Pike at Lyons View Pike	63	14	15
Kingston Pike at Lyons View Pike - Kingston Pike at Northshore Dr	67	63	23
Kingston Pike at Northshore Dr - West Town Mall	9	46	20
West Town Mall - Ray Mears Blvd at Winston Rd	16	65	7
Ray Mears Blvd at Winston Rd - Wal Mart	4	17	10
Wal Mart - Fox Lonoas Rd at Cedar Bluff Rd	9	48	7
Fox Lonoas Rd at Cedar Bluff Rd - Cedar Bluff Rd at Middlebrook Pike	14	20	9
Cedar Bluff Rd at Middlebrook Pike - Parkwest Hospital	4	1	9
Total	123	260	--



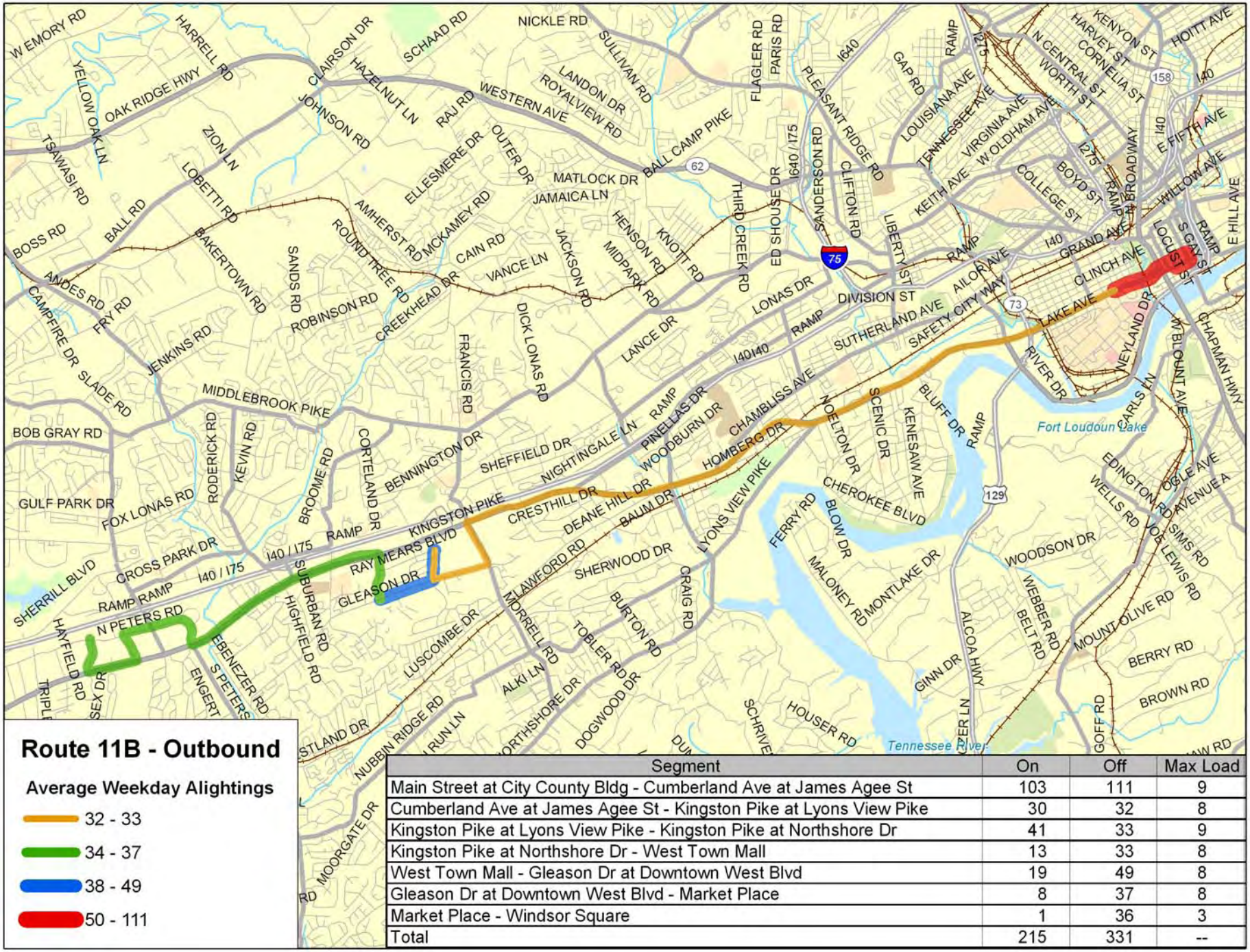
Segment	On	Off	Max Load
Windsor Square - Downtown West Blvd at Gleason Dr	10	14	3
Downtown West Blvd at Gleason Dr - West Town Mall	32	7	7
West Town Mall - Kingston Pike at Northshore Dr	45	2	8
Kingston Pike at Northshore Dr - Kingston Pike at Lyons View Pike	54	20	11
Kingston Pike at Lyons View Pike - Cumberland Ave at James Agee St	37	33	11
Cumberland Ave at James Agee St - Main Street at City County Bldg	24	73	13
Total	202	149	--



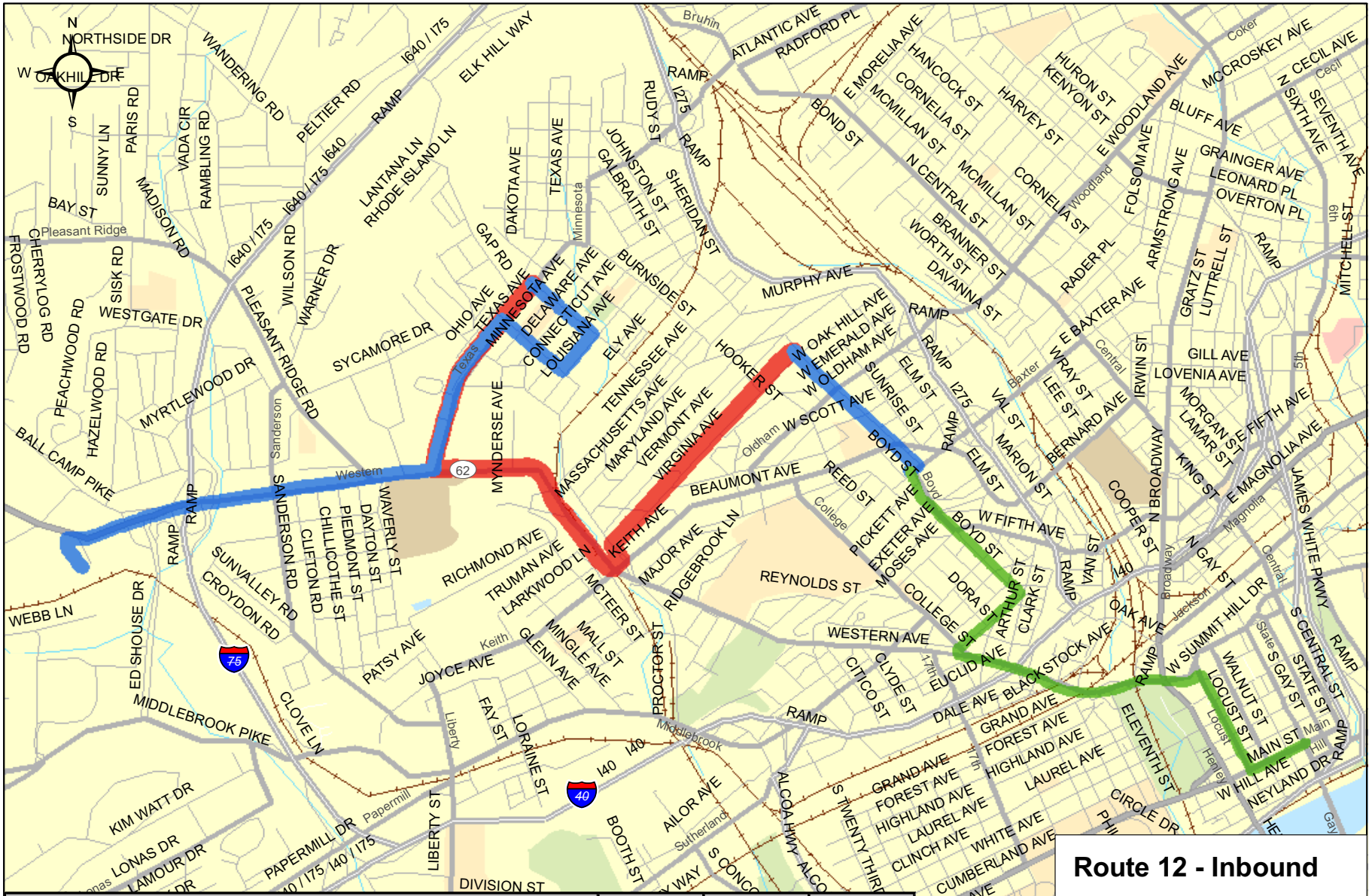
Segment	On	Off	Max Load
Windsor Square - Downtown West Blvd at Gleason Dr	10	14	3
Downtown West Blvd at Gleason Dr - West Town Mall	32	7	7
West Town Mall - Kingston Pike at Northshore Dr	45	2	8
Kingston Pike at Northshore Dr - Kingston Pike at Lyons View Pike	54	20	11
Kingston Pike at Lyons View Pike - Cumberland Ave at James Agee St	37	33	11
Cumberland Ave at James Agee St - Main Street at City County Bldg	24	73	13
Total	202	149	--



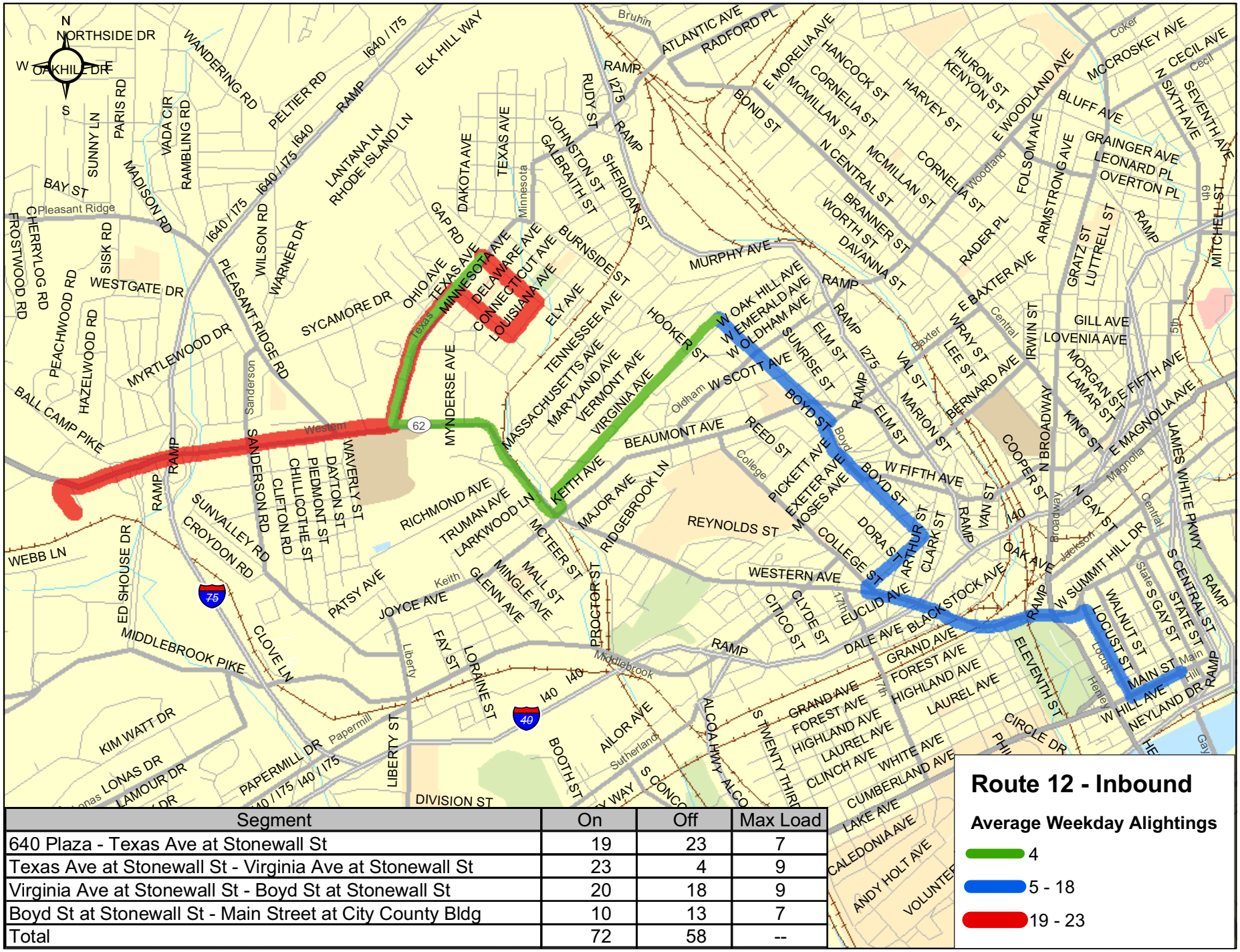
Segment	On	Off	Max Load
Main Street at City County Bldg - Cumberland Ave at James Agee St	103	111	9
Cumberland Ave at James Agee St - Kingston Pike at Lyons View Pike	30	32	8
Kingston Pike at Lyons View Pike - Kingston Pike at Northshore Dr	41	33	9
Kingston Pike at Northshore Dr - West Town Mall	13	33	8
West Town Mall - Gleason Dr at Downtown West Blvd	19	49	8
Gleason Dr at Downtown West Blvd - Market Place	8	37	8
Market Place - Windsor Square	1	36	3
Total	215	331	--



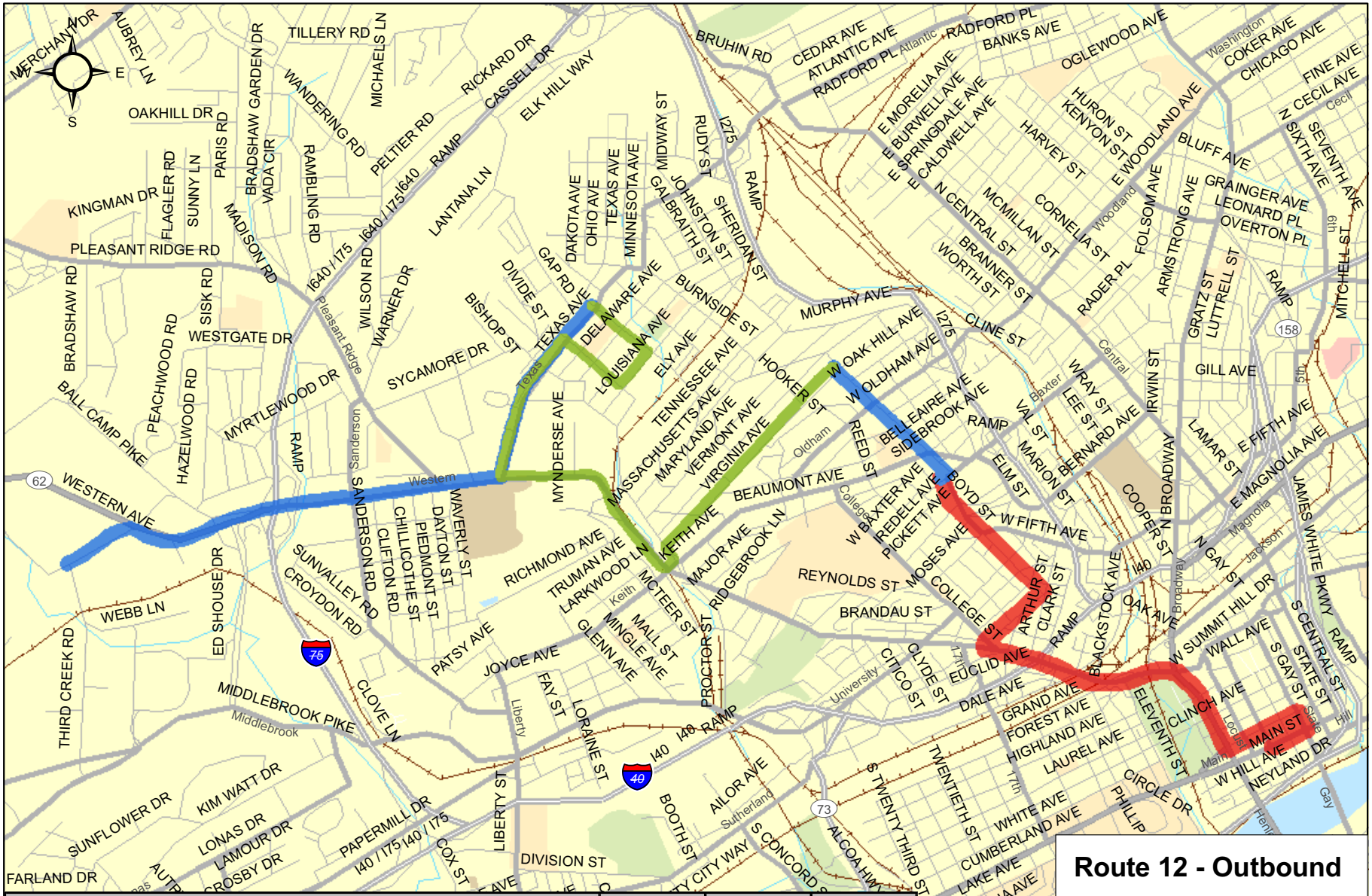
Segment	On	Off	Max Load
Main Street at City County Bldg - Cumberland Ave at James Agee St	103	111	9
Cumberland Ave at James Agee St - Kingston Pike at Lyons View Pike	30	32	8
Kingston Pike at Lyons View Pike - Kingston Pike at Northshore Dr	41	33	9
Kingston Pike at Northshore Dr - West Town Mall	13	33	8
West Town Mall - Gleason Dr at Downtown West Blvd	19	49	8
Gleason Dr at Downtown West Blvd - Market Place	8	37	8
Market Place - Windsor Square	1	36	3
Total	215	331	--



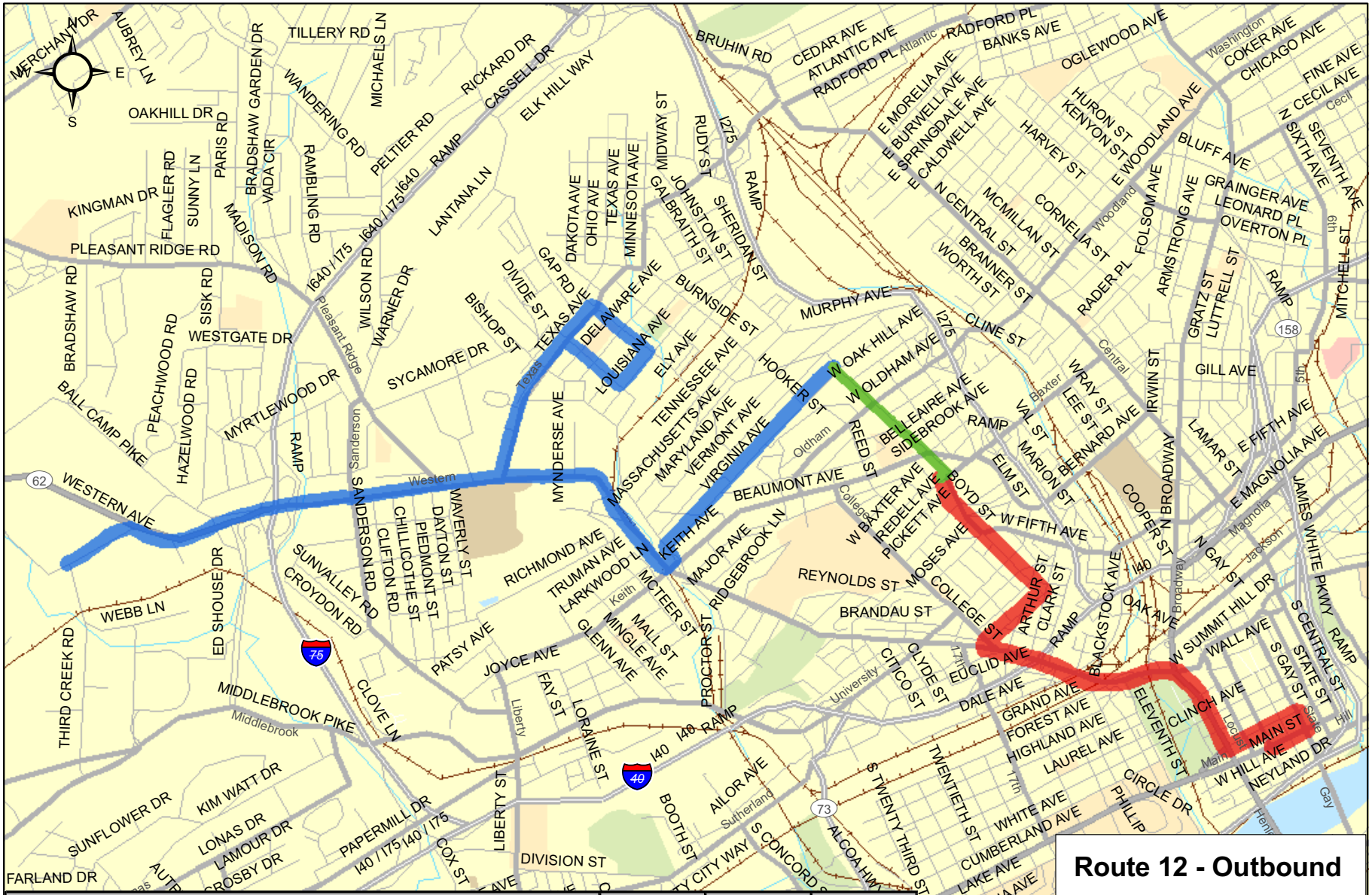
Segment	On	Off	Max Load
640 Plaza - Texas Ave at Stonewall St	19	23	7
Texas Ave at Stonewall St - Virginia Ave at Stonewall St	23	4	9
Virginia Ave at Stonewall St - Boyd St at Stonewall St	20	18	9
Boyd St at Stonewall St - Main Street at City County Bldg	10	13	7
Total	72	58	--



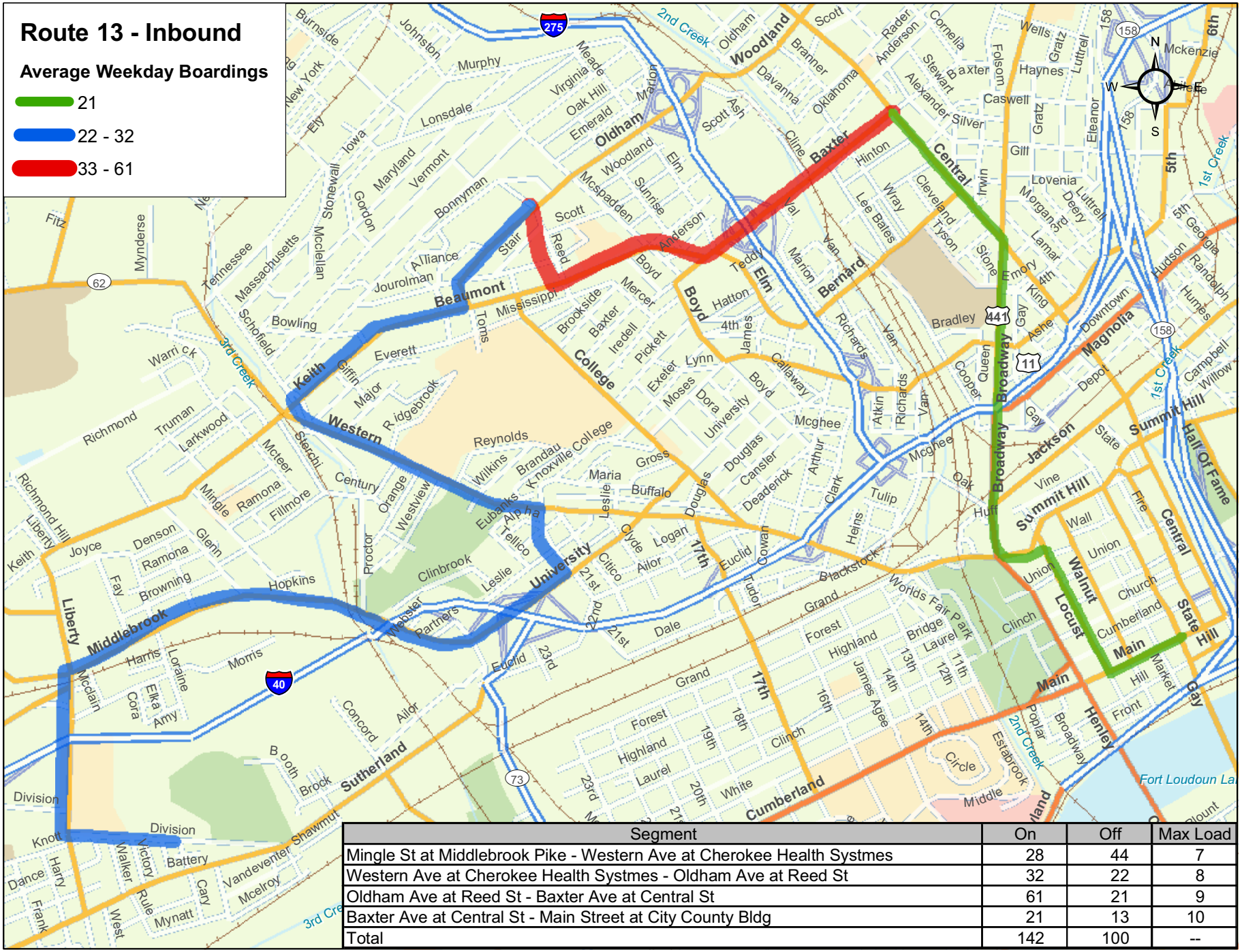
Segment	On	Off	Max Load
640 Plaza - Texas Ave at Stonewall St	19	23	7
Texas Ave at Stonewall St - Virginia Ave at Stonewall St	23	4	9
Virginia Ave at Stonewall St - Boyd St at Stonewall St	20	18	9
Boyd St at Stonewall St - Main Street at City County Bldg	10	13	7
Total	72	58	--



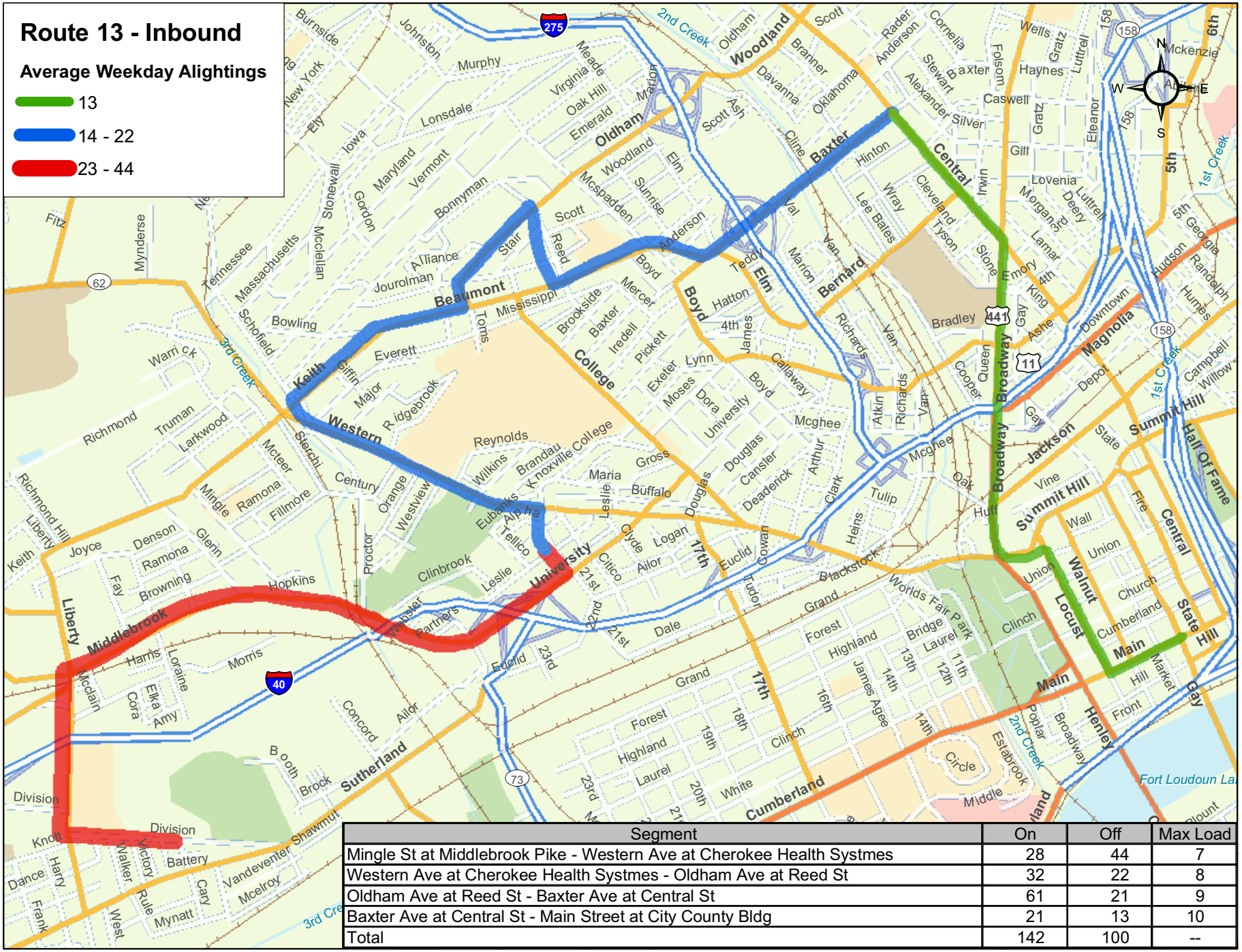
Segment	On	Off	Max Load
Main Street at City County Bldg - Boyd St at University Ave	44	56	8
Boyd St at University Ave - McSpadden St at Virginia Ave	20	3	8
McSpadden St at Virginia Ave - Stonewall St at Texas Ave	8	15	9
Stonewall St at Texas Ave - 640 Plaza	17	19	6
Total	89	93	--



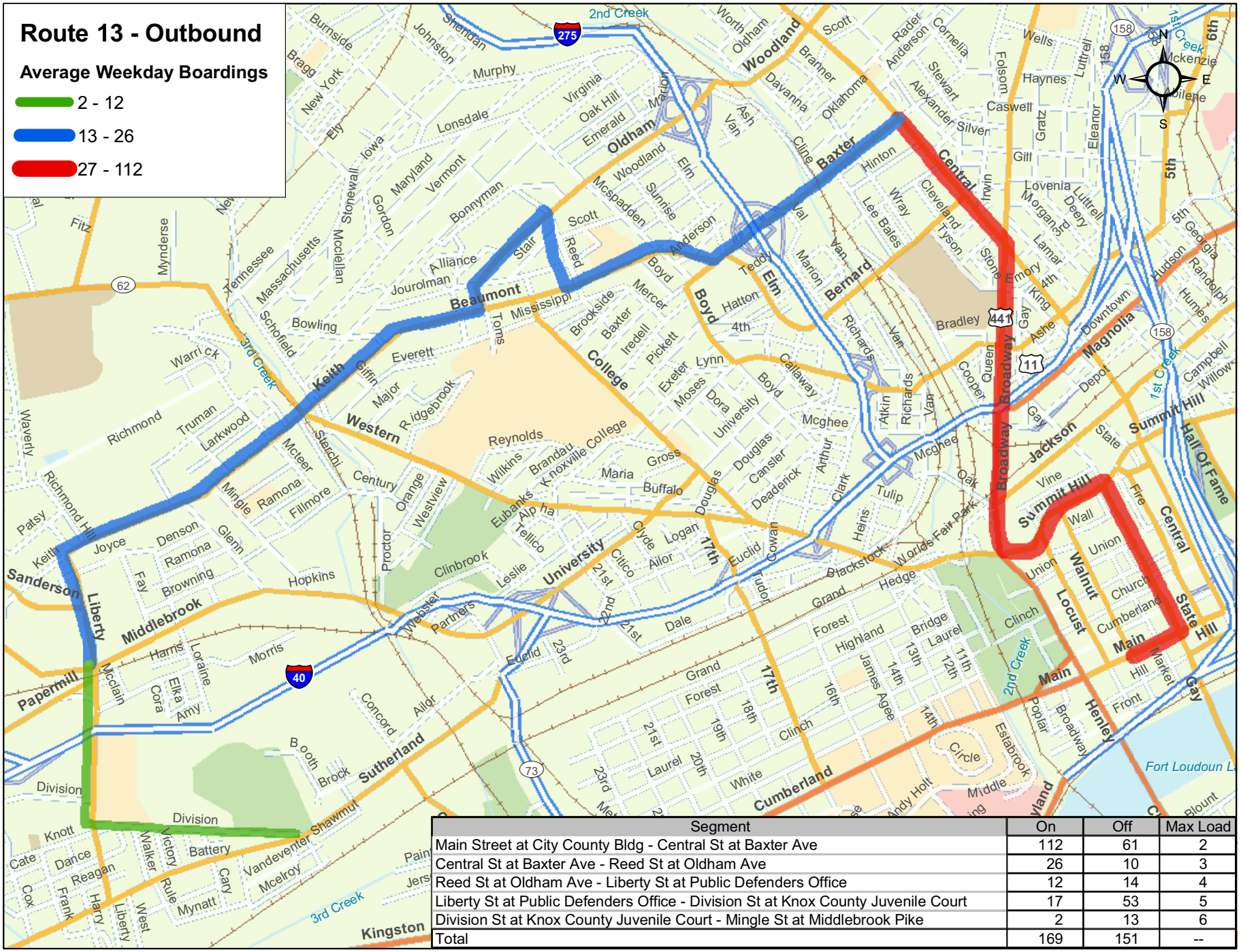
Segment	On	Off	Max Load
Main Street at City County Bldg - Boyd St at University Ave	44	56	8
Boyd St at University Ave - McSpadden St at Virginia Ave	20	3	8
McSpadden St at Virginia Ave - Stonewall St at Texas Ave	8	15	9
Stonewall St at Texas Ave - 640 Plaza	17	19	6
Total	89	93	--



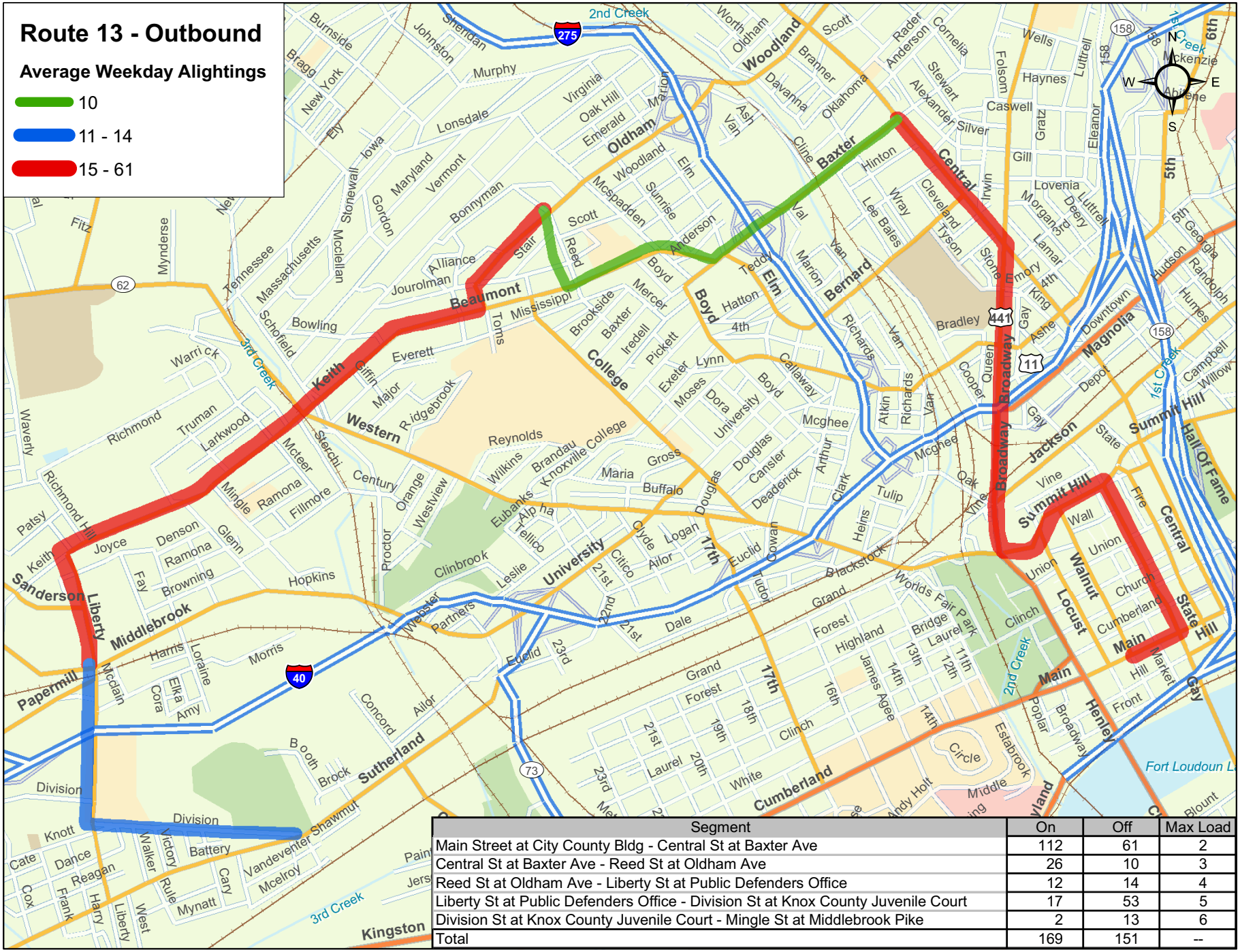
Segment	On	Off	Max Load
Mingle St at Middlebrook Pike - Western Ave at Cherokee Health Systmes	28	44	7
Western Ave at Cherokee Health Systmes - Oldham Ave at Reed St	32	22	8
Oldham Ave at Reed St - Baxter Ave at Central St	61	21	9
Baxter Ave at Central St - Main Street at City County Bldg	21	13	10
Total	142	100	--



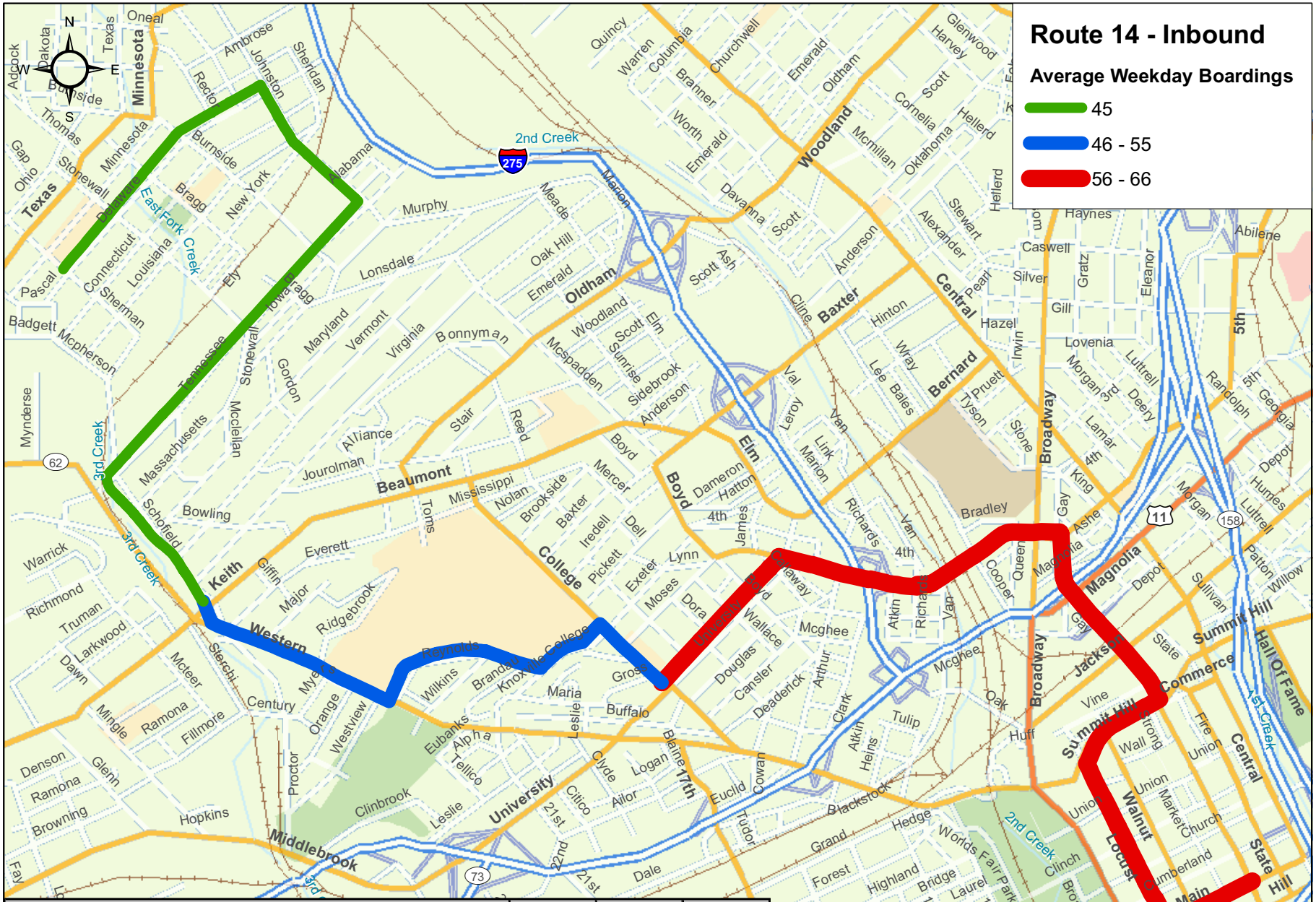
Segment	On	Off	Max Load
Mingle St at Middlebrook Pike - Western Ave at Cherokee Health Systmes	28	44	7
Western Ave at Cherokee Health Systmes - Oldham Ave at Reed St	32	22	8
Oldham Ave at Reed St - Baxter Ave at Central St	61	21	9
Baxter Ave at Central St - Main Street at City County Bldg	21	13	10
Total	142	100	--



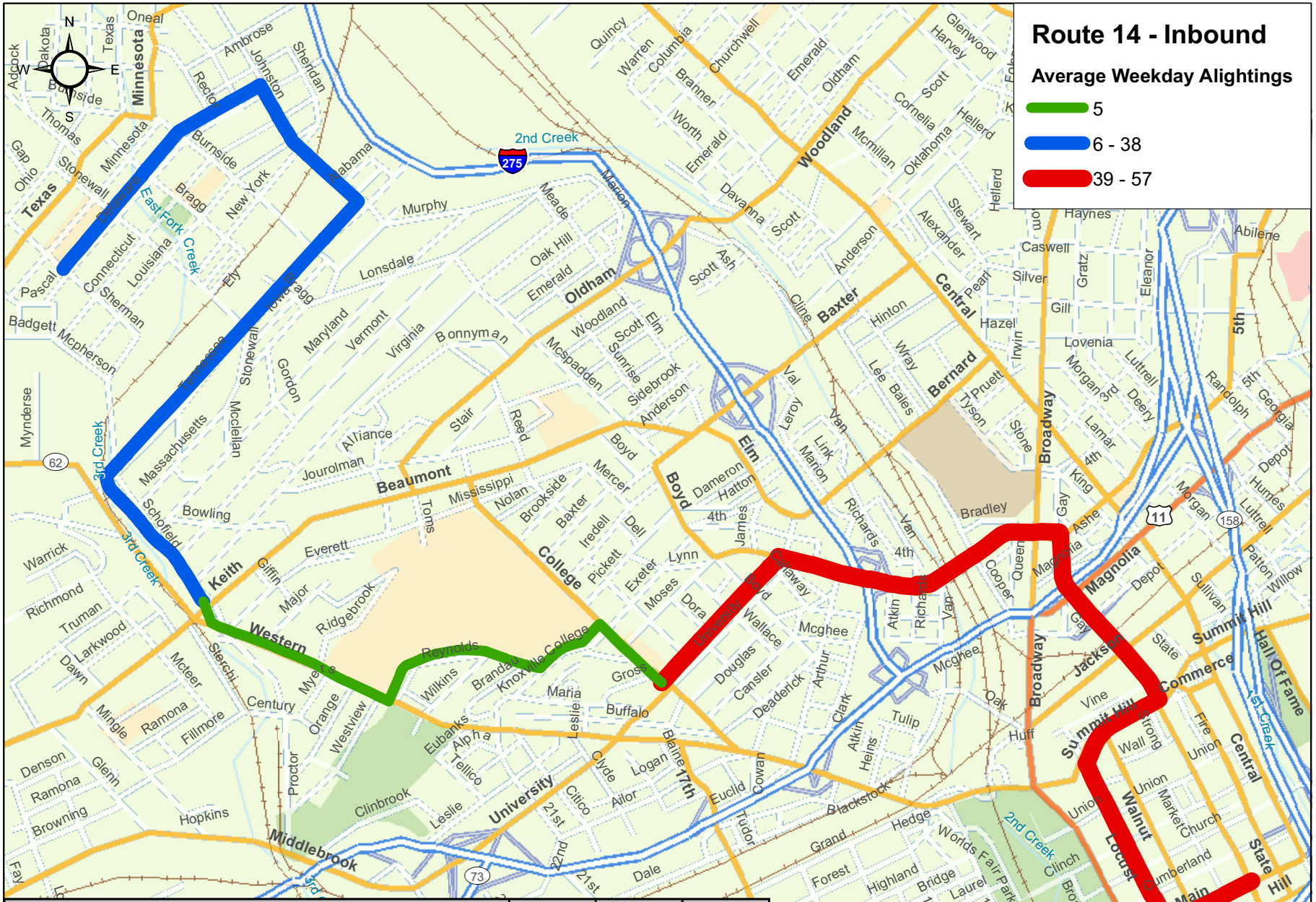
Segment	On	Off	Max Load
Main Street at City County Bldg - Central St at Baxter Ave	112	61	2
Central St at Baxter Ave - Reed St at Oldham Ave	26	10	3
Reed St at Oldham Ave - Liberty St at Public Defenders Office	12	14	4
Liberty St at Public Defenders Office - Division St at Knox County Juvenile Court	17	53	5
Division St at Knox County Juvenile Court - Mingle St at Middlebrook Pike	2	13	6
Total	169	151	--



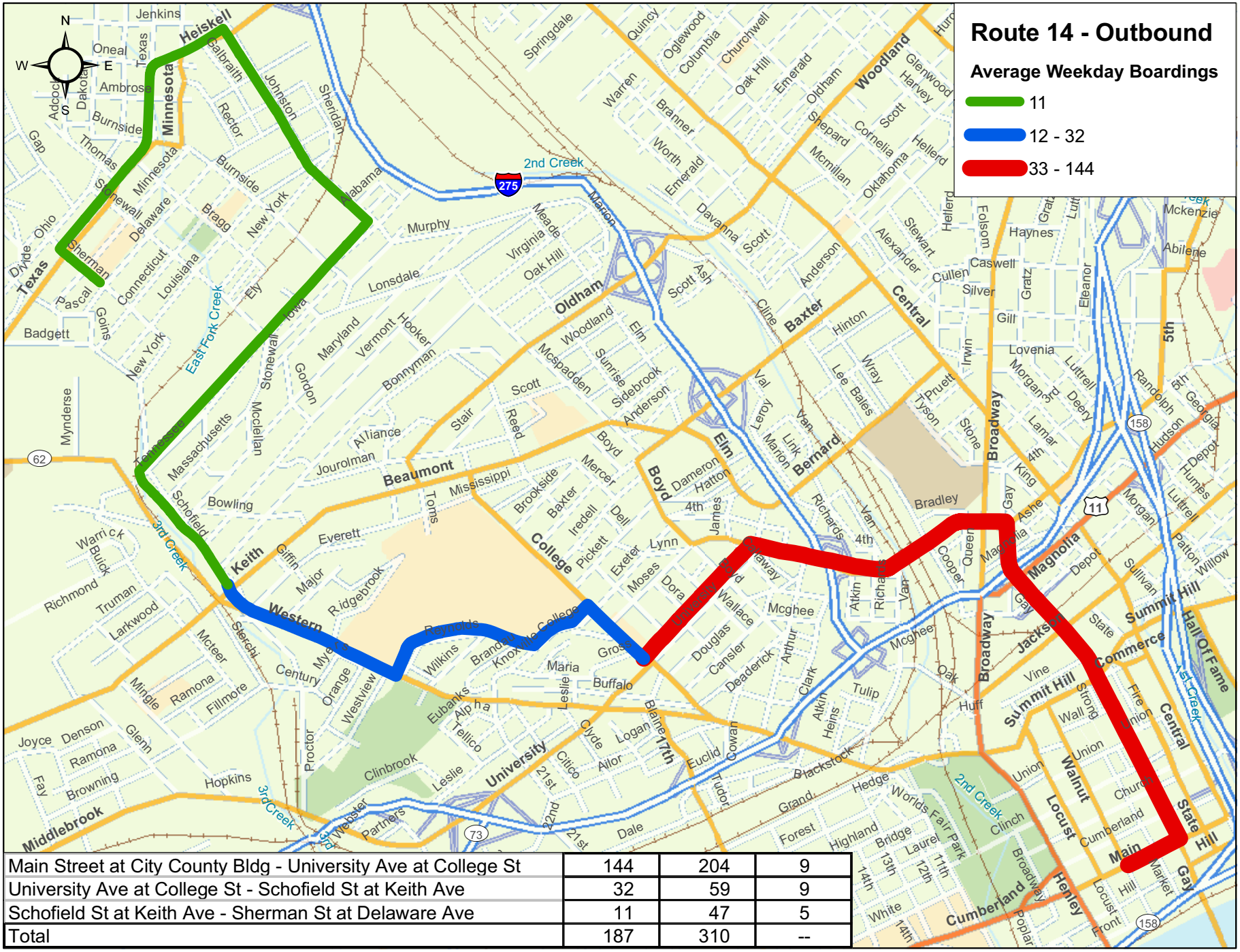
Segment	On	Off	Max Load
Main Street at City County Bldg - Central St at Baxter Ave	112	61	2
Central St at Baxter Ave - Reed St at Oldham Ave	26	10	3
Reed St at Oldham Ave - Liberty St at Public Defenders Office	12	14	4
Liberty St at Public Defenders Office - Division St at Knox County Juvenile Court	17	53	5
Division St at Knox County Juvenile Court - Mingle St at Middlebrook Pike	2	13	6
Total	169	151	--



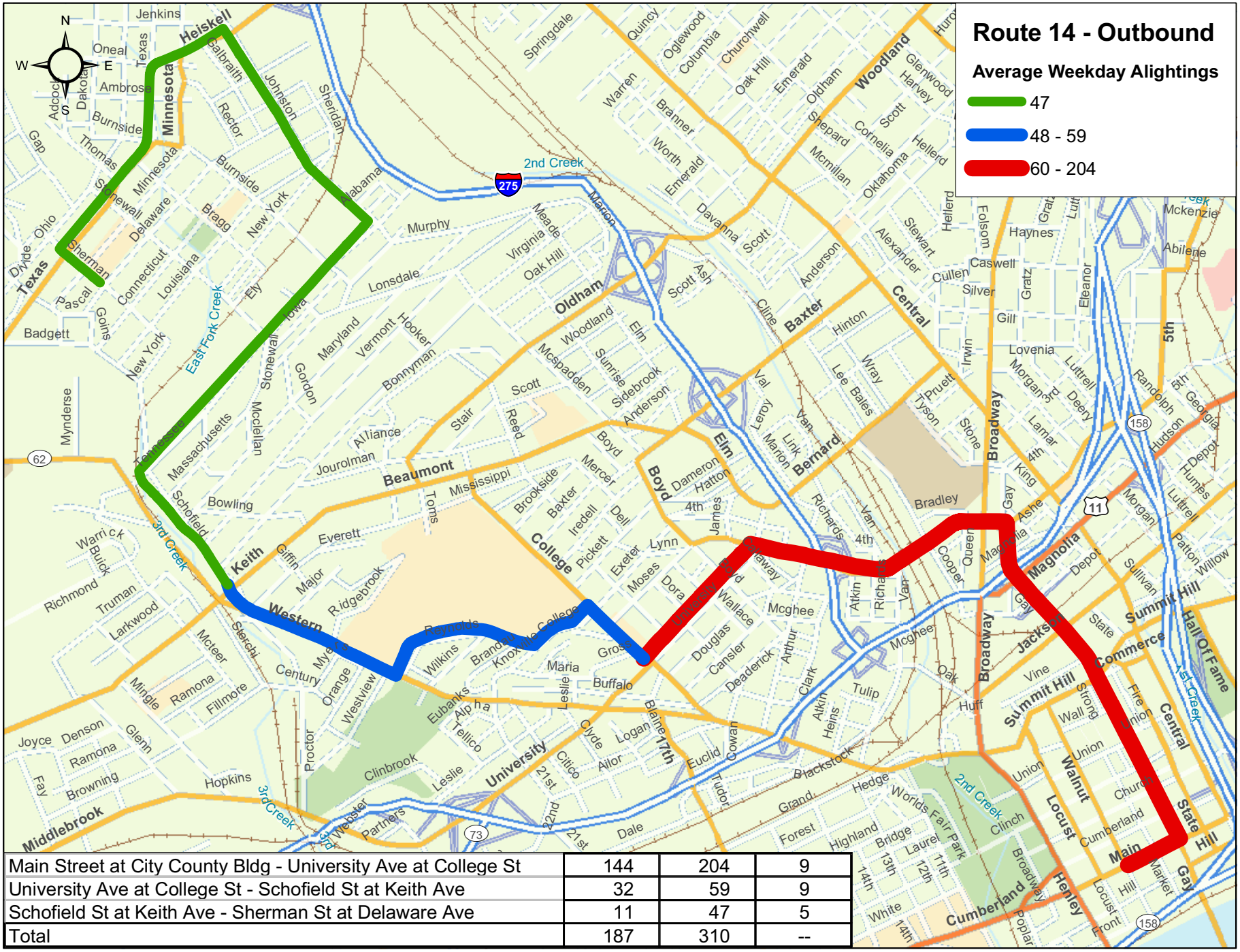
Segment	On	Off	Max Load
Sherman St at Delaware Ave - Schofield St at Keith Ave	45	38	7
Schofield St at Keith Ave - College St at University Ave	55	5	8
College St at University Ave - Main Street at City County Bldg	66	57	9
Total	166	100	--



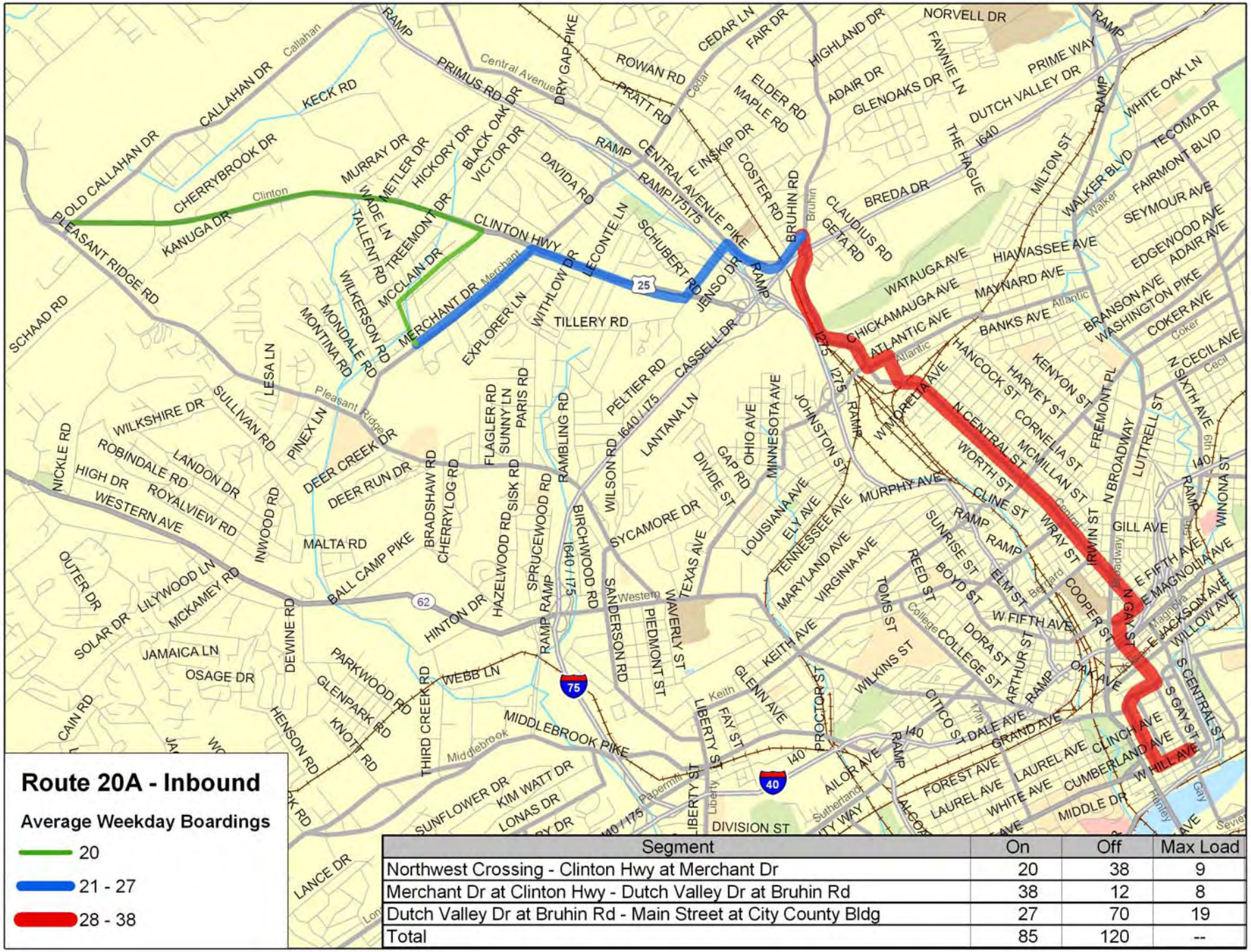
Segment	On	Off	Max Load
Sherman St at Delaware Ave - Schofield St at Keith Ave	45	38	7
Schofield St at Keith Ave - College St at University Ave	55	5	8
College St at University Ave - Main Street at City County Bldg	66	57	9
Total	166	100	--



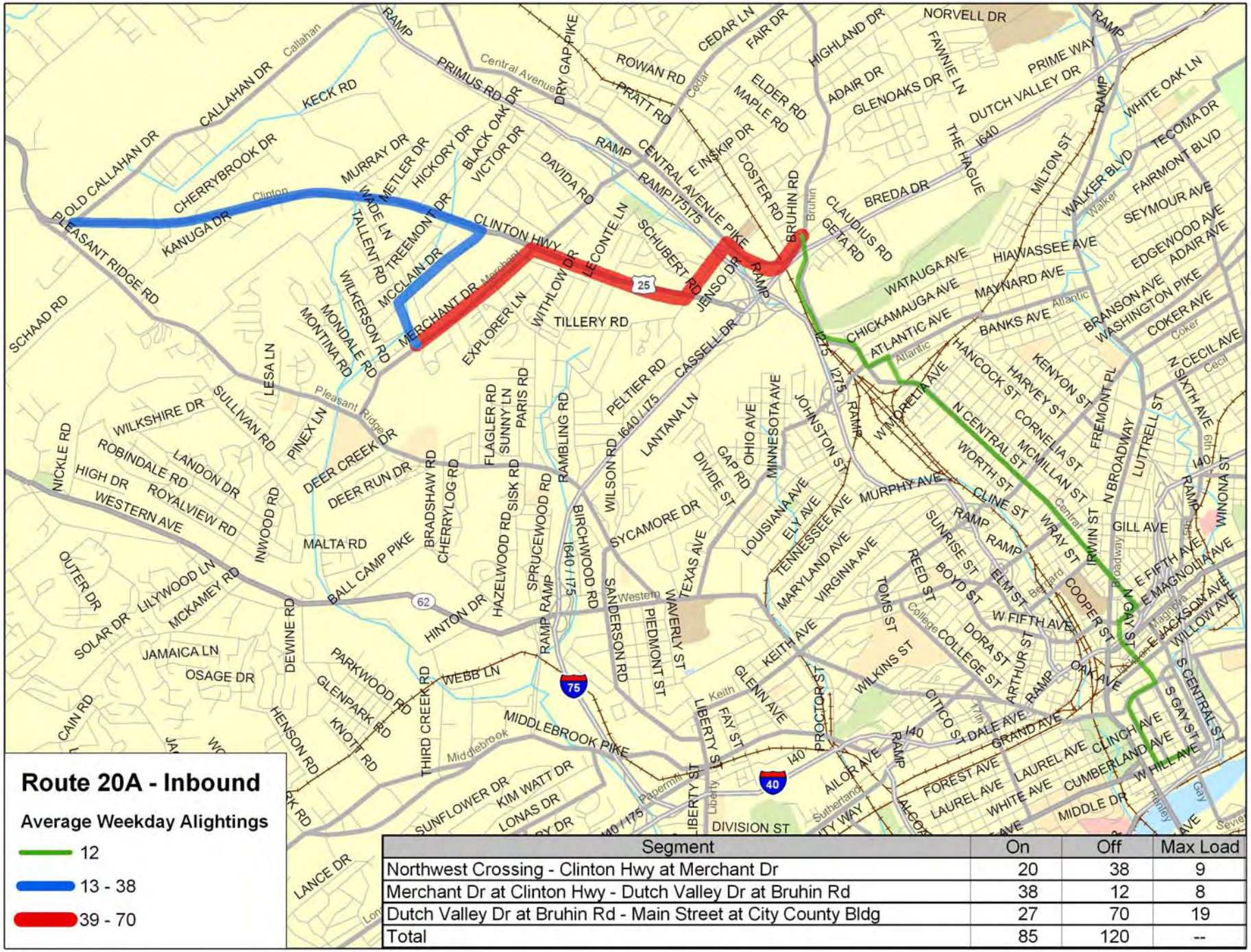
Main Street at City County Bldg - University Ave at College St	144	204	9
University Ave at College St - Schofield St at Keith Ave	32	59	9
Schofield St at Keith Ave - Sherman St at Delaware Ave	11	47	5
Total	187	310	--



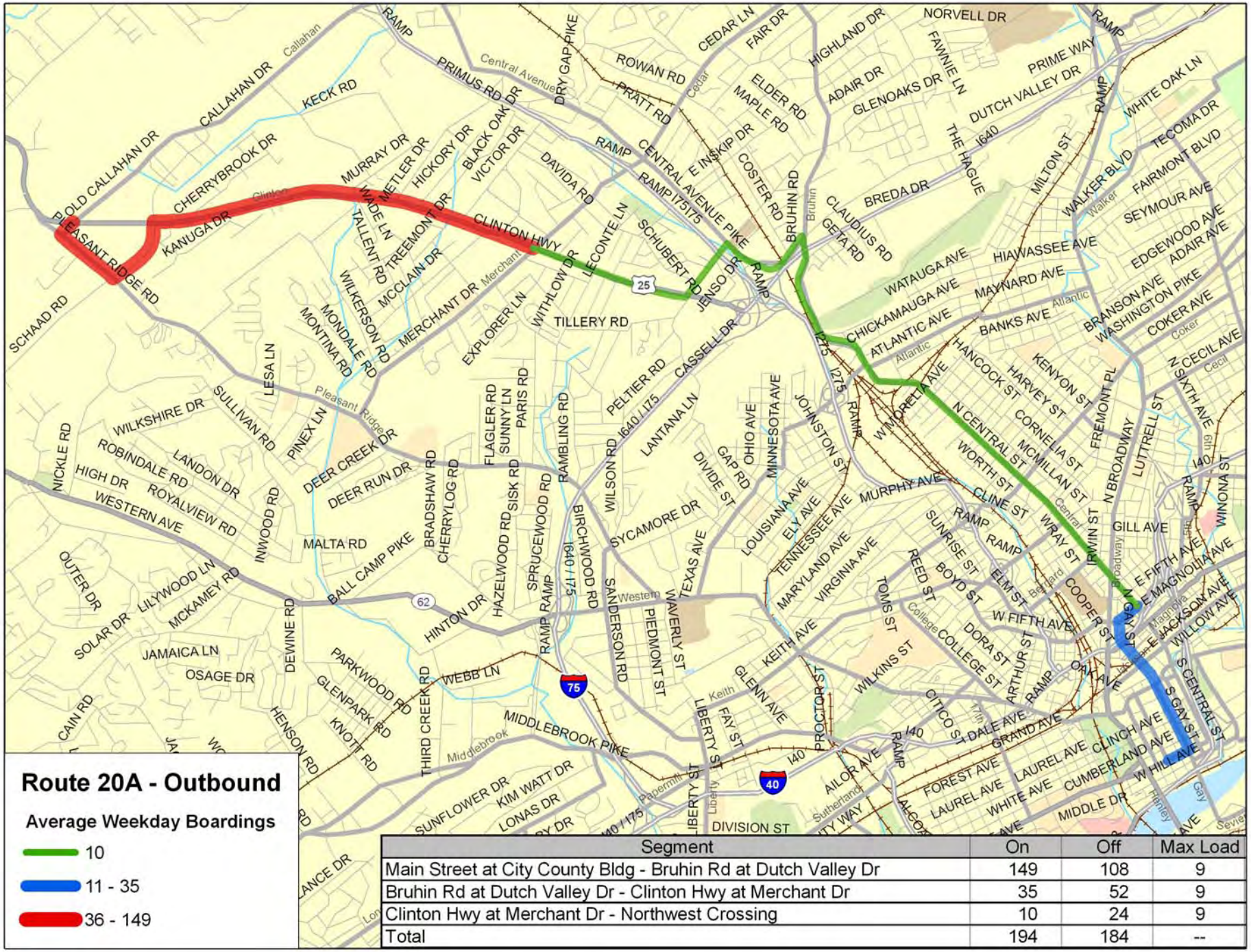
Main Street at City County Bldg - University Ave at College St	144	204	9
University Ave at College St - Schofield St at Keith Ave	32	59	9
Schofield St at Keith Ave - Sherman St at Delaware Ave	11	47	5
Total	187	310	--



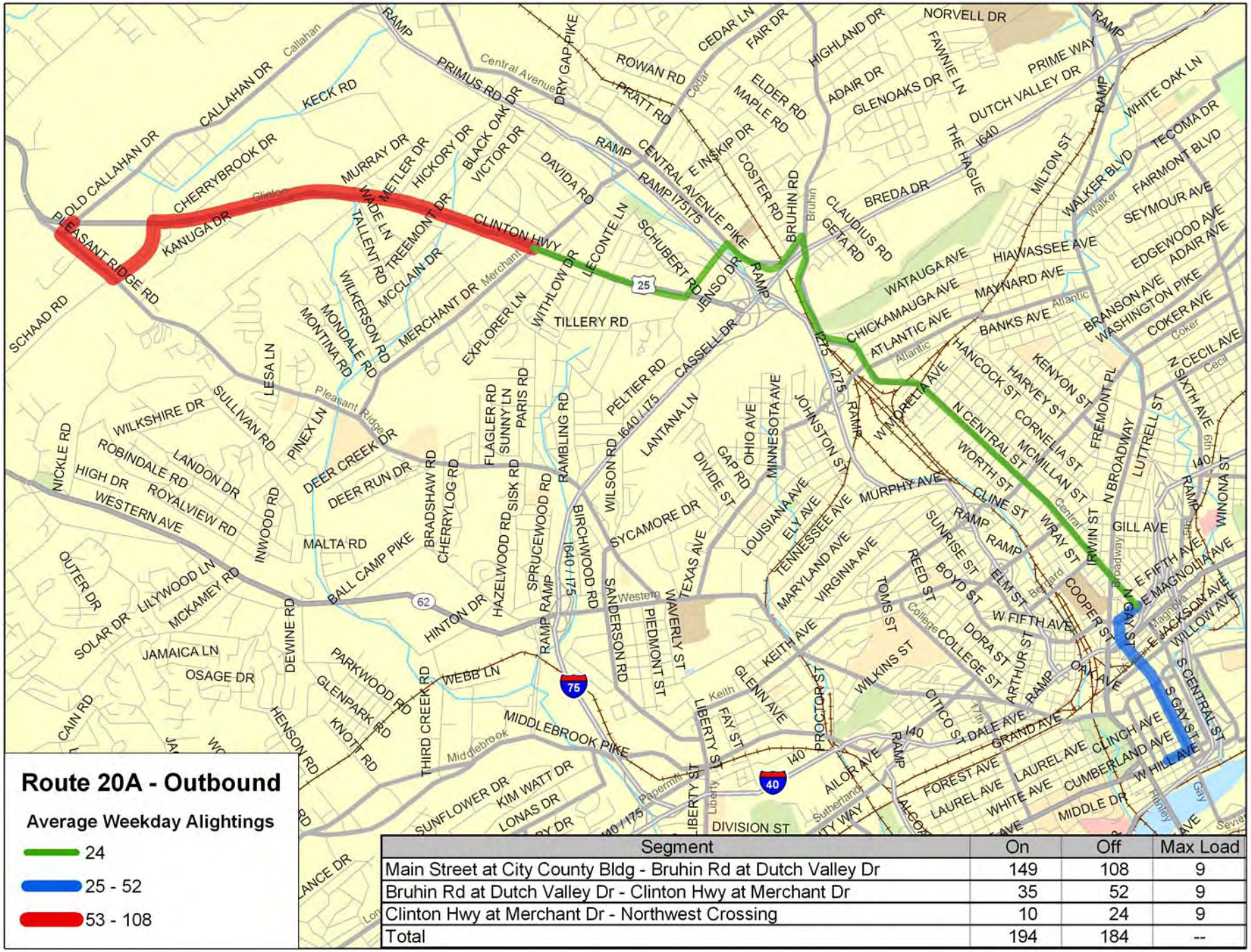
Segment	On	Off	Max Load
Northwest Crossing - Clinton Hwy at Merchant Dr	20	38	9
Merchant Dr at Clinton Hwy - Dutch Valley Dr at Bruhin Rd	38	12	8
Dutch Valley Dr at Bruhin Rd - Main Street at City County Bldg	27	70	19
Total	85	120	--



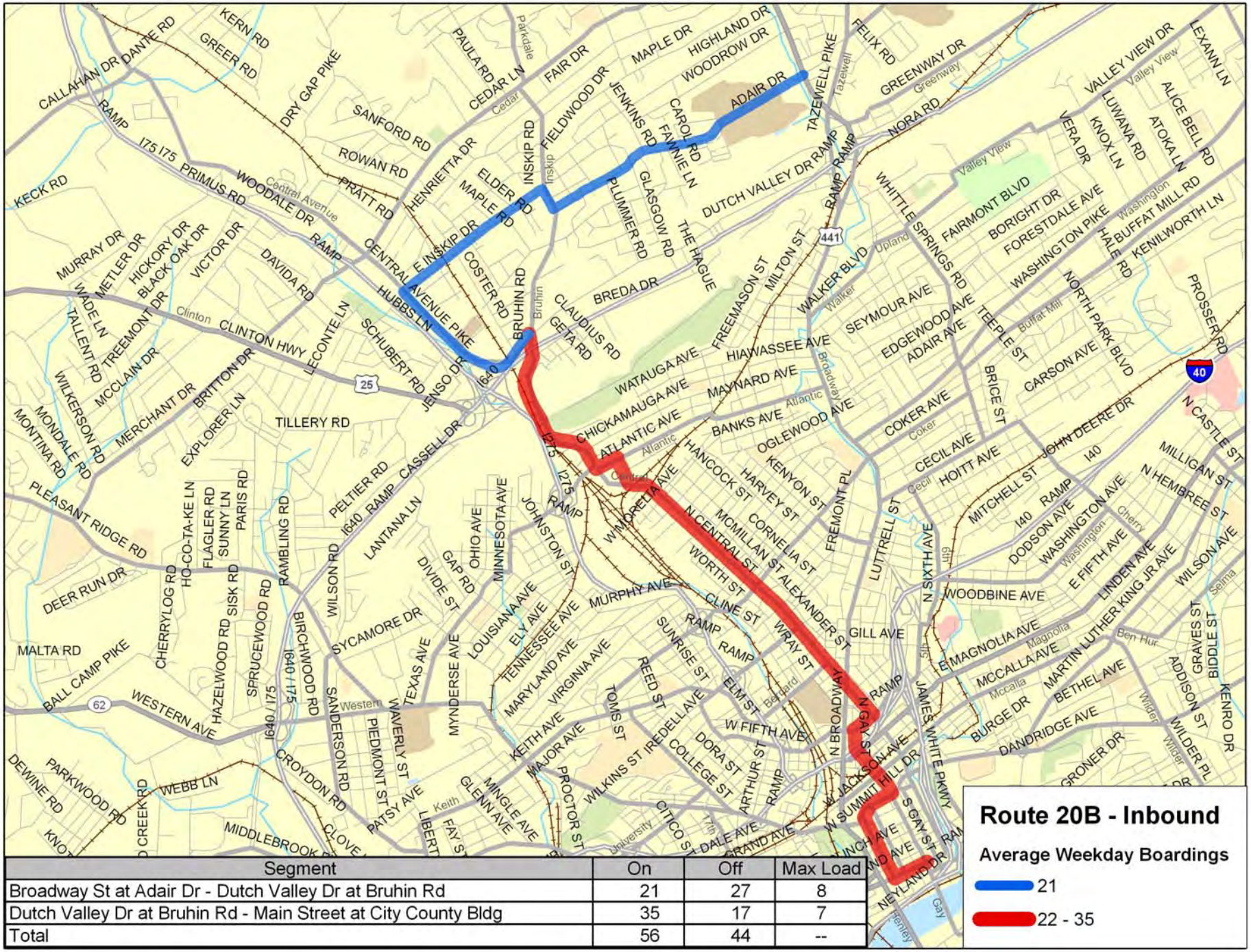
Segment	On	Off	Max Load
Northwest Crossing - Clinton Hwy at Merchant Dr	20	38	9
Merchant Dr at Clinton Hwy - Dutch Valley Dr at Bruhin Rd	38	12	8
Dutch Valley Dr at Bruhin Rd - Main Street at City County Bldg	27	70	19
Total	85	120	--



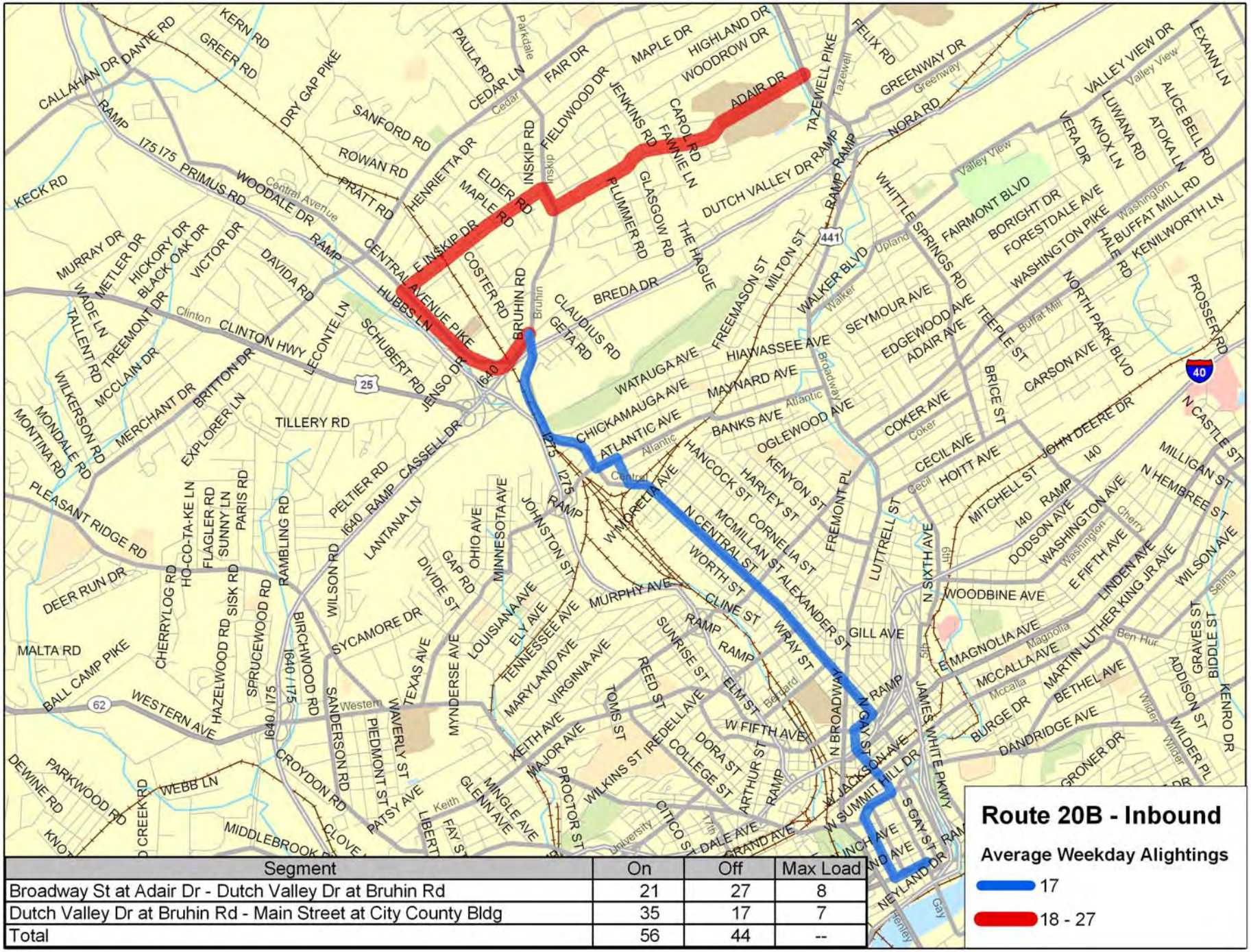
Segment	On	Off	Max Load
Main Street at City County Bldg - Bruhin Rd at Dutch Valley Dr	149	108	9
Bruhin Rd at Dutch Valley Dr - Clinton Hwy at Merchant Dr	35	52	9
Clinton Hwy at Merchant Dr - Northwest Crossing	10	24	9
Total	194	184	--



Segment	On	Off	Max Load
Main Street at City County Bldg - Bruhin Rd at Dutch Valley Dr	149	108	9
Bruhin Rd at Dutch Valley Dr - Clinton Hwy at Merchant Dr	35	52	9
Clinton Hwy at Merchant Dr - Northwest Crossing	10	24	9
Total	194	184	--

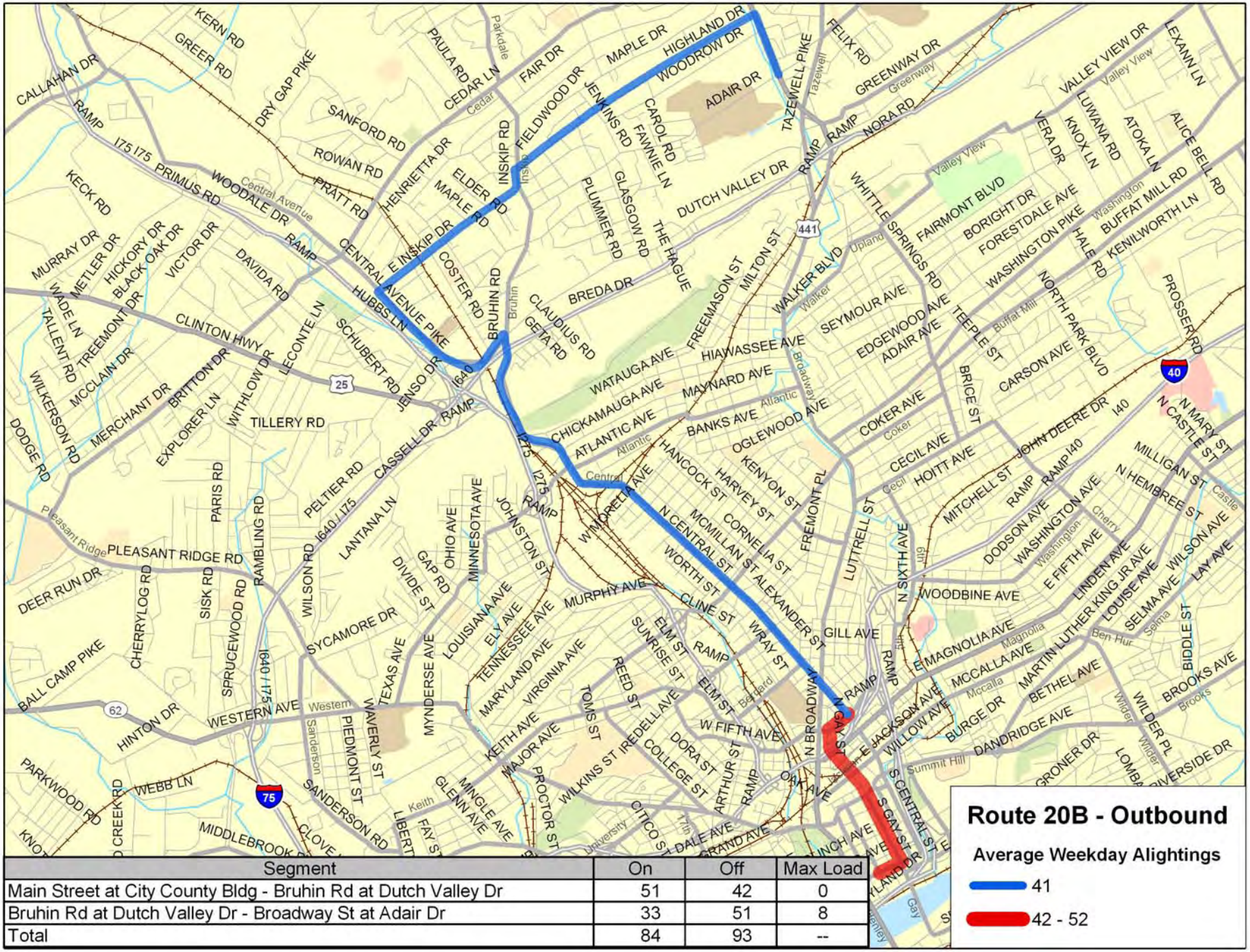


Segment	On	Off	Max Load
Broadway St at Adair Dr - Dutch Valley Dr at Bruhin Rd	21	27	8
Dutch Valley Dr at Bruhin Rd - Main Street at City County Bldg	35	17	7
Total	56	44	--

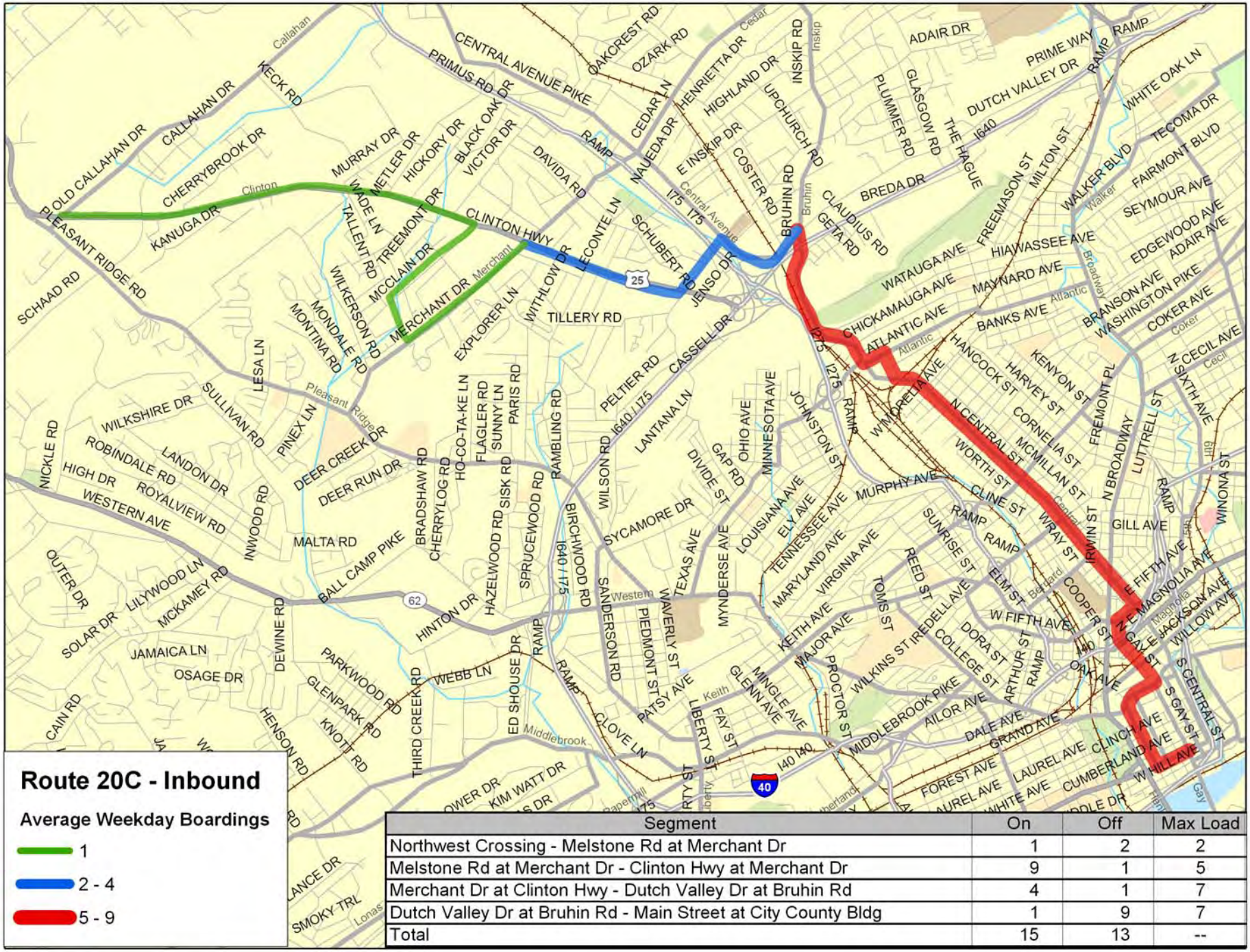


Segment	On	Off	Max Load
Broadway St at Adair Dr - Dutch Valley Dr at Bruhin Rd	21	27	8
Dutch Valley Dr at Bruhin Rd - Main Street at City County Bldg	35	17	7
Total	56	44	--

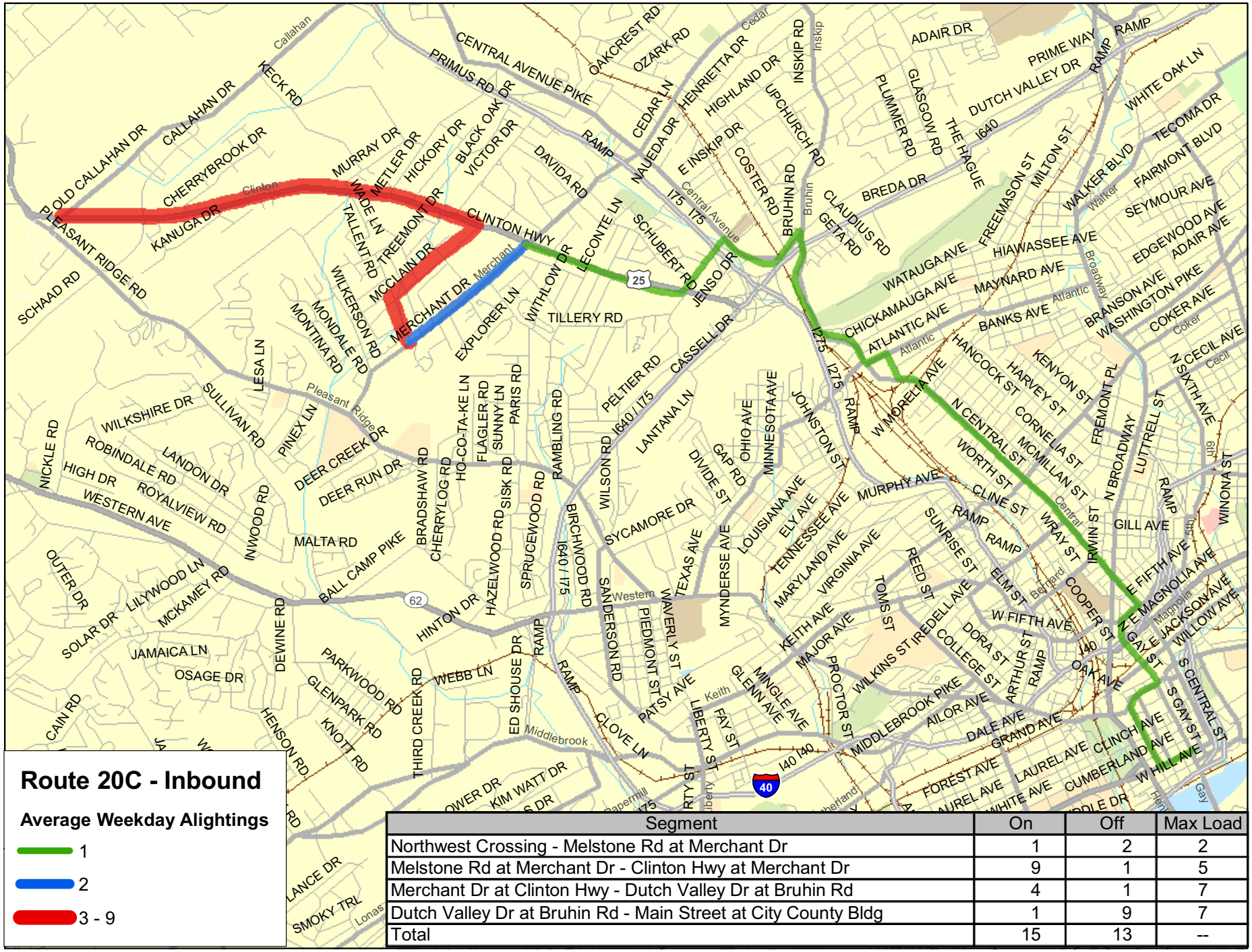
Segment	On	Off	Max Load
Main Street at City County Bldg - Bruhin Rd at Dutch Valley Dr	51	42	0
Bruhin Rd at Dutch Valley Dr - Broadway St at Adair Dr	33	51	8
Total	84	93	--



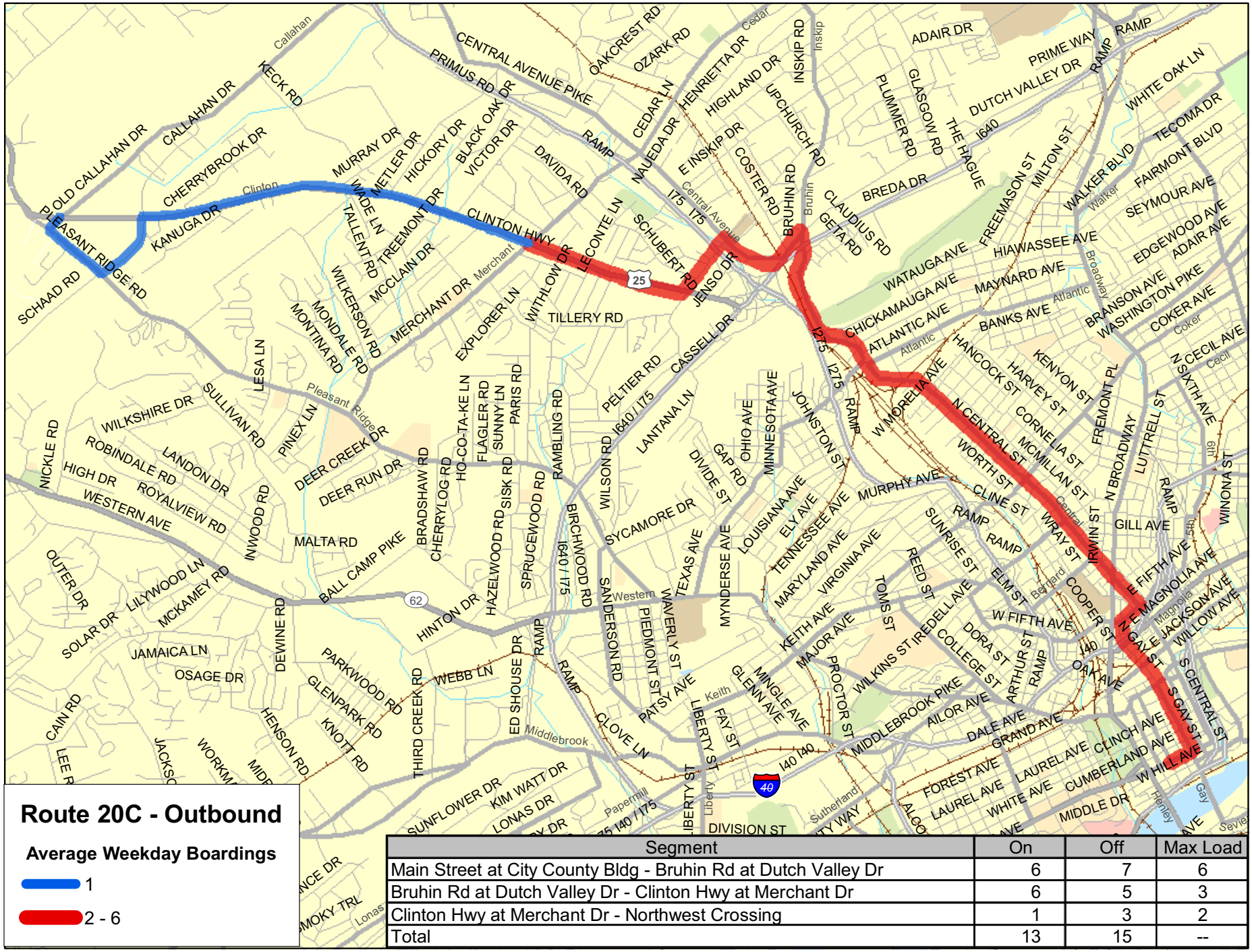
Segment	On	Off	Max Load
Main Street at City County Bldg - Bruhin Rd at Dutch Valley Dr	51	42	0
Bruhin Rd at Dutch Valley Dr - Broadway St at Adair Dr	33	51	8
Total	84	93	--



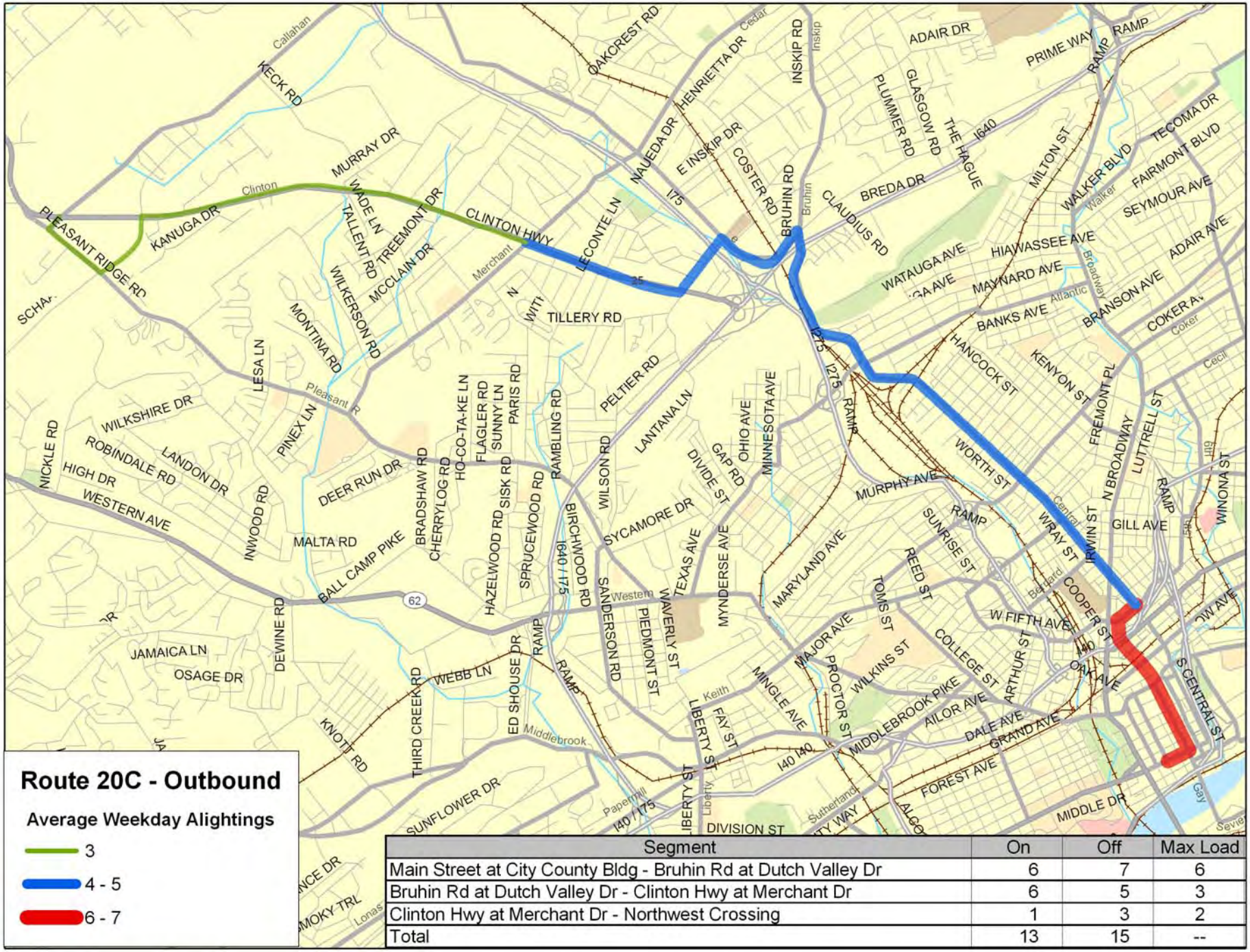
Segment	On	Off	Max Load
Northwest Crossing - Melstone Rd at Merchant Dr	1	2	2
Melstone Rd at Merchant Dr - Clinton Hwy at Merchant Dr	9	1	5
Merchant Dr at Clinton Hwy - Dutch Valley Dr at Bruhin Rd	4	1	7
Dutch Valley Dr at Bruhin Rd - Main Street at City County Bldg	1	9	7
Total	15	13	--



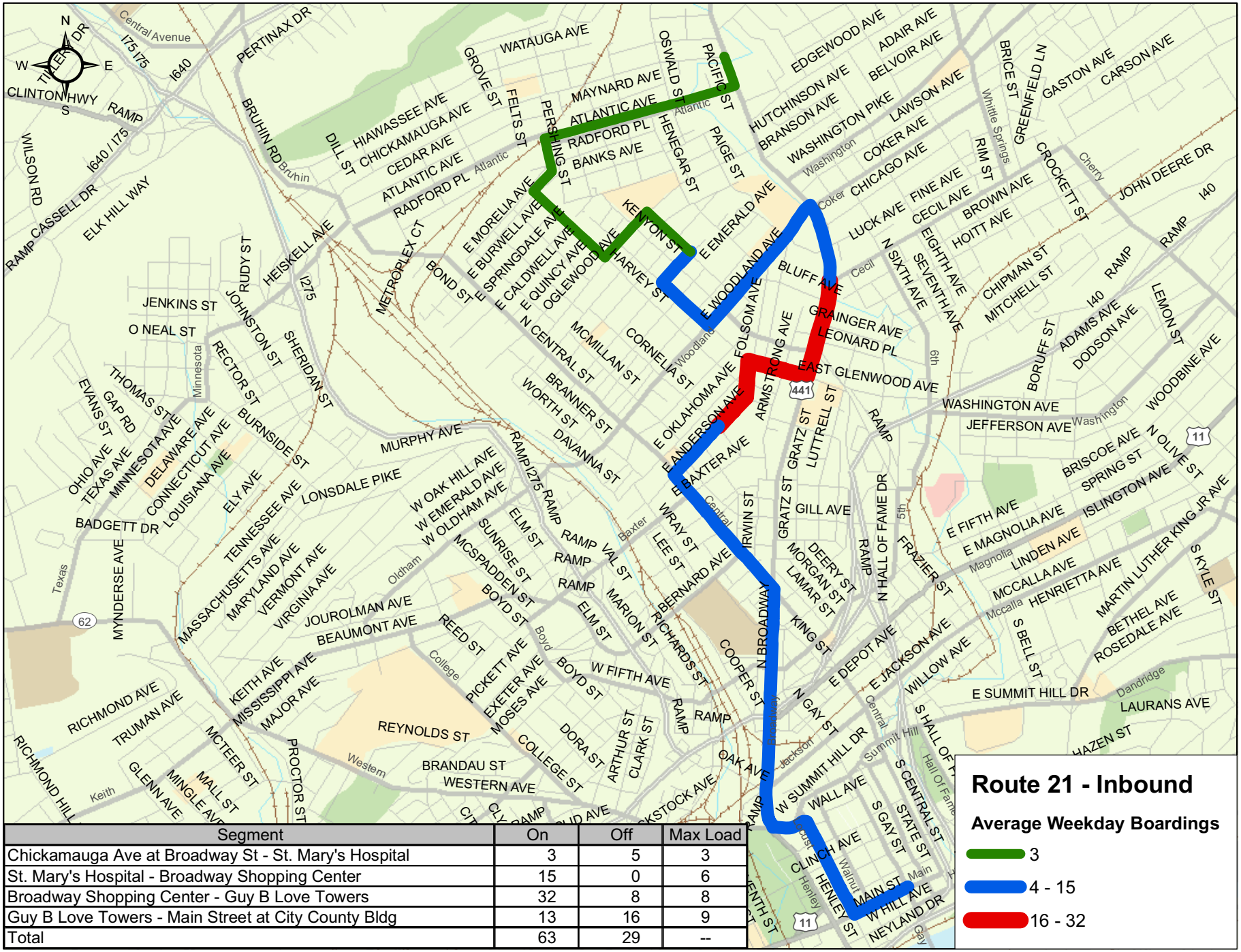
Segment	On	Off	Max Load
Northwest Crossing - Melstone Rd at Merchant Dr	1	2	2
Melstone Rd at Merchant Dr - Clinton Hwy at Merchant Dr	9	1	5
Merchant Dr at Clinton Hwy - Dutch Valley Dr at Bruhin Rd	4	1	7
Dutch Valley Dr at Bruhin Rd - Main Street at City County Bldg	1	9	7
Total	15	13	--



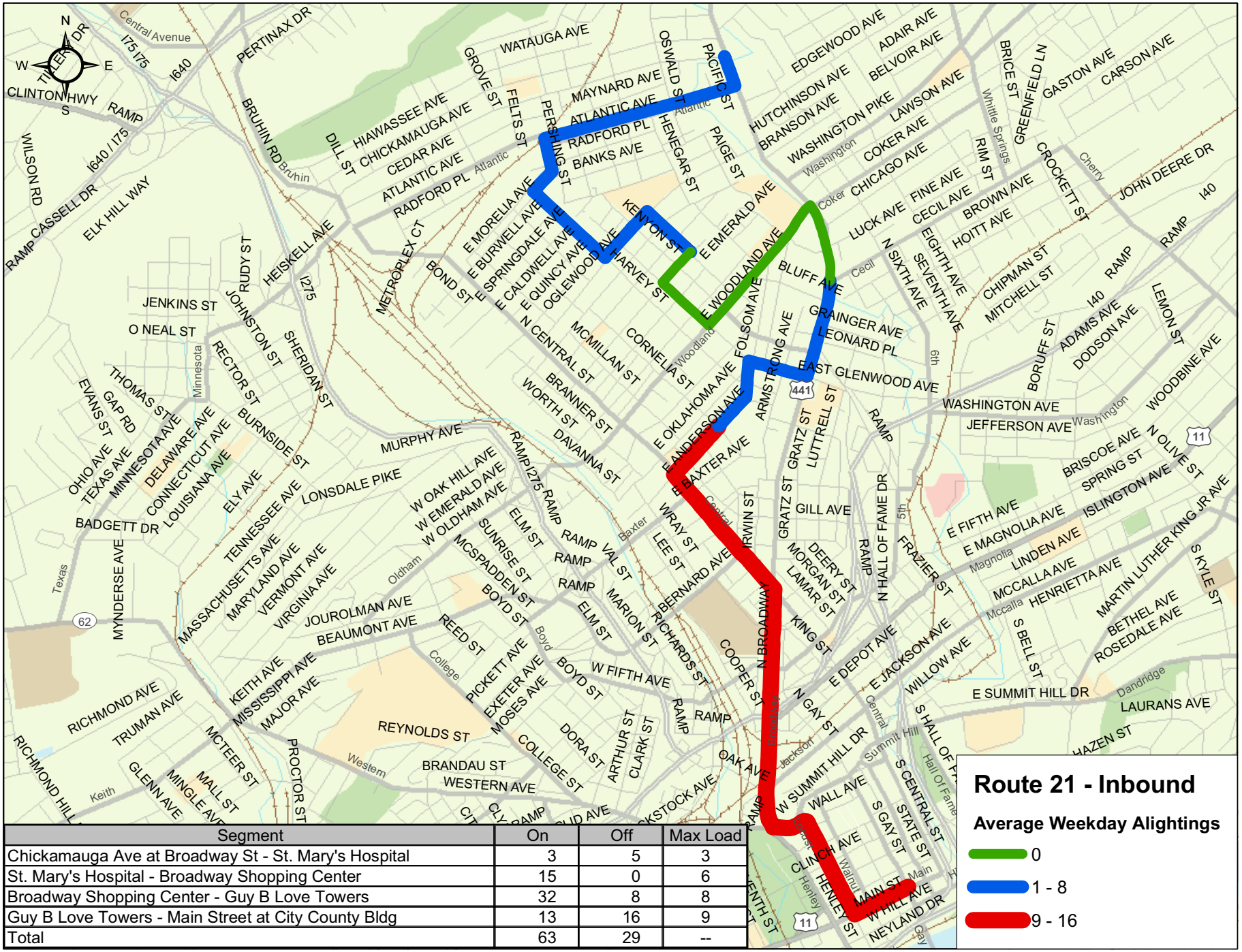
Segment	On	Off	Max Load
Main Street at City County Bldg - Bruhin Rd at Dutch Valley Dr	6	7	6
Bruhin Rd at Dutch Valley Dr - Clinton Hwy at Merchant Dr	6	5	3
Clinton Hwy at Merchant Dr - Northwest Crossing	1	3	2
Total	13	15	--



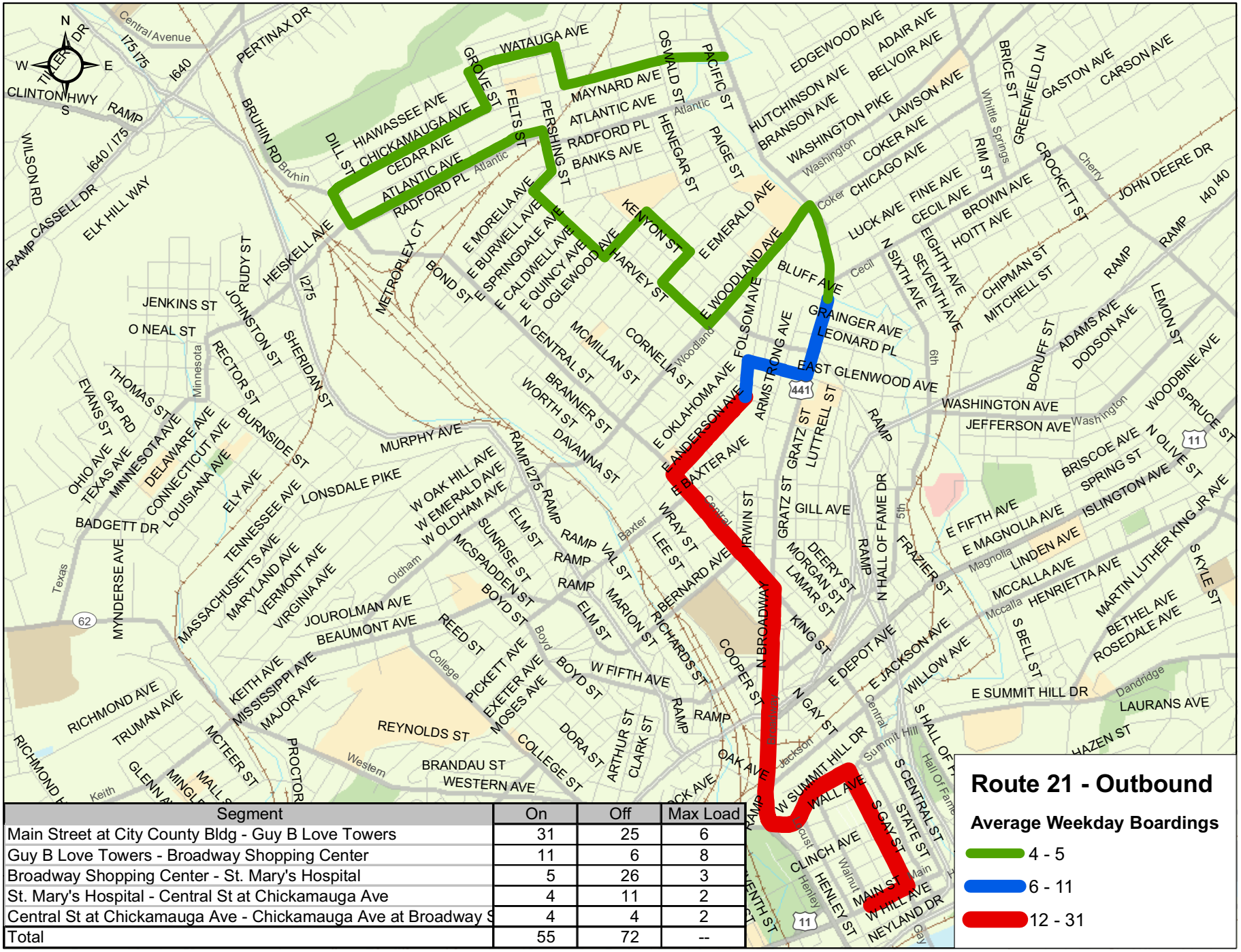
Segment	On	Off	Max Load
Main Street at City County Bldg - Bruhin Rd at Dutch Valley Dr	6	7	6
Bruhin Rd at Dutch Valley Dr - Clinton Hwy at Merchant Dr	6	5	3
Clinton Hwy at Merchant Dr - Northwest Crossing	1	3	2
Total	13	15	--



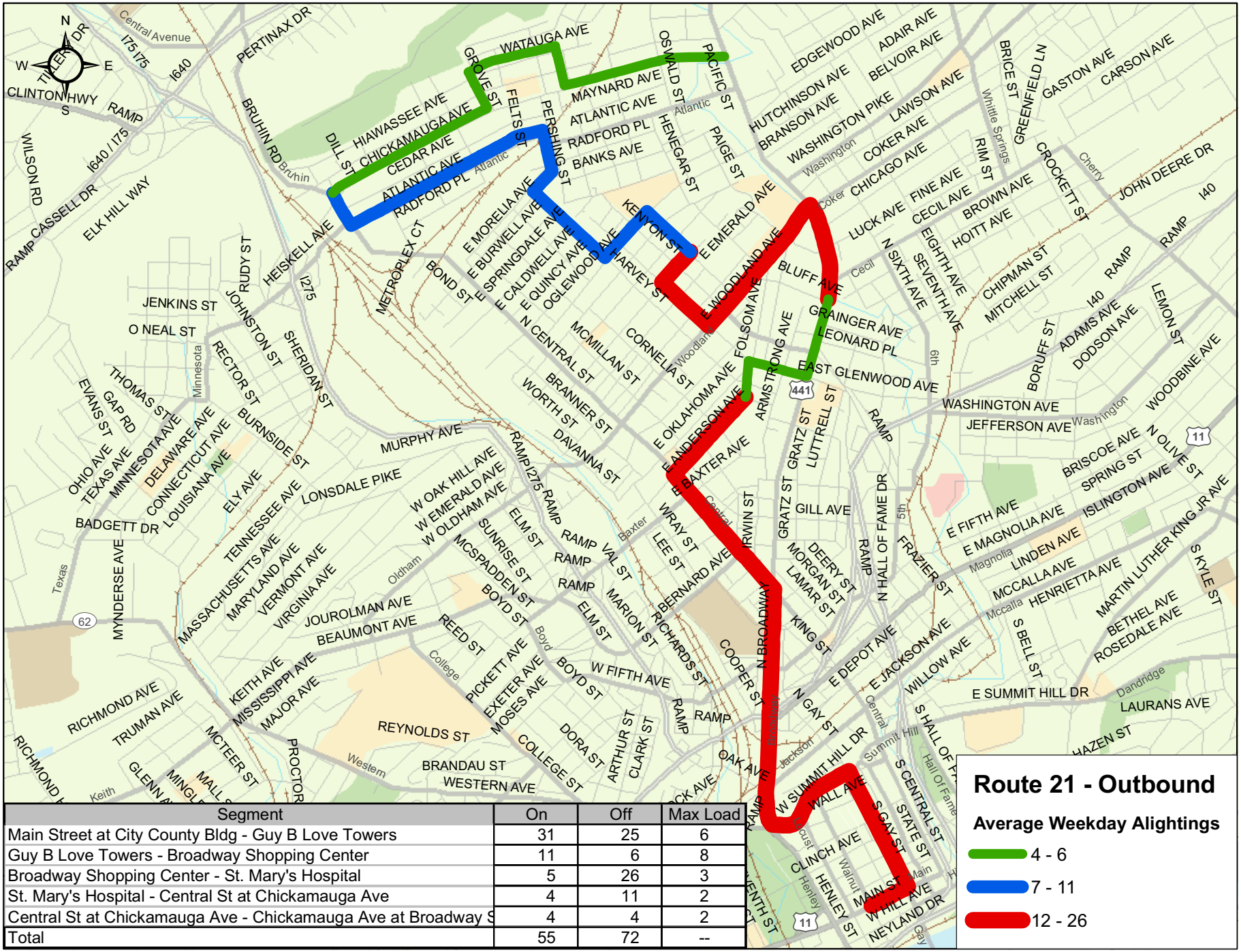
Segment	On	Off	Max Load
Chickamauga Ave at Broadway St - St. Mary's Hospital	3	5	3
St. Mary's Hospital - Broadway Shopping Center	15	0	6
Broadway Shopping Center - Guy B Love Towers	32	8	8
Guy B Love Towers - Main Street at City County Bldg	13	16	9
Total	63	29	--



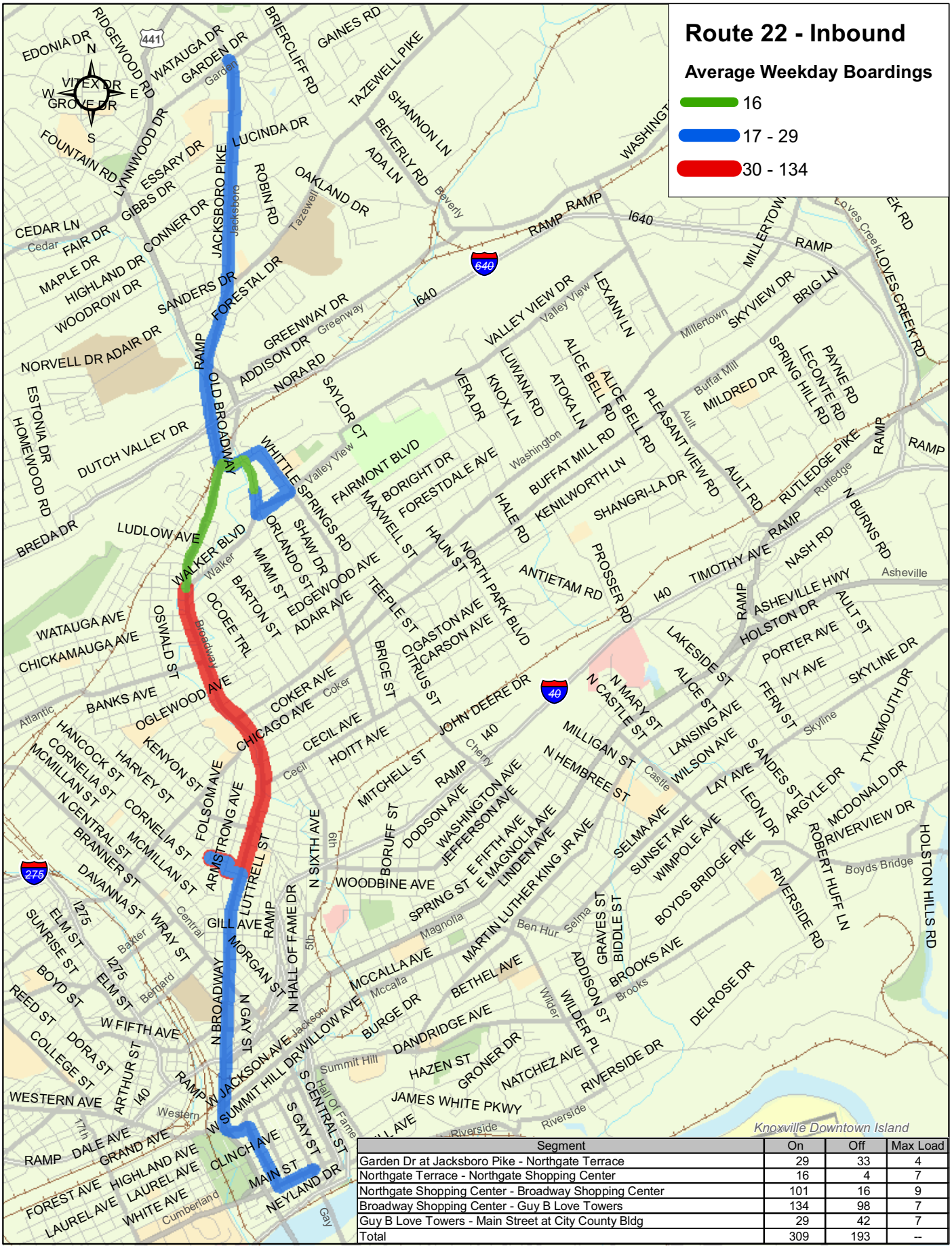
Segment	On	Off	Max Load
Chickamauga Ave at Broadway St - St. Mary's Hospital	3	5	3
St. Mary's Hospital - Broadway Shopping Center	15	0	6
Broadway Shopping Center - Guy B Love Towers	32	8	8
Guy B Love Towers - Main Street at City County Bldg	13	16	9
Total	63	29	--



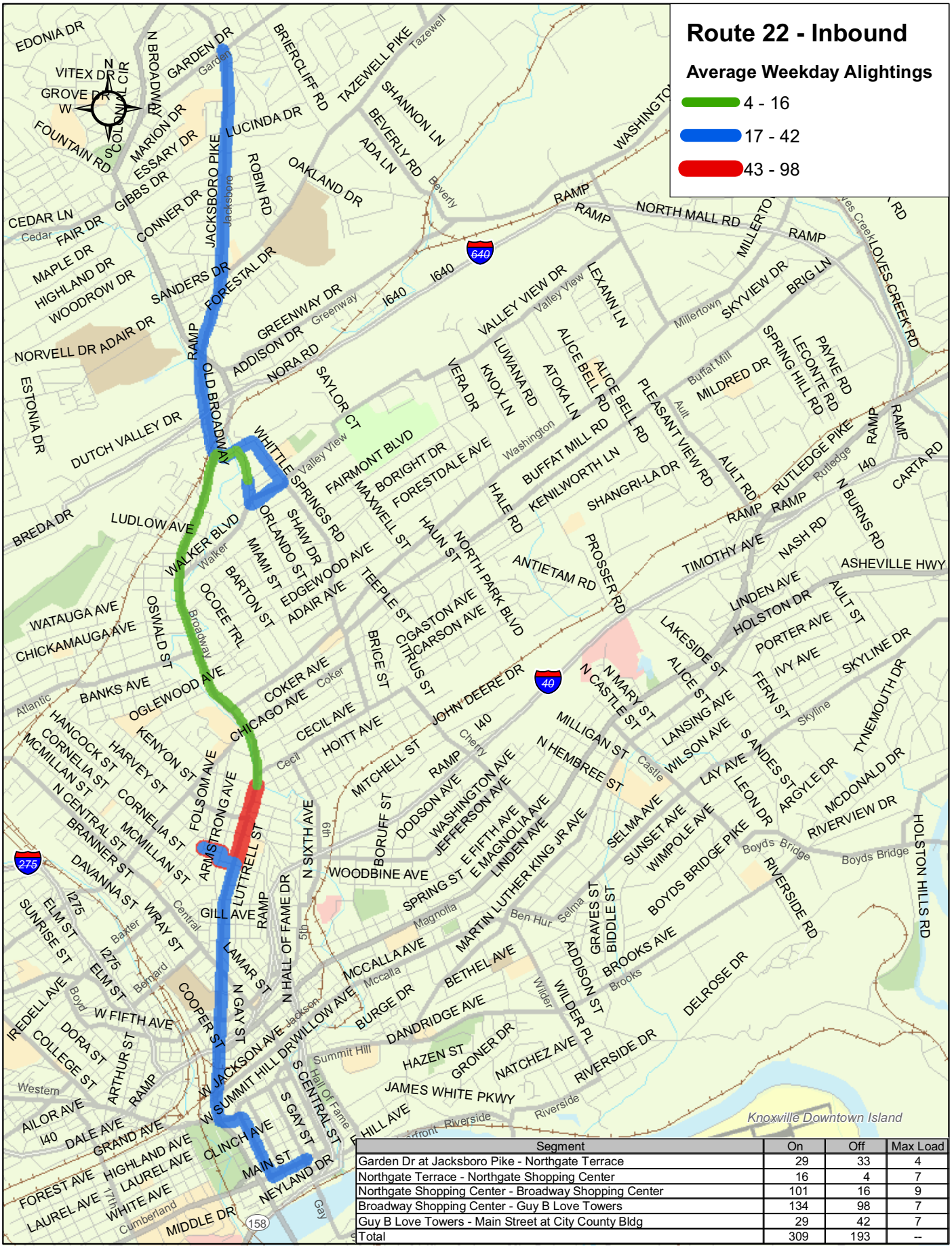
Segment	On	Off	Max Load
Main Street at City County Bldg - Guy B Love Towers	31	25	6
Guy B Love Towers - Broadway Shopping Center	11	6	8
Broadway Shopping Center - St. Mary's Hospital	5	26	3
St. Mary's Hospital - Central St at Chickamauga Ave	4	11	2
Central St at Chickamauga Ave - Chickamauga Ave at Broadway S	4	4	2
Total	55	72	--



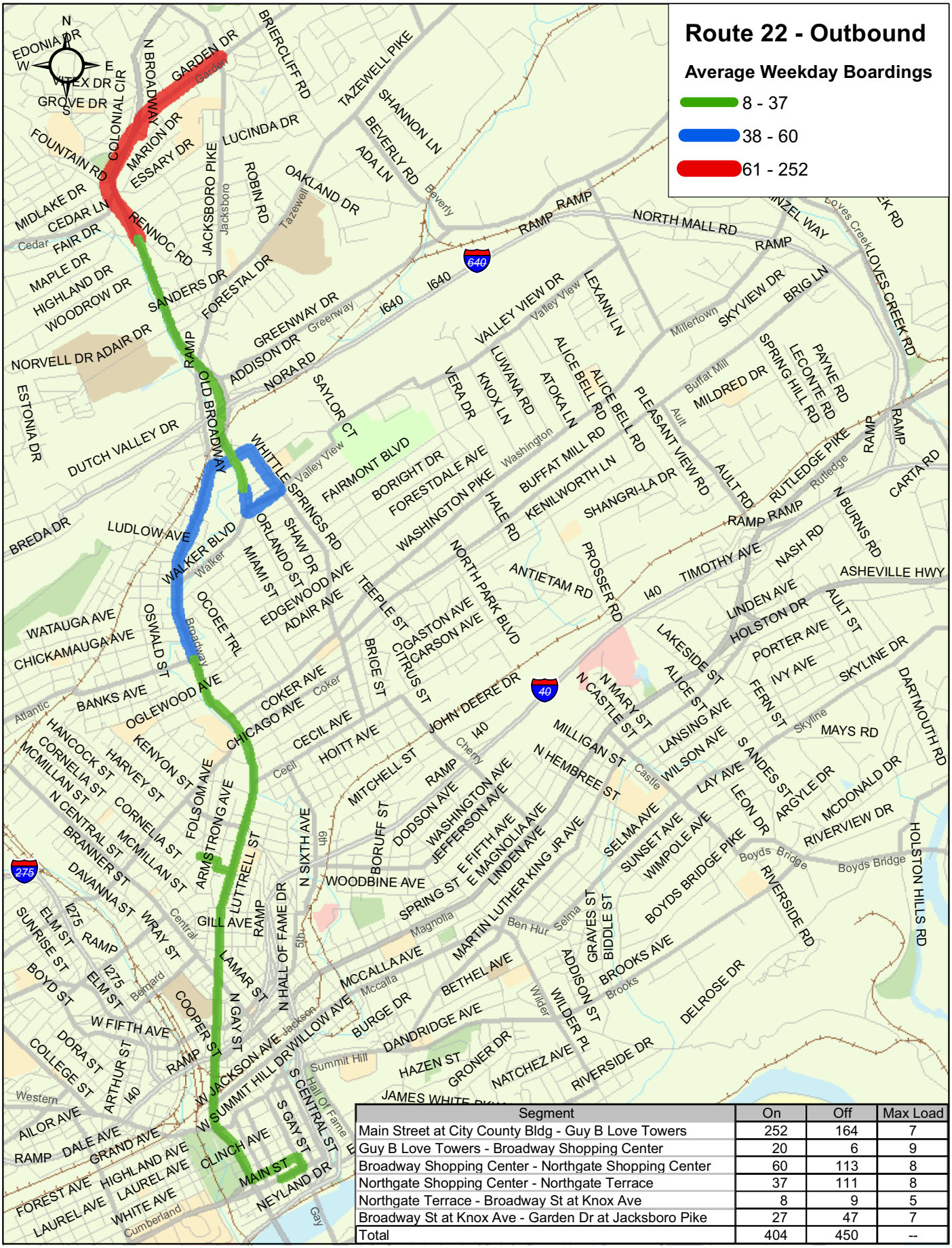
Segment	On	Off	Max Load
Main Street at City County Bldg - Guy B Love Towers	31	25	6
Guy B Love Towers - Broadway Shopping Center	11	6	8
Broadway Shopping Center - St. Mary's Hospital	5	26	3
St. Mary's Hospital - Central St at Chickamauga Ave	4	11	2
Central St at Chickamauga Ave - Chickamauga Ave at Broadway S	4	4	2
Total	55	72	--



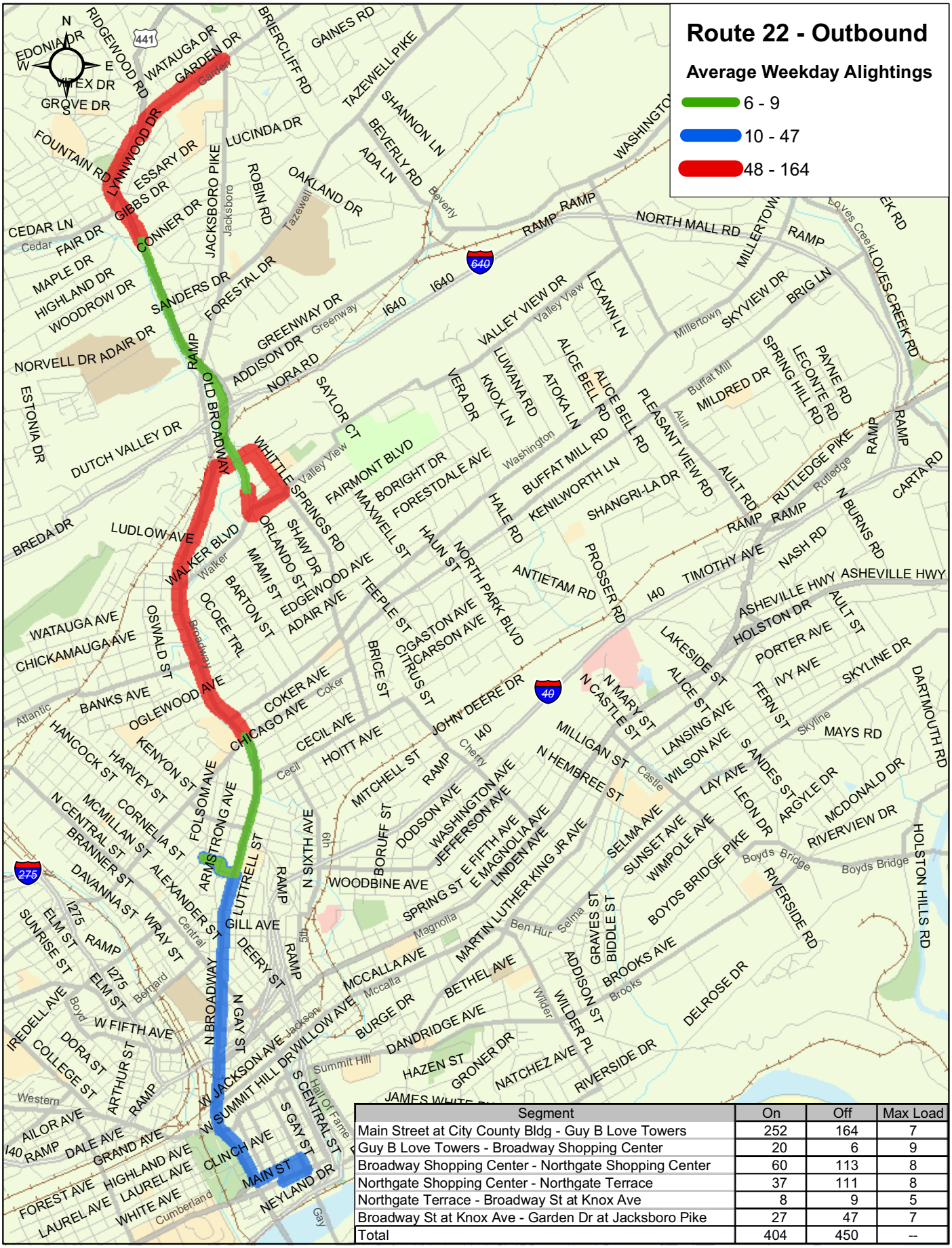
Segment	On	Off	Max Load
Garden Dr at Jacksboro Pike - Northgate Terrace	29	33	4
Northgate Terrace - Northgate Shopping Center	16	4	7
Northgate Shopping Center - Broadway Shopping Center	101	16	9
Broadway Shopping Center - Guy B Love Towers	134	98	7
Guy B Love Towers - Main Street at City County Bldg	29	42	7
Total	309	193	--



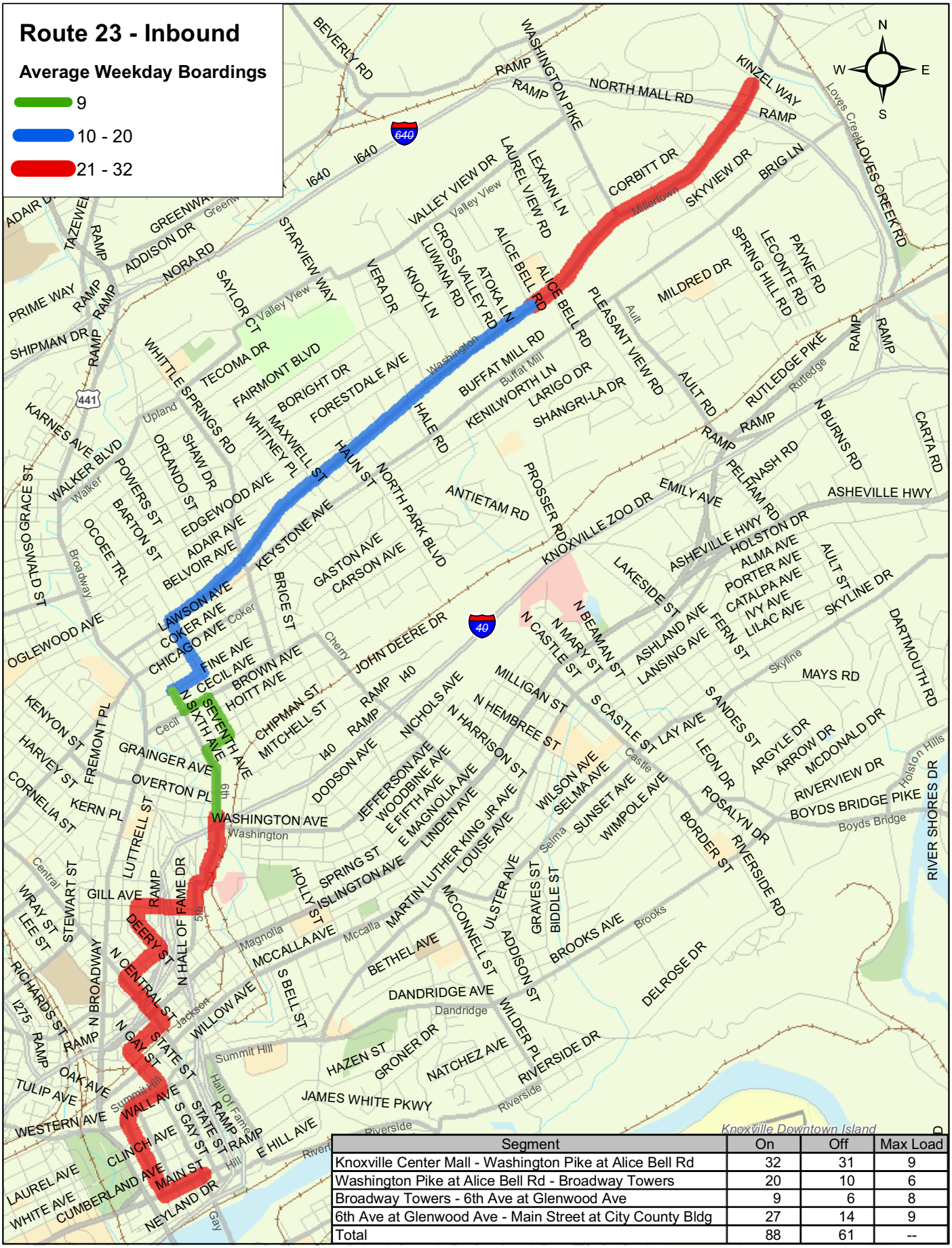
Segment	On	Off	Max Load
Garden Dr at Jacksboro Pike - Northgate Terrace	29	33	4
Northgate Terrace - Northgate Shopping Center	16	4	7
Northgate Shopping Center - Broadway Shopping Center	101	16	9
Broadway Shopping Center - Guy B Love Towers	134	98	7
Guy B Love Towers - Main Street at City County Bldg	29	42	7
Total	309	193	--



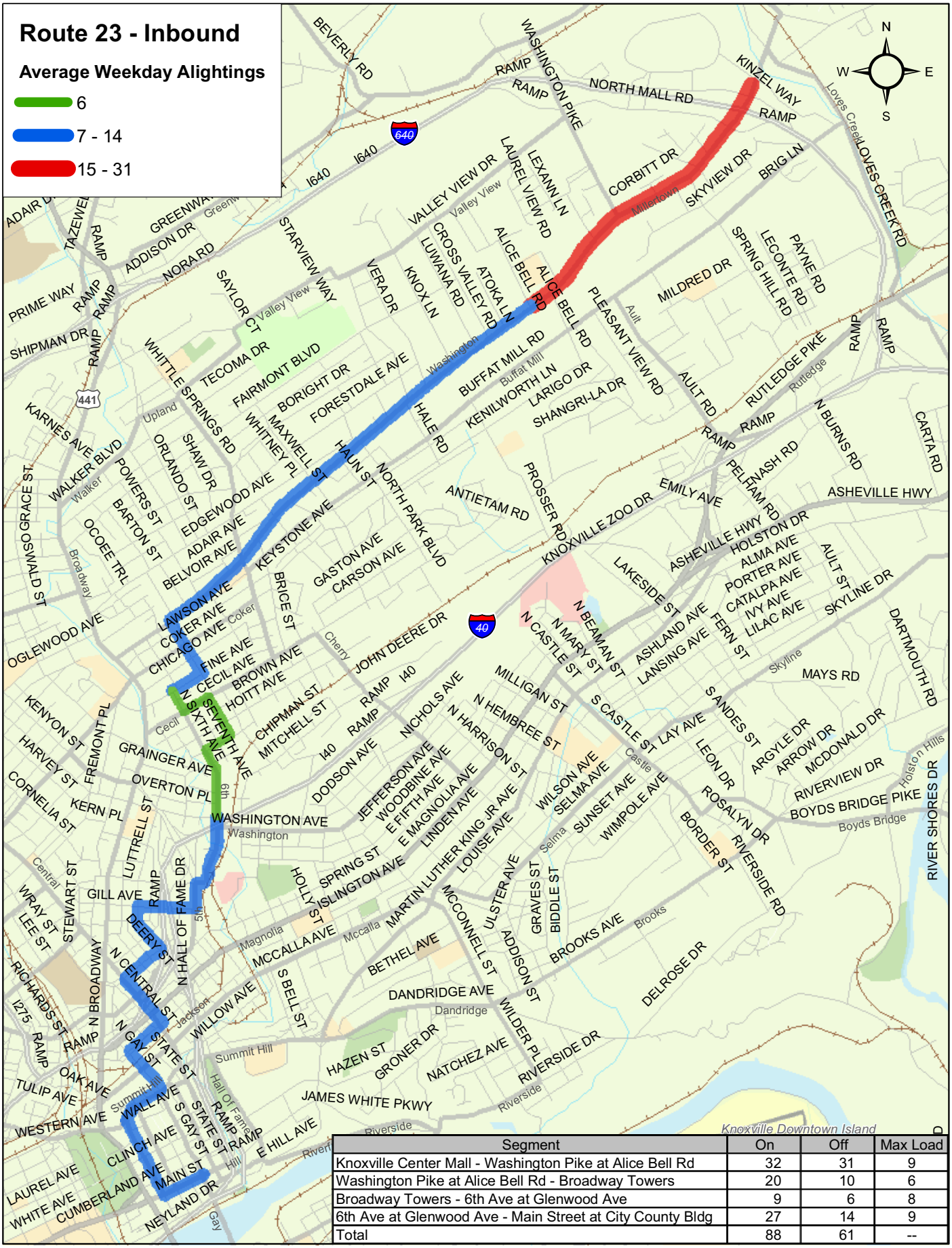
Segment	On	Off	Max Load
Main Street at City County Bldg - Guy B Love Towers	252	164	7
Guy B Love Towers - Broadway Shopping Center	20	6	9
Broadway Shopping Center - Northgate Shopping Center	60	113	8
Northgate Shopping Center - Northgate Terrace	37	111	8
Northgate Terrace - Broadway St at Knox Ave	8	9	5
Broadway St at Knox Ave - Garden Dr at Jacksboro Pike	27	47	7
Total	404	450	--



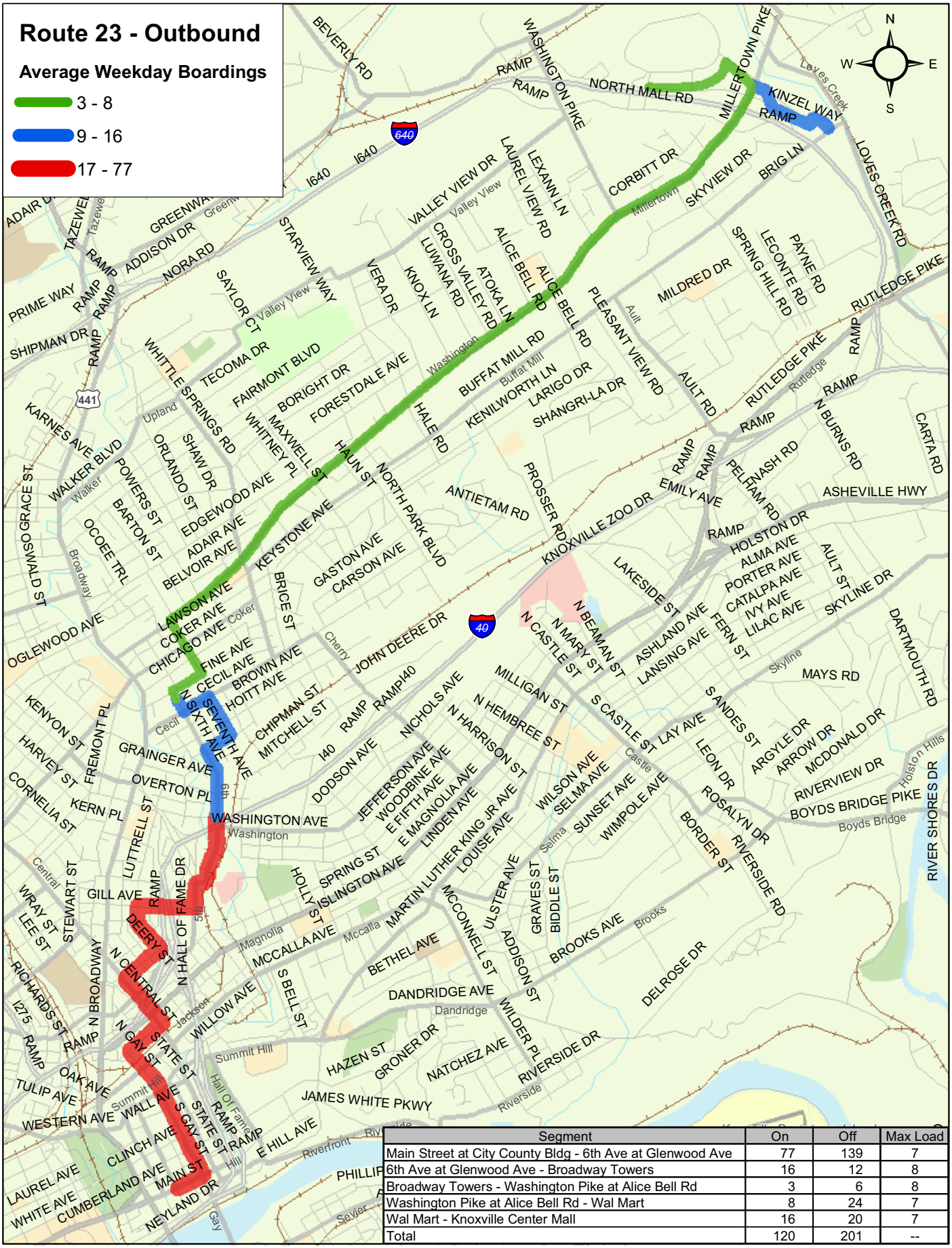
Segment	On	Off	Max Load
Main Street at City County Bldg - Guy B Love Towers	252	164	7
Guy B Love Towers - Broadway Shopping Center	20	6	9
Broadway Shopping Center - Northgate Shopping Center	60	113	8
Northgate Shopping Center - Northgate Terrace	37	111	8
Northgate Terrace - Broadway St at Knox Ave	8	9	5
Broadway St at Knox Ave - Garden Dr at Jacksboro Pike	27	47	7
Total	404	450	--



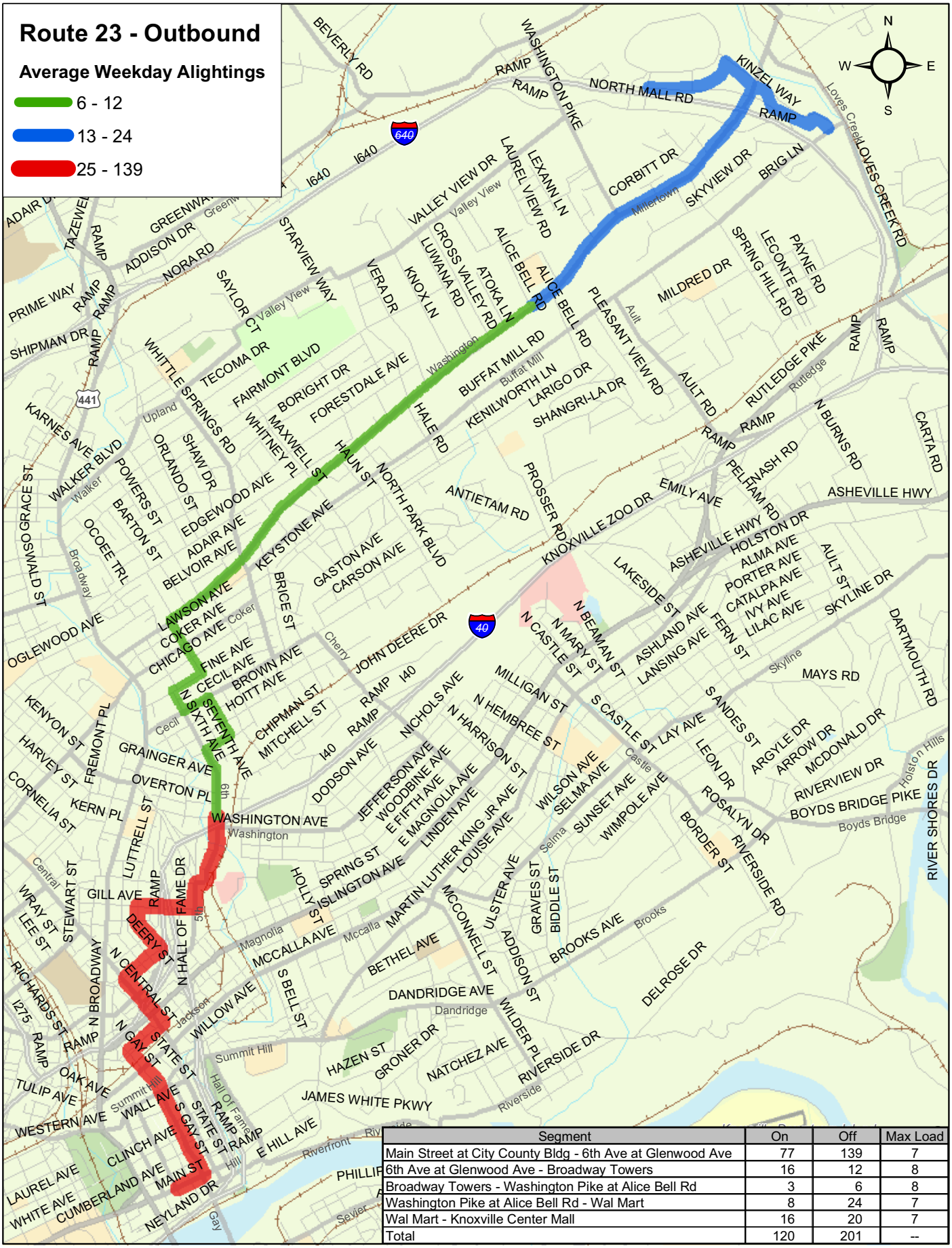
Segment	On	Off	Max Load
Knoxville Center Mall - Washington Pike at Alice Bell Rd	32	31	9
Washington Pike at Alice Bell Rd - Broadway Towers	20	10	6
Broadway Towers - 6th Ave at Glenwood Ave	9	6	8
6th Ave at Glenwood Ave - Main Street at City County Bldg	27	14	9
Total	88	61	--



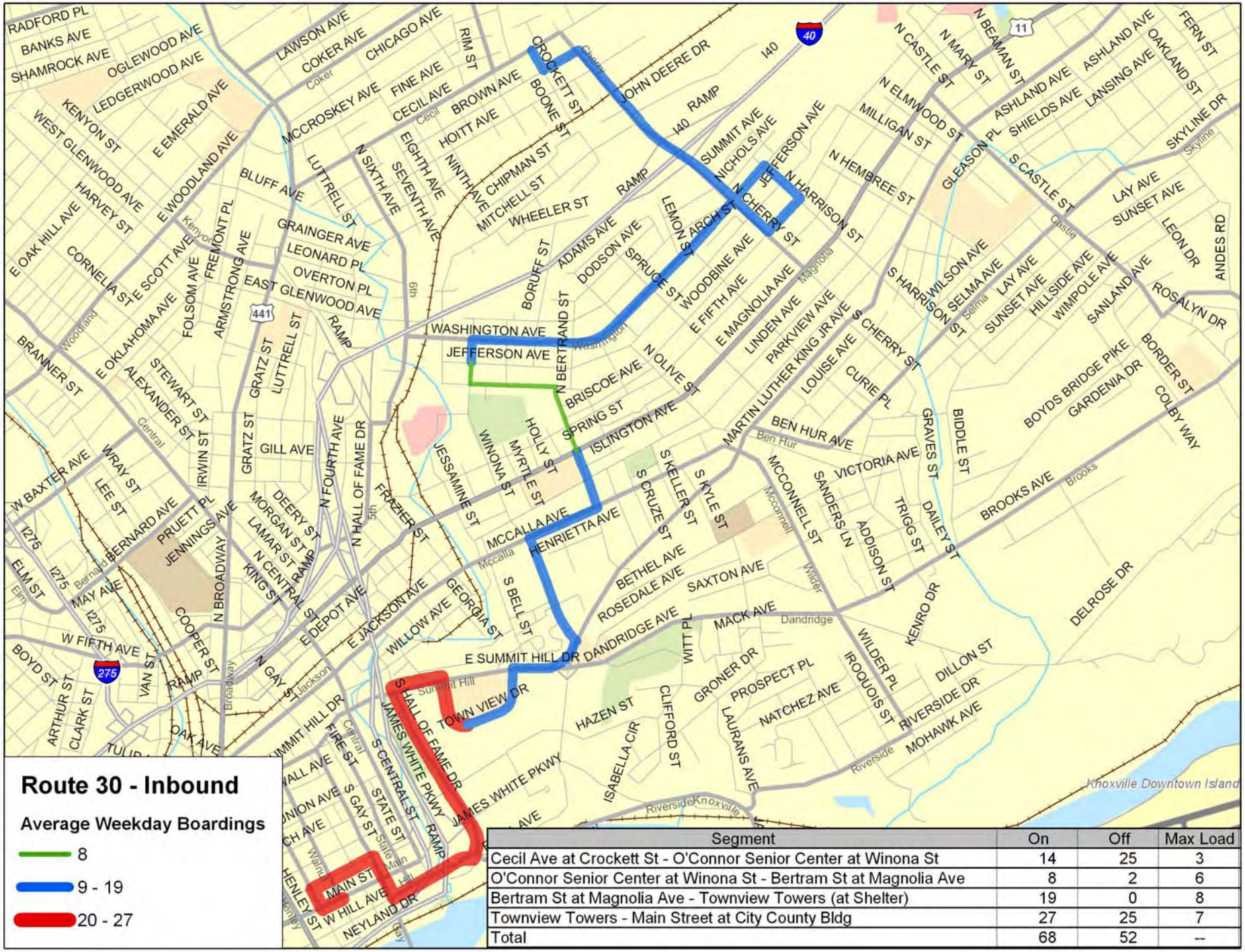
Segment	On	Off	Max Load
Knoxville Center Mall - Washington Pike at Alice Bell Rd	32	31	9
Washington Pike at Alice Bell Rd - Broadway Towers	20	10	6
Broadway Towers - 6th Ave at Glenwood Ave	9	6	8
6th Ave at Glenwood Ave - Main Street at City County Bldg	27	14	9
Total	88	61	--



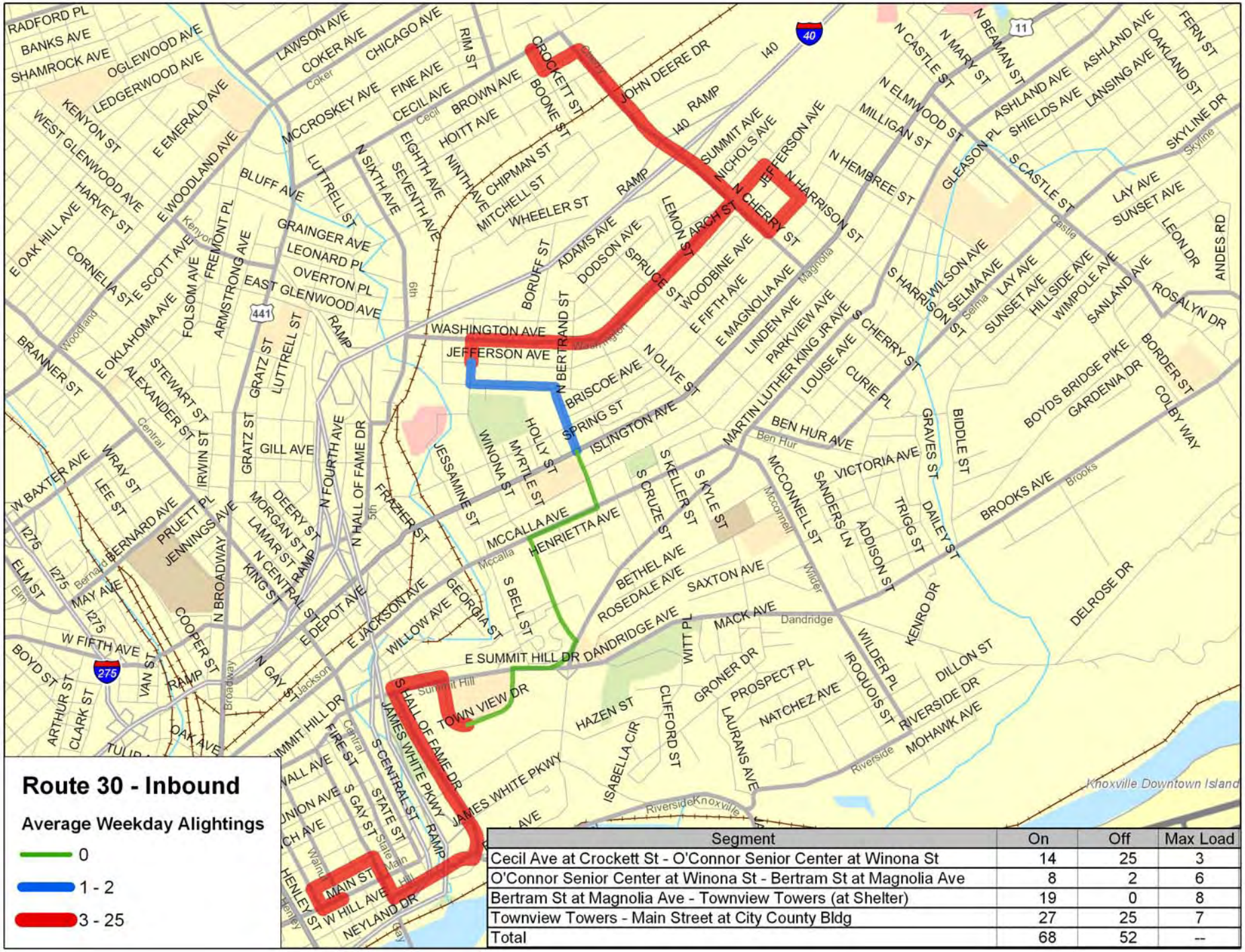
Segment	On	Off	Max Load
Main Street at City County Bldg - 6th Ave at Glenwood Ave	77	139	7
6th Ave at Glenwood Ave - Broadway Towers	16	12	8
Broadway Towers - Washington Pike at Alice Bell Rd	3	6	8
Washington Pike at Alice Bell Rd - Wal Mart	8	24	7
Wal Mart - Knoxville Center Mall	16	20	7
Total	120	201	--



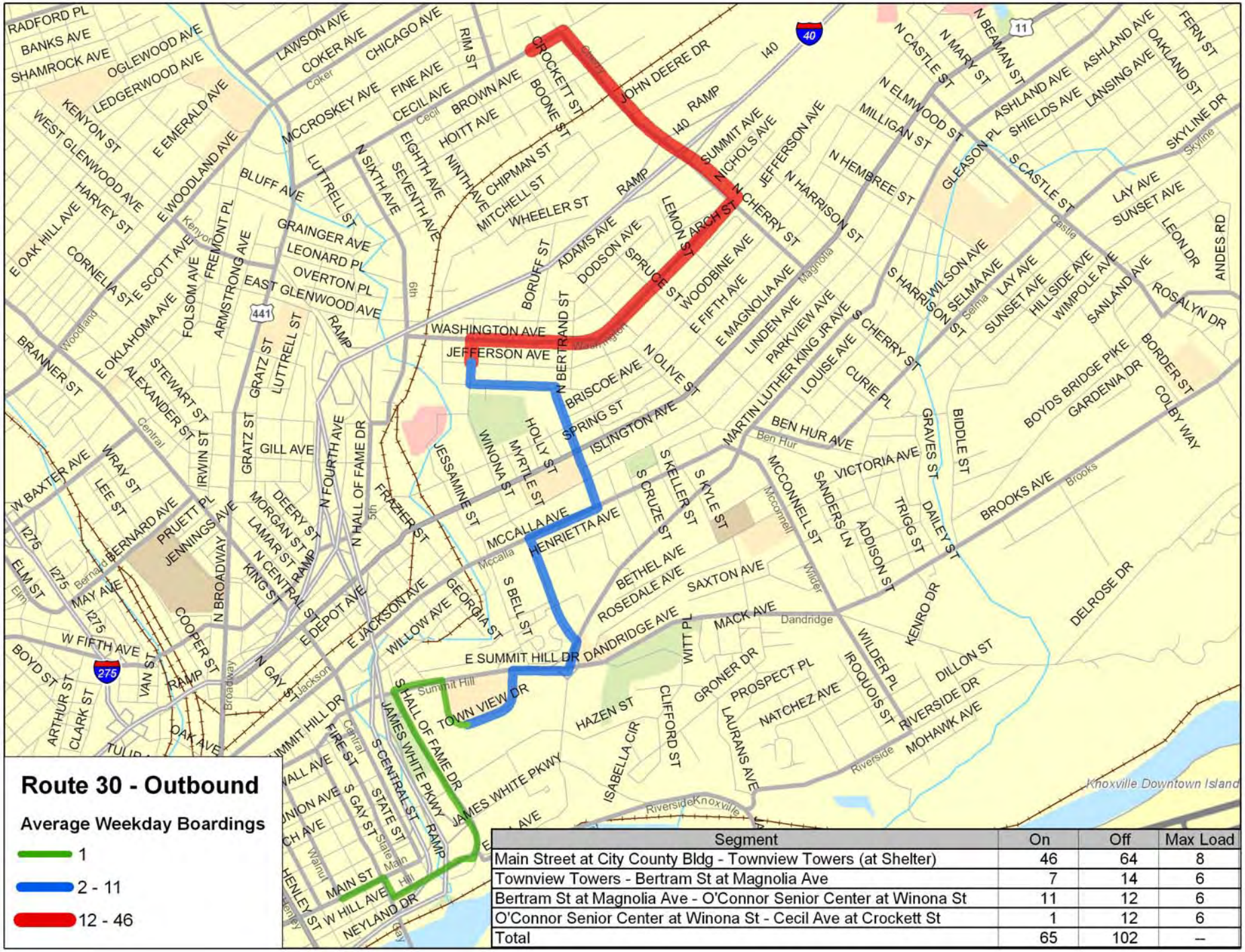
Segment	On	Off	Max Load
Main Street at City County Bldg - 6th Ave at Glenwood Ave	77	139	7
6th Ave at Glenwood Ave - Broadway Towers	16	12	8
Broadway Towers - Washington Pike at Alice Bell Rd	3	6	8
Washington Pike at Alice Bell Rd - Wal Mart	8	24	7
Wal Mart - Knoxville Center Mall	16	20	7
Total	120	201	--



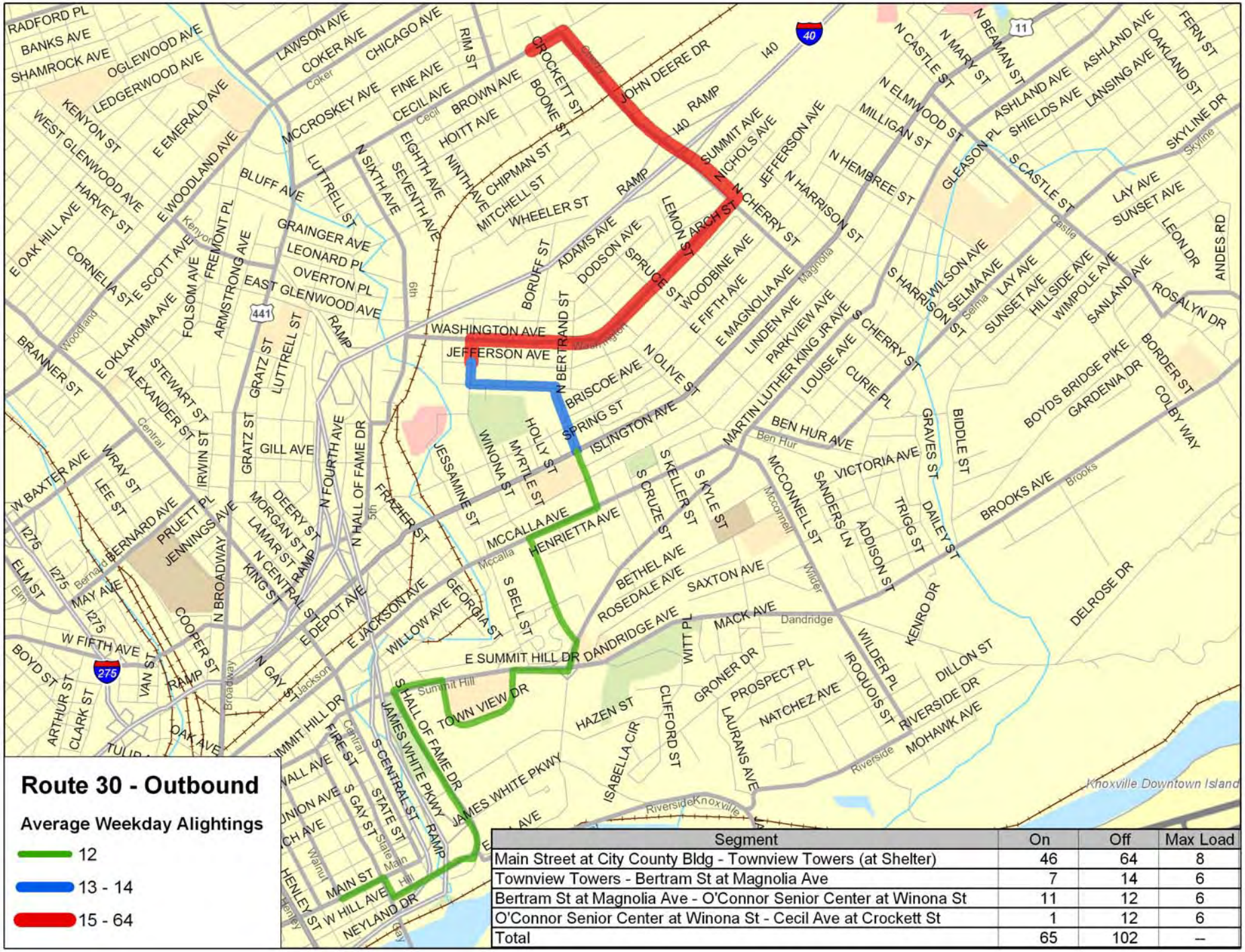
Segment	On	Off	Max Load
Cecil Ave at Crockett St - O'Connor Senior Center at Winona St	14	25	3
O'Connor Senior Center at Winona St - Bertram St at Magnolia Ave	8	2	6
Bertram St at Magnolia Ave - Townview Towers (at Shelter)	19	0	8
Townview Towers - Main Street at City County Bldg	27	25	7
Total	68	52	--



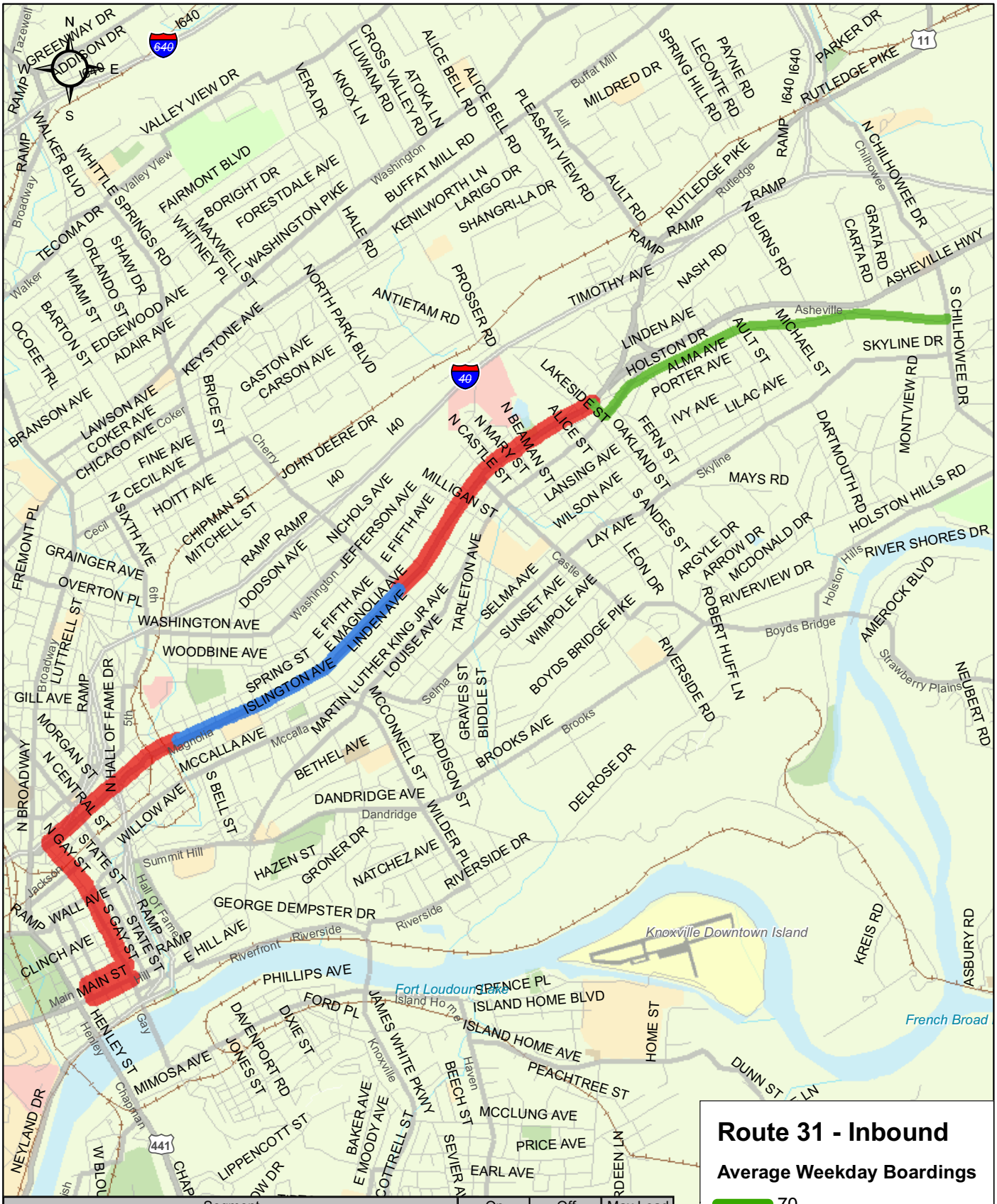
Segment	On	Off	Max Load
Cecil Ave at Crockett St - O'Connor Senior Center at Winona St	14	25	3
O'Connor Senior Center at Winona St - Bertram St at Magnolia Ave	8	2	6
Bertram St at Magnolia Ave - Townview Towers (at Shelter)	19	0	8
Townview Towers - Main Street at City County Bldg	27	25	7
Total	68	52	--



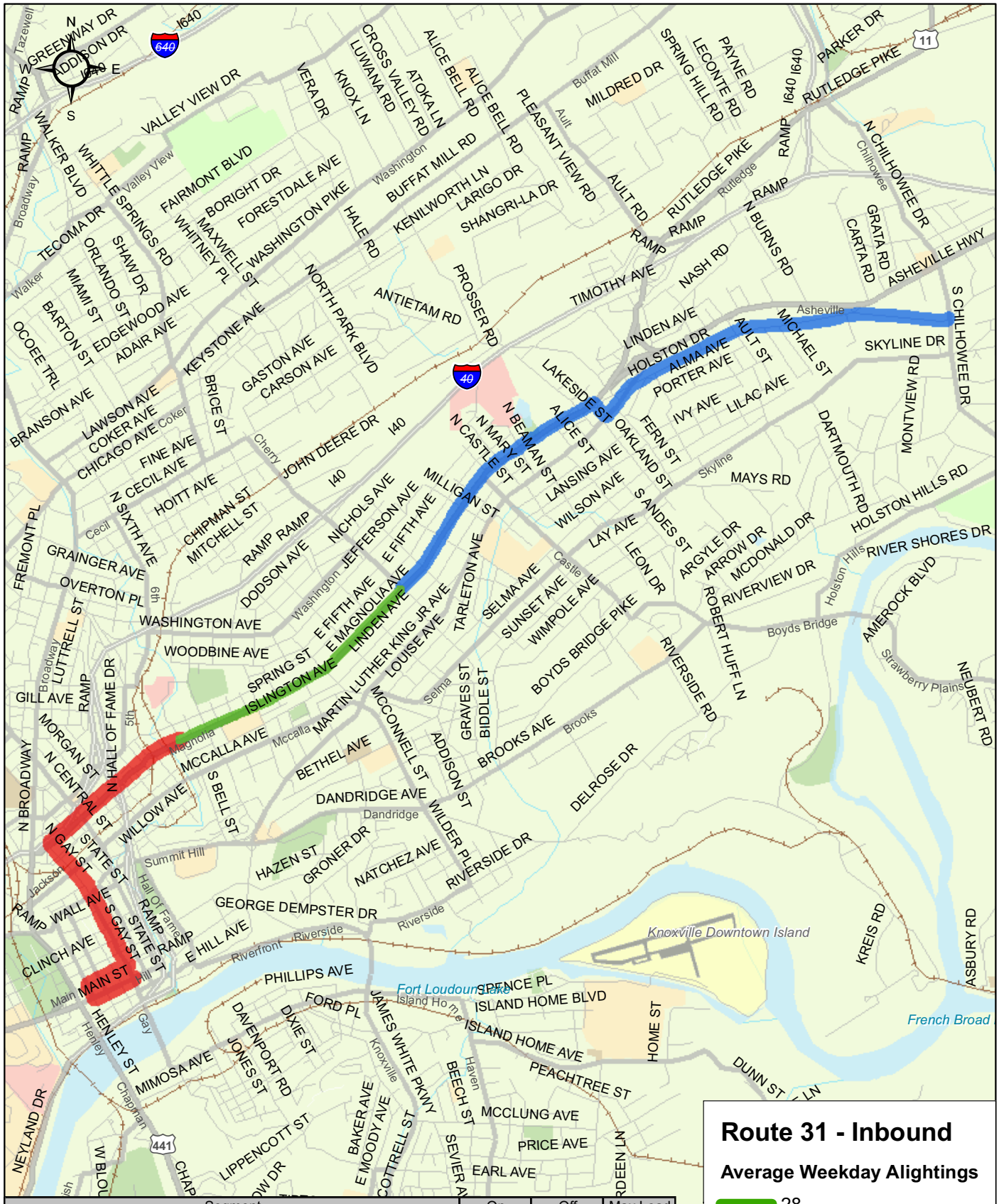
Segment	On	Off	Max Load
Main Street at City County Bldg - Townview Towers (at Shelter)	46	64	8
Townview Towers - Bertram St at Magnolia Ave	7	14	6
Bertram St at Magnolia Ave - O'Connor Senior Center at Winona St	11	12	6
O'Connor Senior Center at Winona St - Cecil Ave at Crockett St	1	12	6
Total	65	102	–



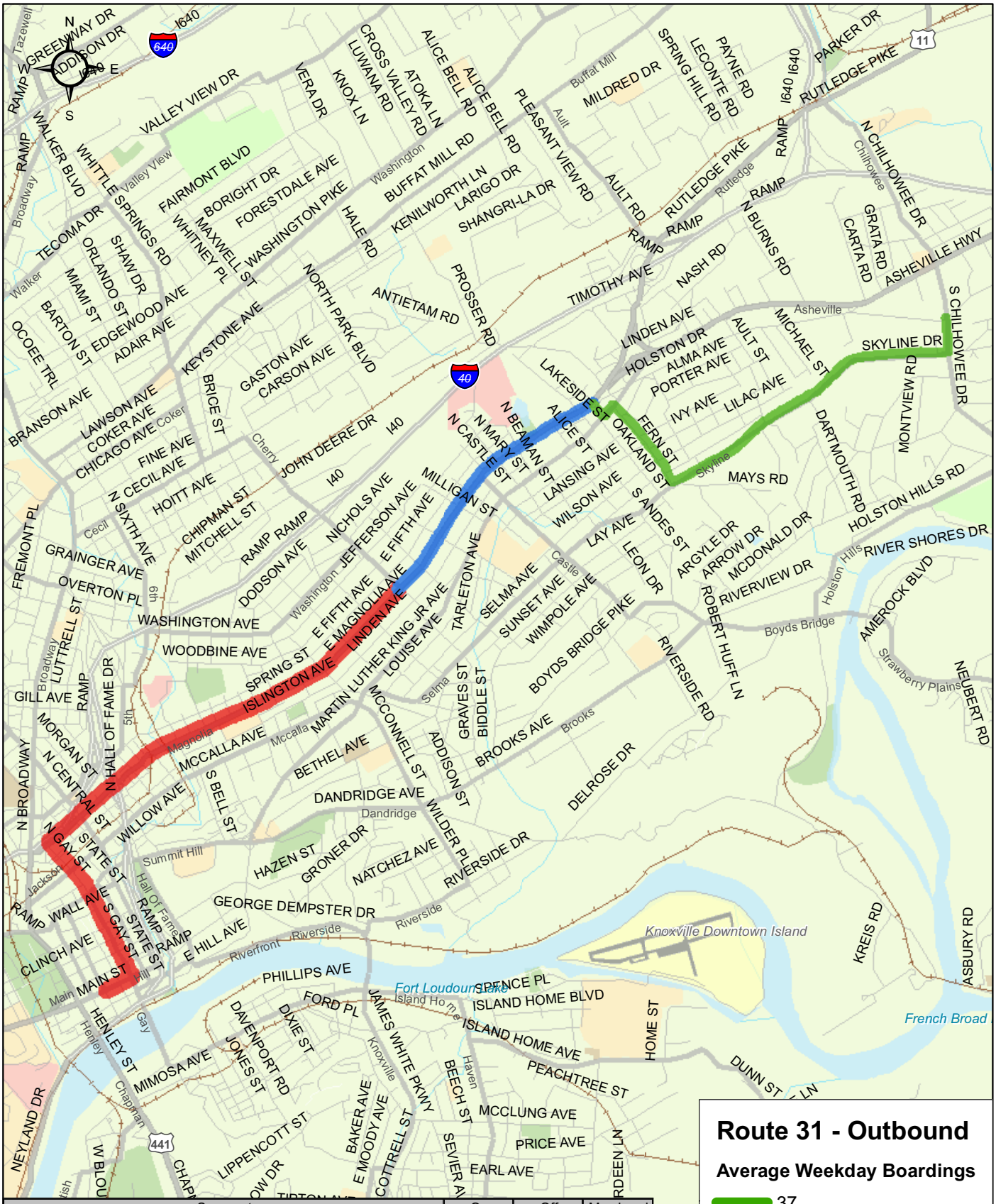
Segment	On	Off	Max Load
Main Street at City County Bldg - Townview Towers (at Shelter)	46	64	8
Townview Towers - Bertram St at Magnolia Ave	7	14	6
Bertram St at Magnolia Ave - O'Connor Senior Center at Winona St	11	12	6
O'Connor Senior Center at Winona St - Cecil Ave at Crockett St	1	12	6
Total	65	102	–



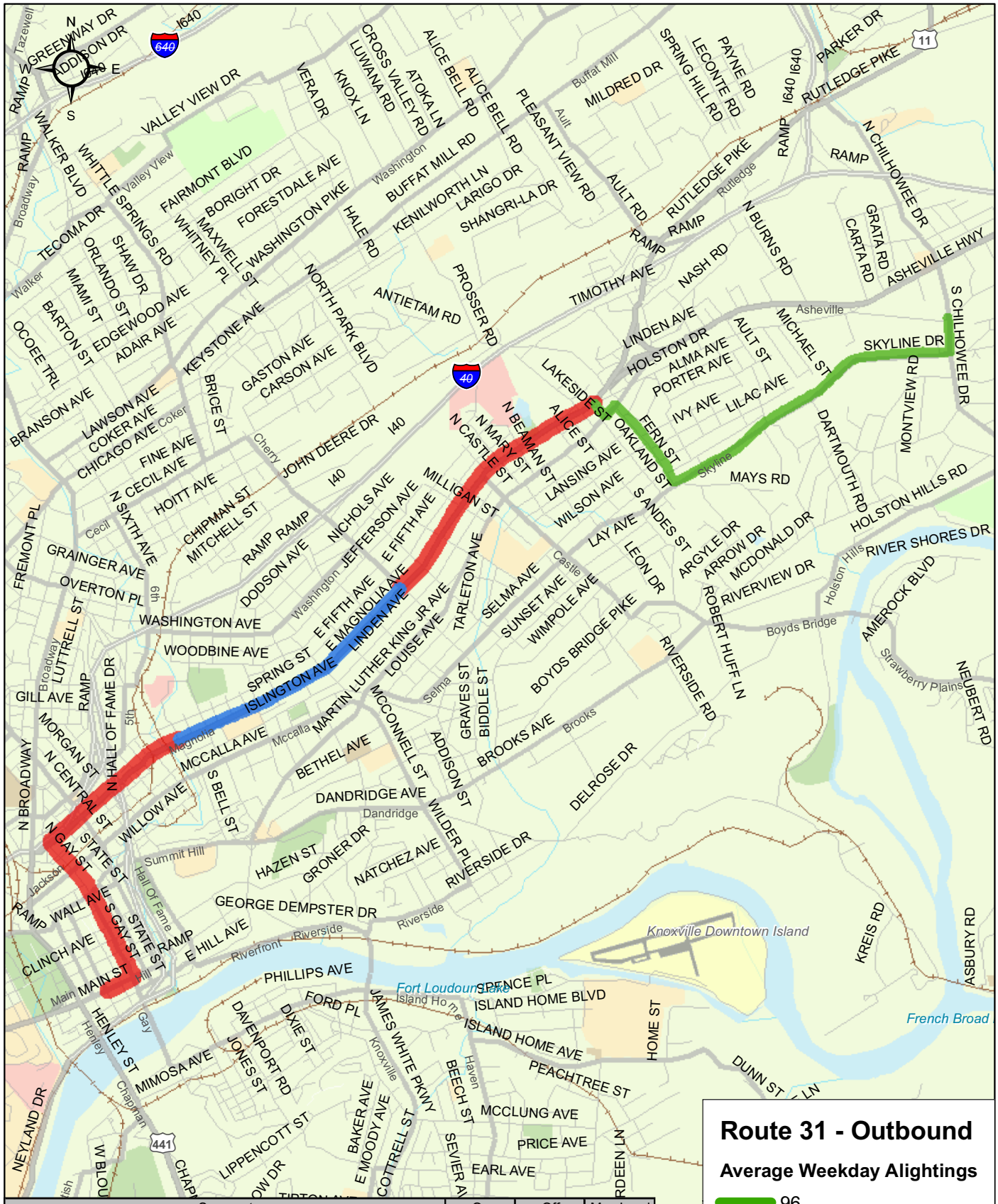
Segment	On	Off	Max Load
Chihowee Ave at Holston Dr - Magnolia Ave at Kirkwood St	70	59	9
Magnolia Ave at Kirkwood St - Magnolia Ave at Cherry St	139	72	9
Magnolia Ave at Cherry St - Magnolia Ave at Jessamine St	104	28	9
Magnolia Ave at Jessamine St - Main Street at City County Bldg	132	105	9
Total	445	264	--



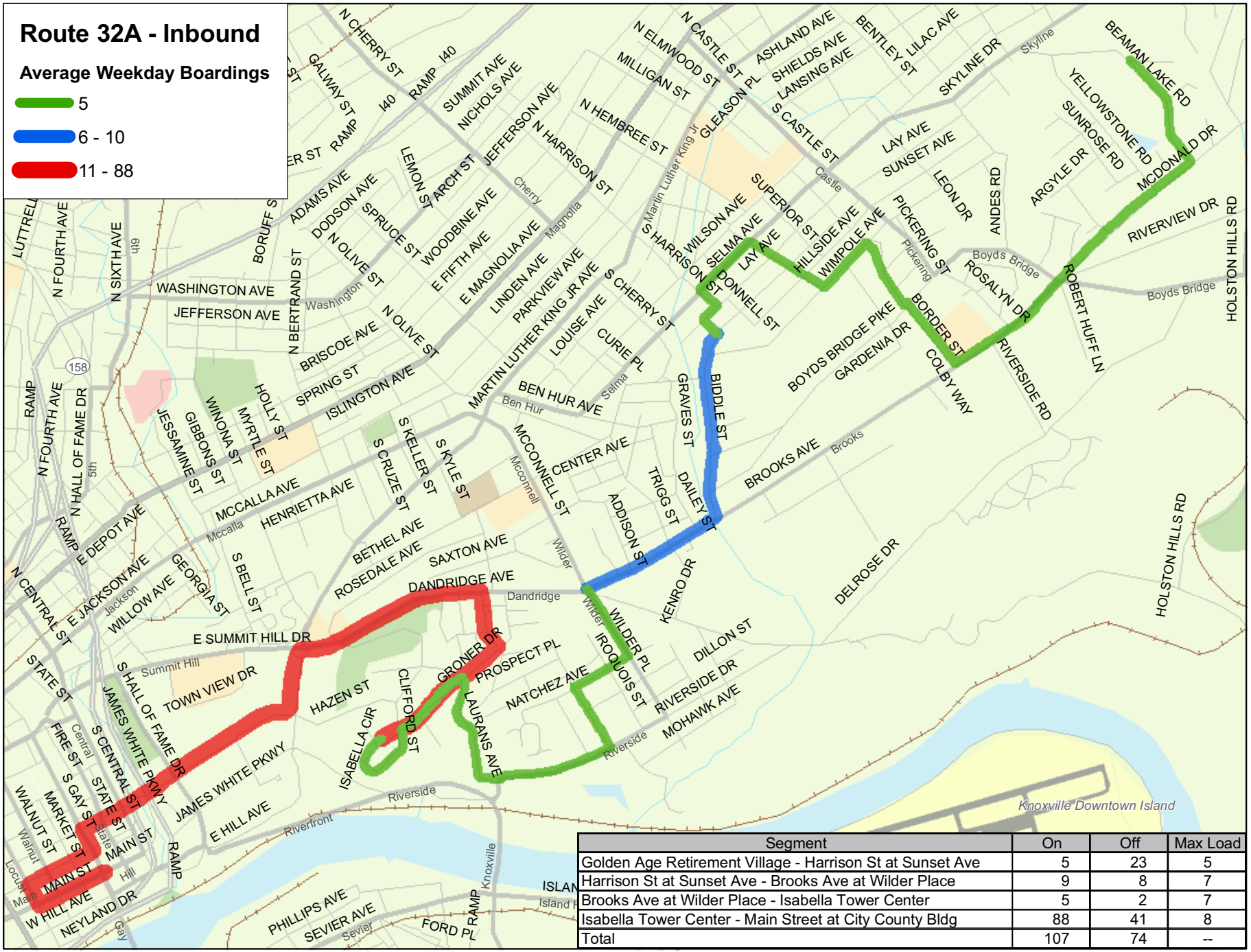
Segment	On	Off	Max Load
Chihowee Ave at Holston Dr - Magnolia Ave at Kirkwood St	70	59	9
Magnolia Ave at Kirkwood St - Magnolia Ave at Cherry St	139	72	9
Magnolia Ave at Cherry St - Magnolia Ave at Jessamine St	104	28	9
Magnolia Ave at Jessamine St - Main Street at City County Bldg	132	105	9
Total	445	264	--



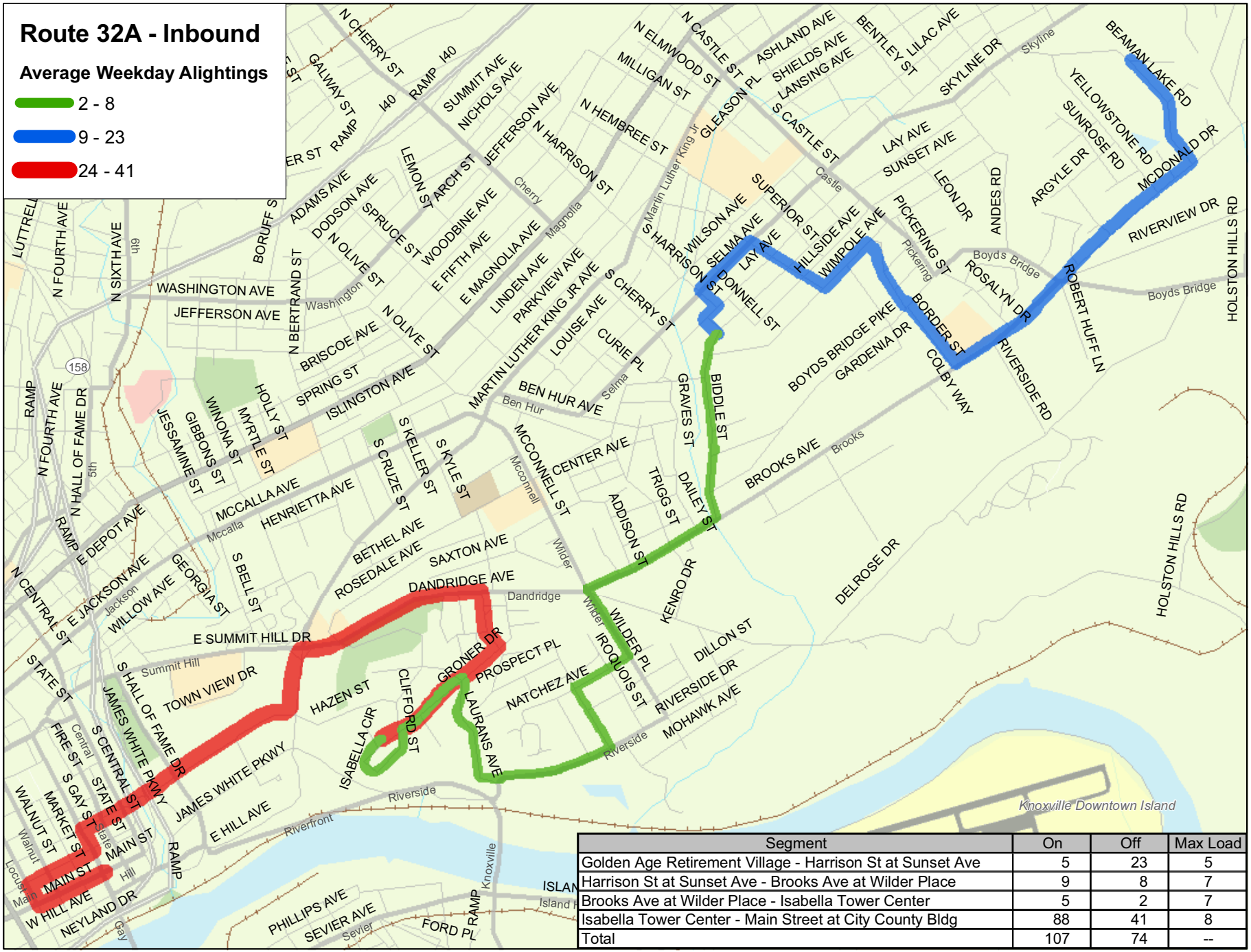
Segment	On	Off	Max Load
Main Street at City County Bldg - Magnolia Ave at Jessamine St	205	141	8
Magnolia Ave at Jessamine St - Magnolia Ave at Cherry St	125	105	9
Magnolia Ave at Cherry St - Magnolia Ave at Kirkwood St	42	141	8
Magnolia Ave at Kirkwood St - Chihowee Ave at Holston Dr	37	96	9
Total	409	483	--



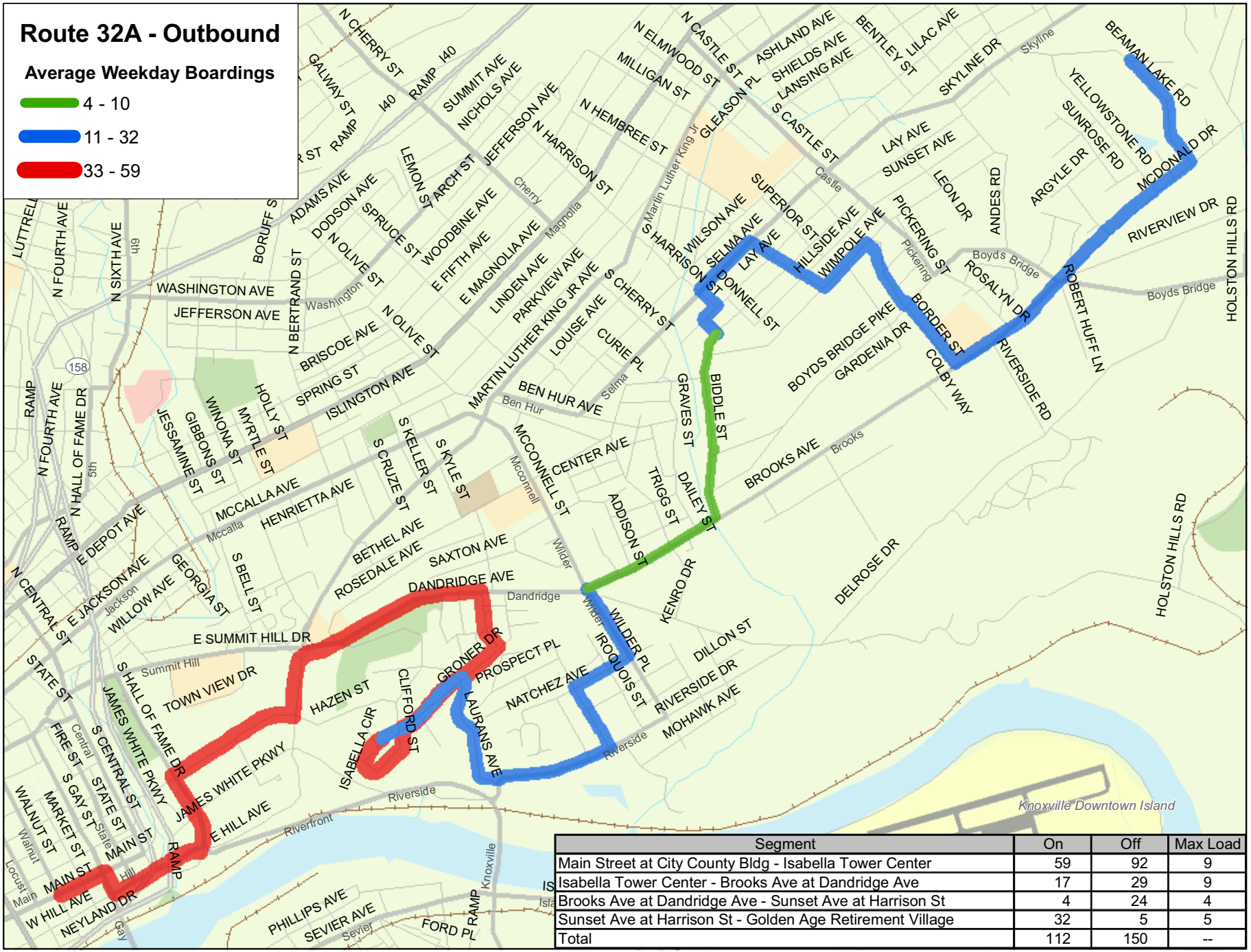
Segment	On	Off	Max Load
Main Street at City County Bldg - Magnolia Ave at Jessamine St	205	141	8
Magnolia Ave at Jessamine St - Magnolia Ave at Cherry St	125	105	9
Magnolia Ave at Cherry St - Magnolia Ave at Kirkwood St	42	141	8
Magnolia Ave at Kirkwood St - Chihowee Ave at Holston Dr	37	96	9
Total	409	483	--



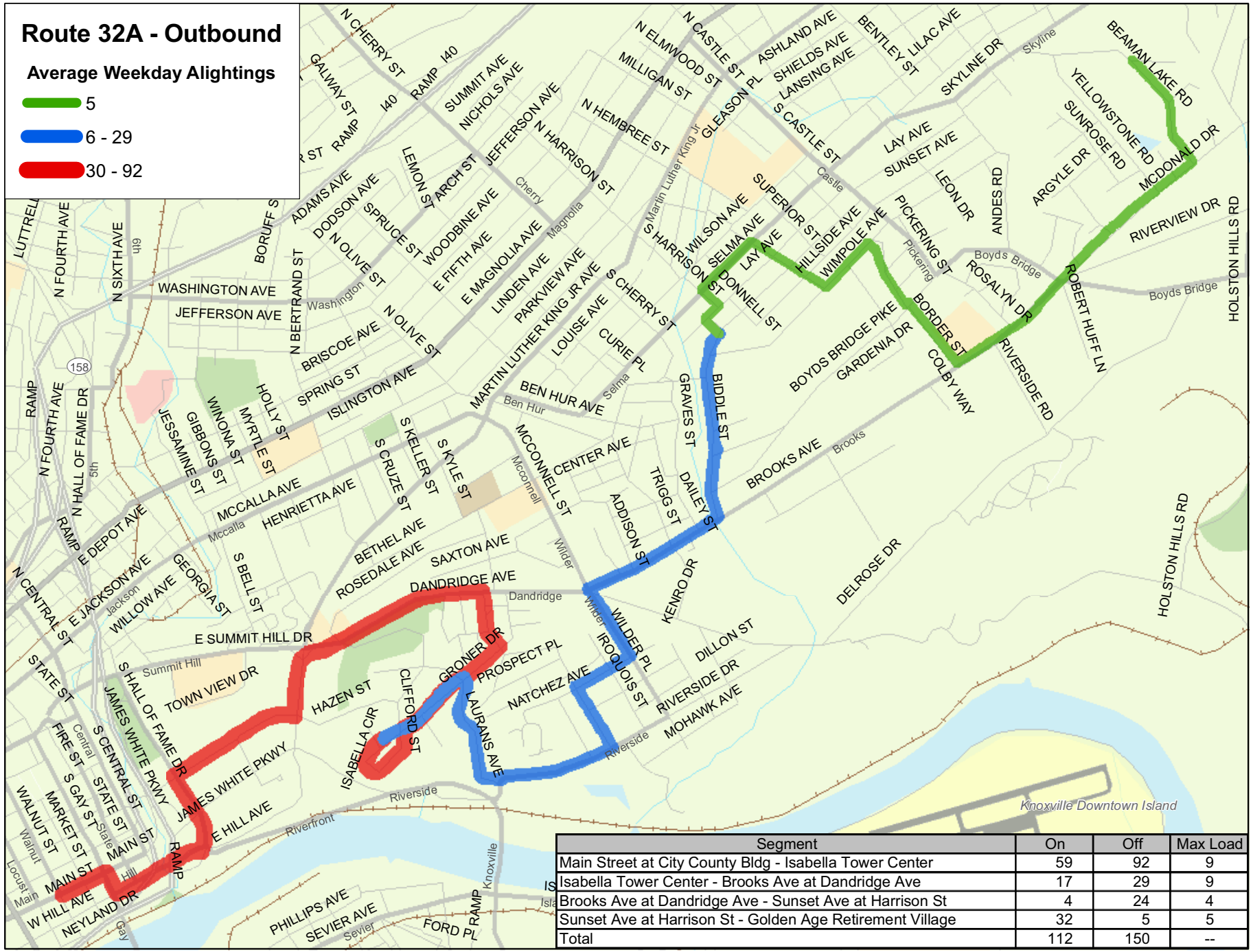
Segment	On	Off	Max Load
Golden Age Retirement Village - Harrison St at Sunset Ave	5	23	5
Harrison St at Sunset Ave - Brooks Ave at Wilder Place	9	8	7
Brooks Ave at Wilder Place - Isabella Tower Center	5	2	7
Isabella Tower Center - Main Street at City County Bldg	88	41	8
Total	107	74	--



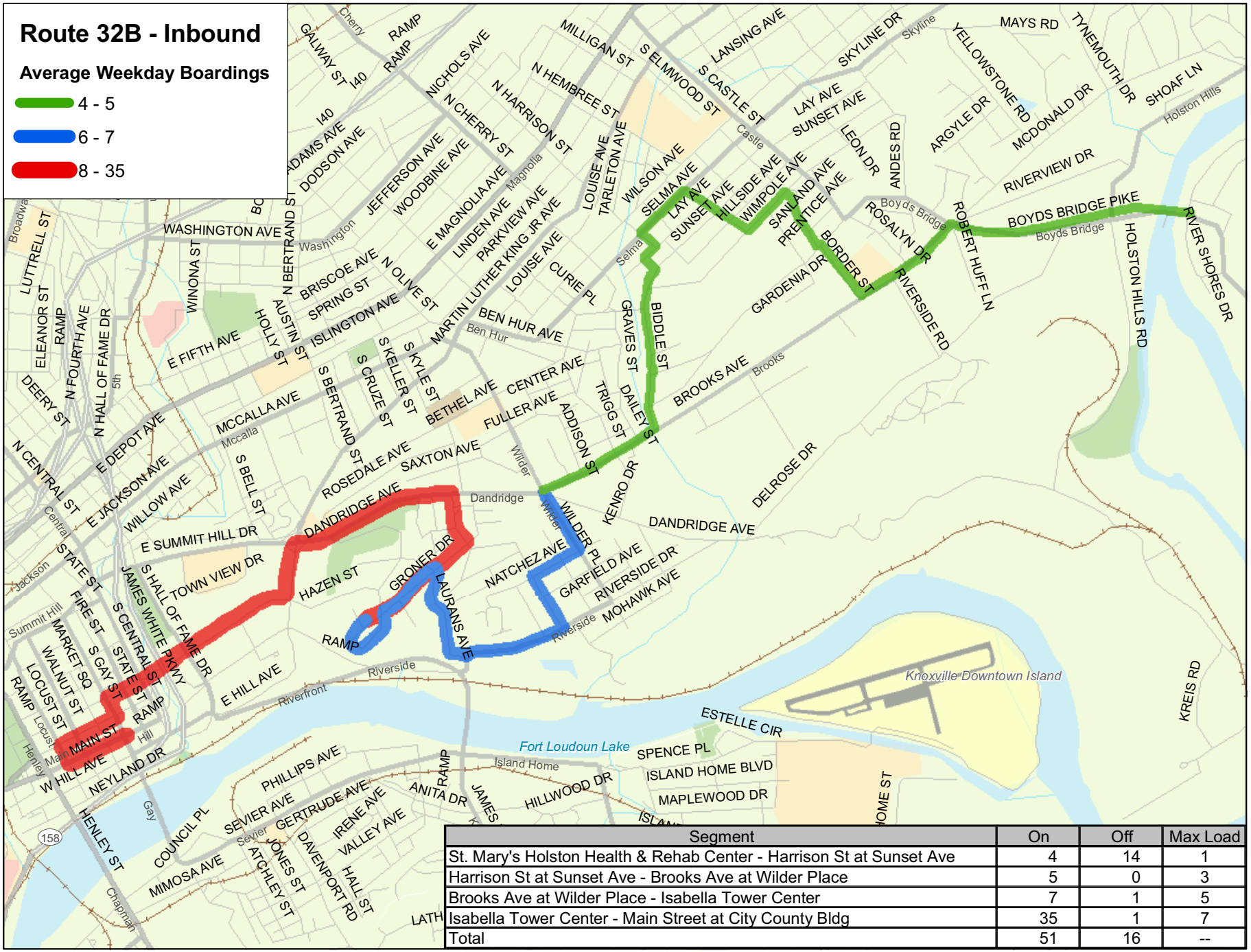
Segment	On	Off	Max Load
Golden Age Retirement Village - Harrison St at Sunset Ave	5	23	5
Harrison St at Sunset Ave - Brooks Ave at Wilder Place	9	8	7
Brooks Ave at Wilder Place - Isabella Tower Center	5	2	7
Isabella Tower Center - Main Street at City County Bldg	88	41	8
Total	107	74	--



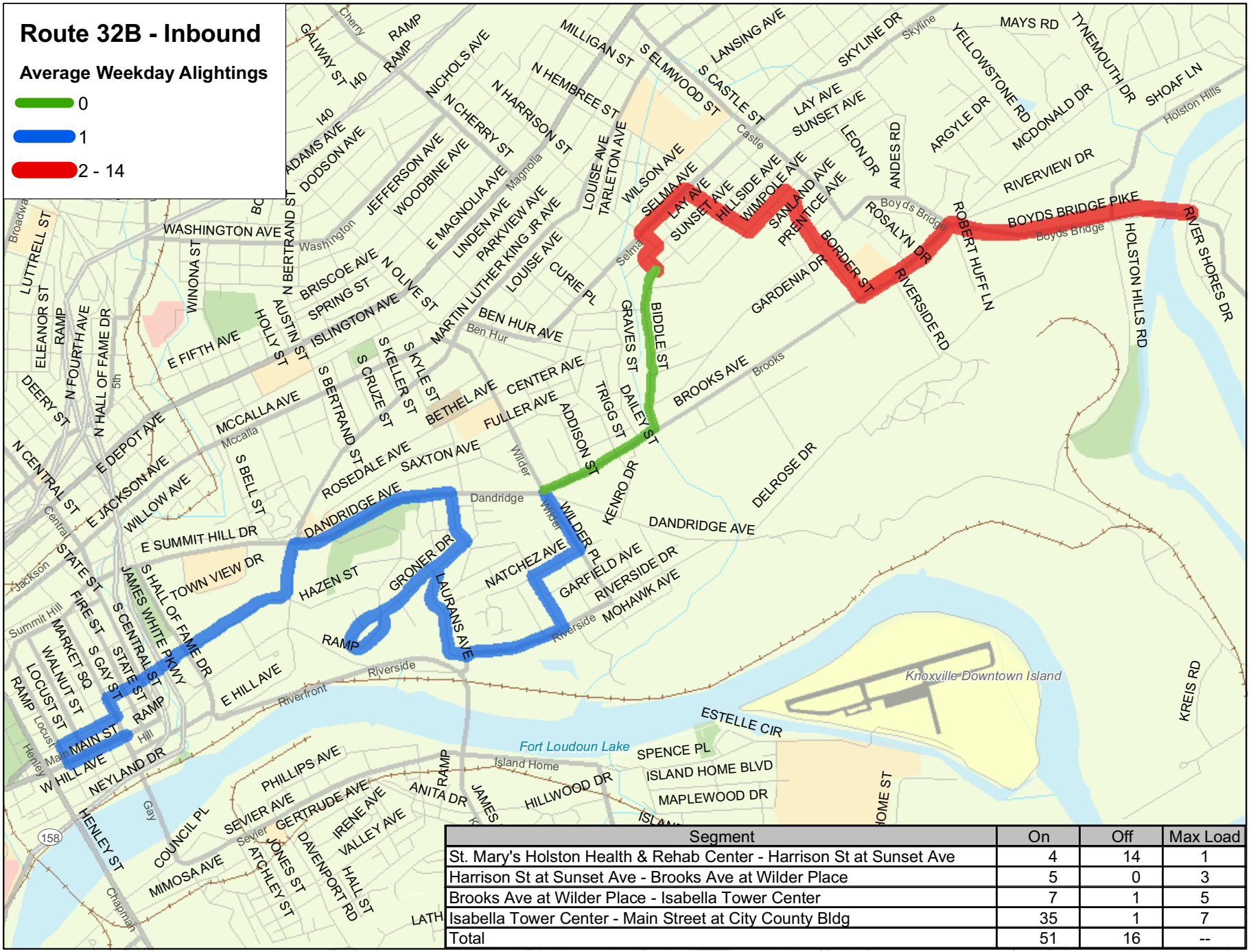
Segment	On	Off	Max Load
Main Street at City County Bldg - Isabella Tower Center	59	92	9
Isabella Tower Center - Brooks Ave at Dandridge Ave	17	29	9
Brooks Ave at Dandridge Ave - Sunset Ave at Harrison St	4	24	4
Sunset Ave at Harrison St - Golden Age Retirement Village	32	5	5
Total	112	150	--



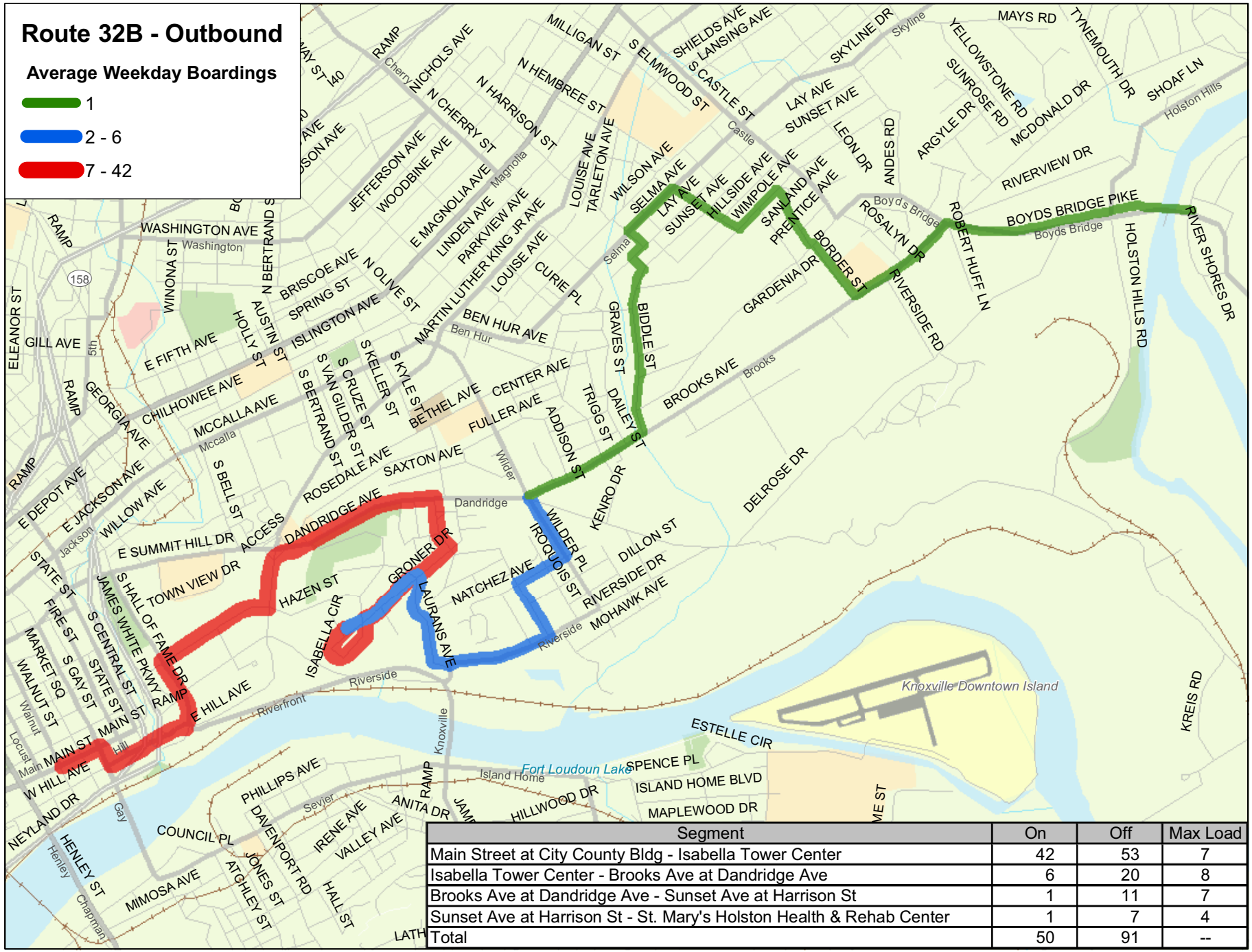
Segment	On	Off	Max Load
Main Street at City County Bldg - Isabella Tower Center	59	92	9
Isabella Tower Center - Brooks Ave at Dandridge Ave	17	29	9
Brooks Ave at Dandridge Ave - Sunset Ave at Harrison St	4	24	4
Sunset Ave at Harrison St - Golden Age Retirement Village	32	5	5
Total	112	150	--



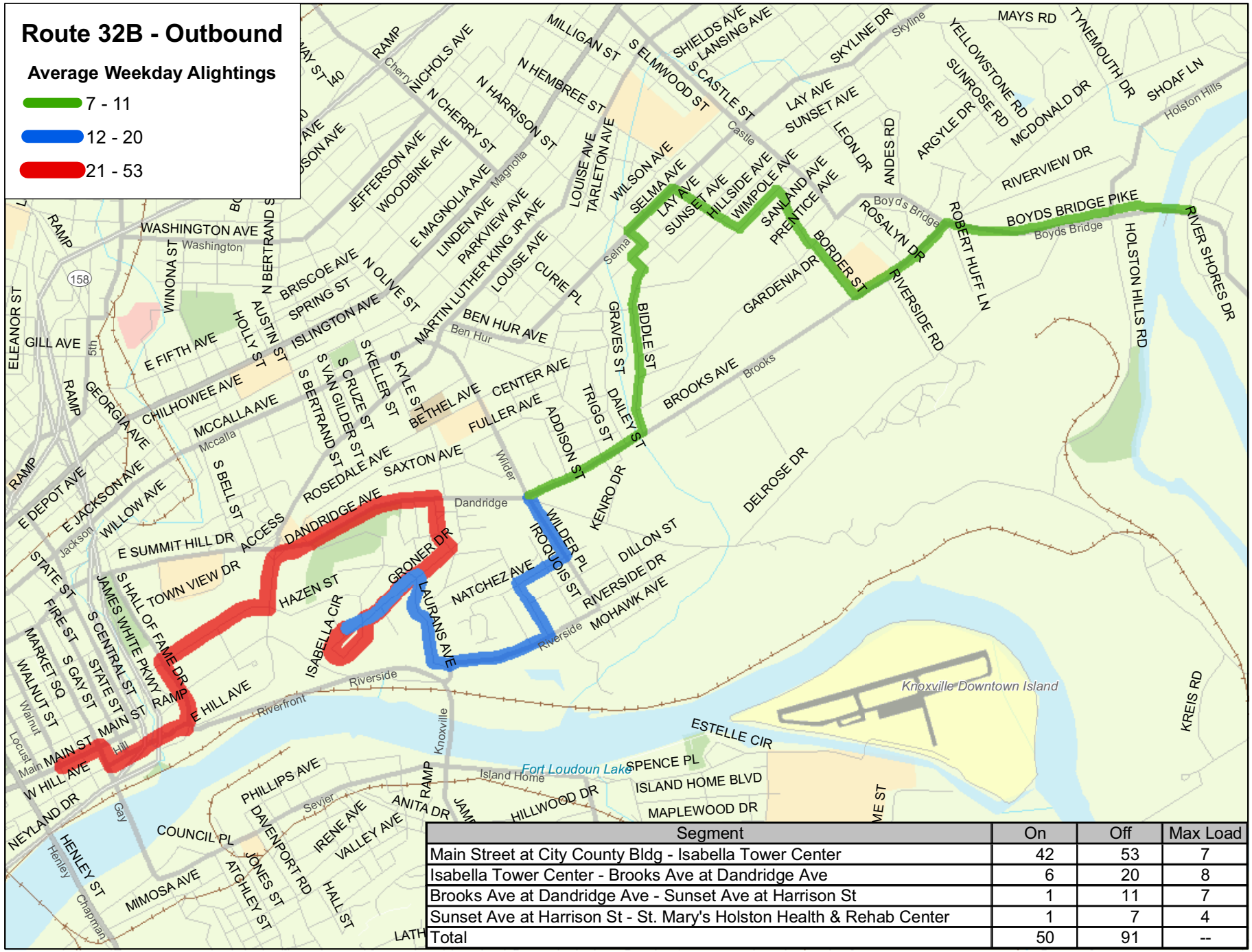
Segment	On	Off	Max Load
St. Mary's Holston Health & Rehab Center - Harrison St at Sunset Ave	4	14	1
Harrison St at Sunset Ave - Brooks Ave at Wilder Place	5	0	3
Brooks Ave at Wilder Place - Isabella Tower Center	7	1	5
Isabella Tower Center - Main Street at City County Bldg	35	1	7
Total	51	16	--



Segment	On	Off	Max Load
St. Mary's Holston Health & Rehab Center - Harrison St at Sunset Ave	4	14	1
Harrison St at Sunset Ave - Brooks Ave at Wilder Place	5	0	3
Brooks Ave at Wilder Place - Isabella Tower Center	7	1	5
Isabella Tower Center - Main Street at City County Bldg	35	1	7
Total	51	16	--



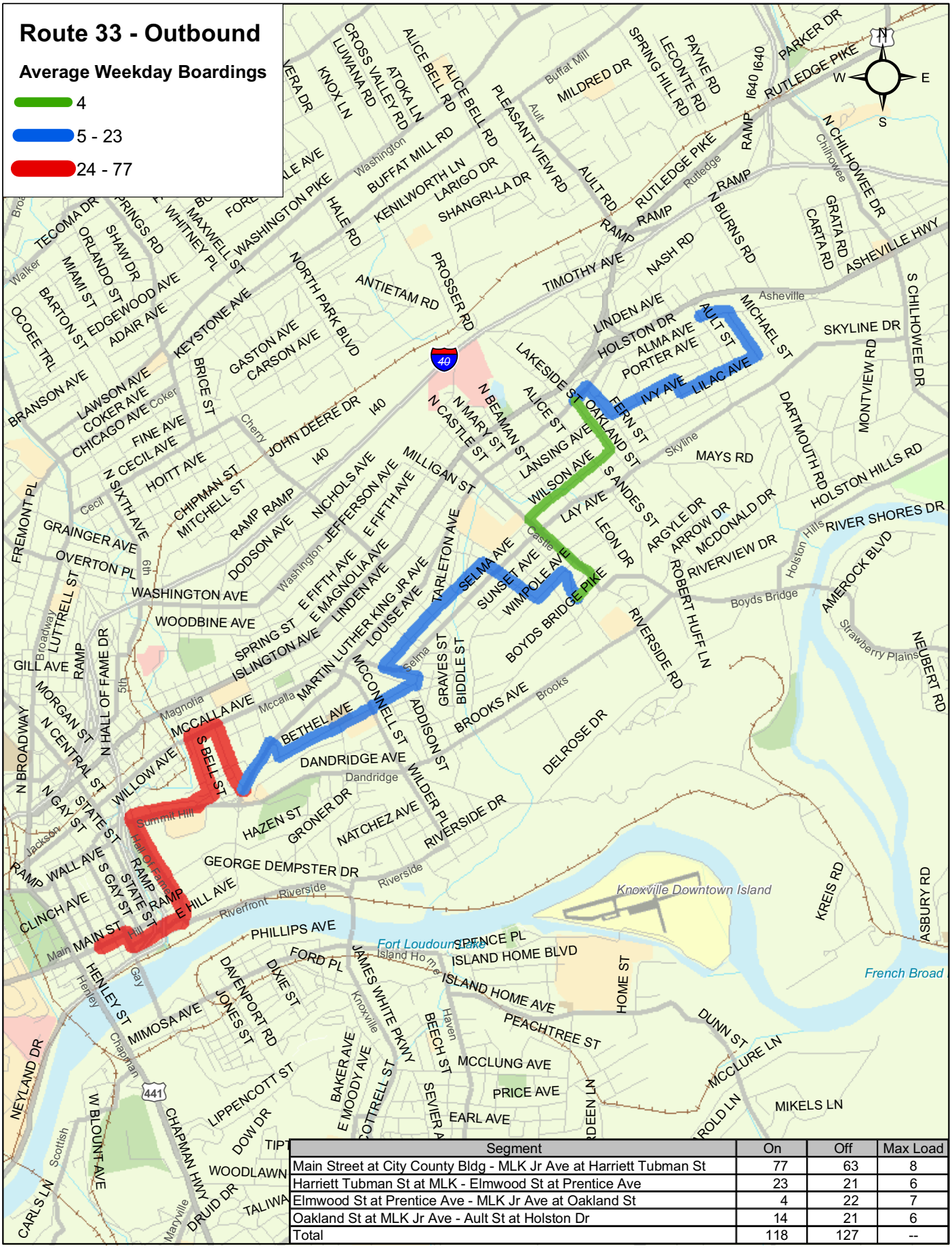
Segment	On	Off	Max Load
Main Street at City County Bldg - Isabella Tower Center	42	53	7
Isabella Tower Center - Brooks Ave at Dandridge Ave	6	20	8
Brooks Ave at Dandridge Ave - Sunset Ave at Harrison St	1	11	7
Sunset Ave at Harrison St - St. Mary's Holston Health & Rehab Center	1	7	4
Total	50	91	--



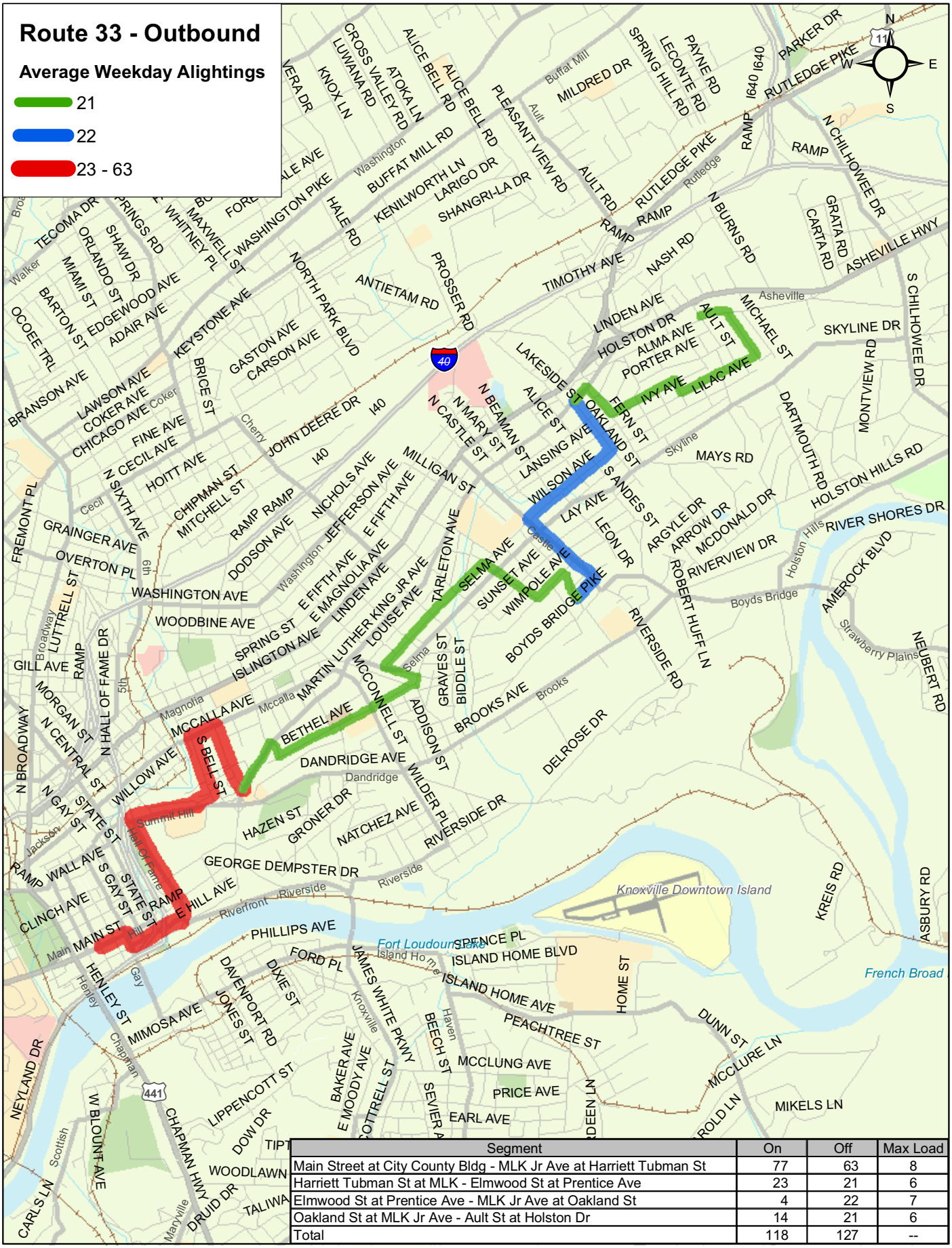
Segment	On	Off	Max Load
Main Street at City County Bldg - Isabella Tower Center	42	53	7
Isabella Tower Center - Brooks Ave at Dandridge Ave	6	20	8
Brooks Ave at Dandridge Ave - Sunset Ave at Harrison St	1	11	7
Sunset Ave at Harrison St - St. Mary's Holston Health & Rehab Center	1	7	4
Total	50	91	--

Segment	On	Off	Max Load
Ault St at Holston Dr - MLK Jr Ave at Oakland St	12	19	6
MLK Jr Ave at Oakland St - Prentice Ave at Elmwood St	16	1	6
Prentice Ave at Elmwood St - MLK Jr Ave at Harriett Tubman St	7	5	6
MLK Jr Ave at Harriett Tubman St - Main Street at City County Bldg	32	19	8
Total	67	44	--

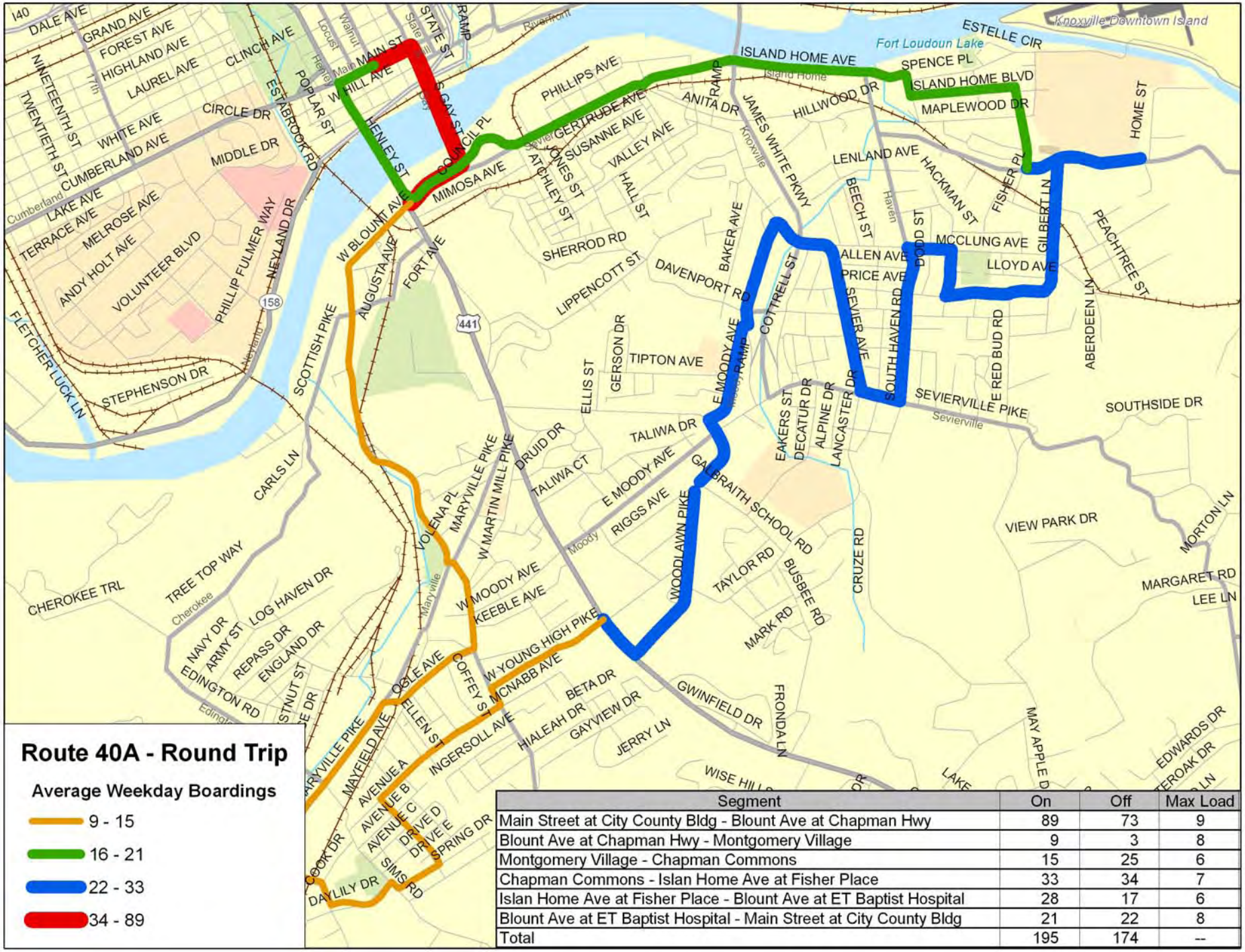
Segment	On	Off	Max Load
Ault St at Holston Dr - MLK Jr Ave at Oakland St	12	19	6
MLK Jr Ave at Oakland St - Prentice Ave at Elmwood St	16	1	6
Prentice Ave at Elmwood St - MLK Jr Ave at Harriett Tubman St	7	5	6
MLK Jr Ave at Harriett Tubman St - Main Street at City County Bldg	32	19	8
Total	67	44	--



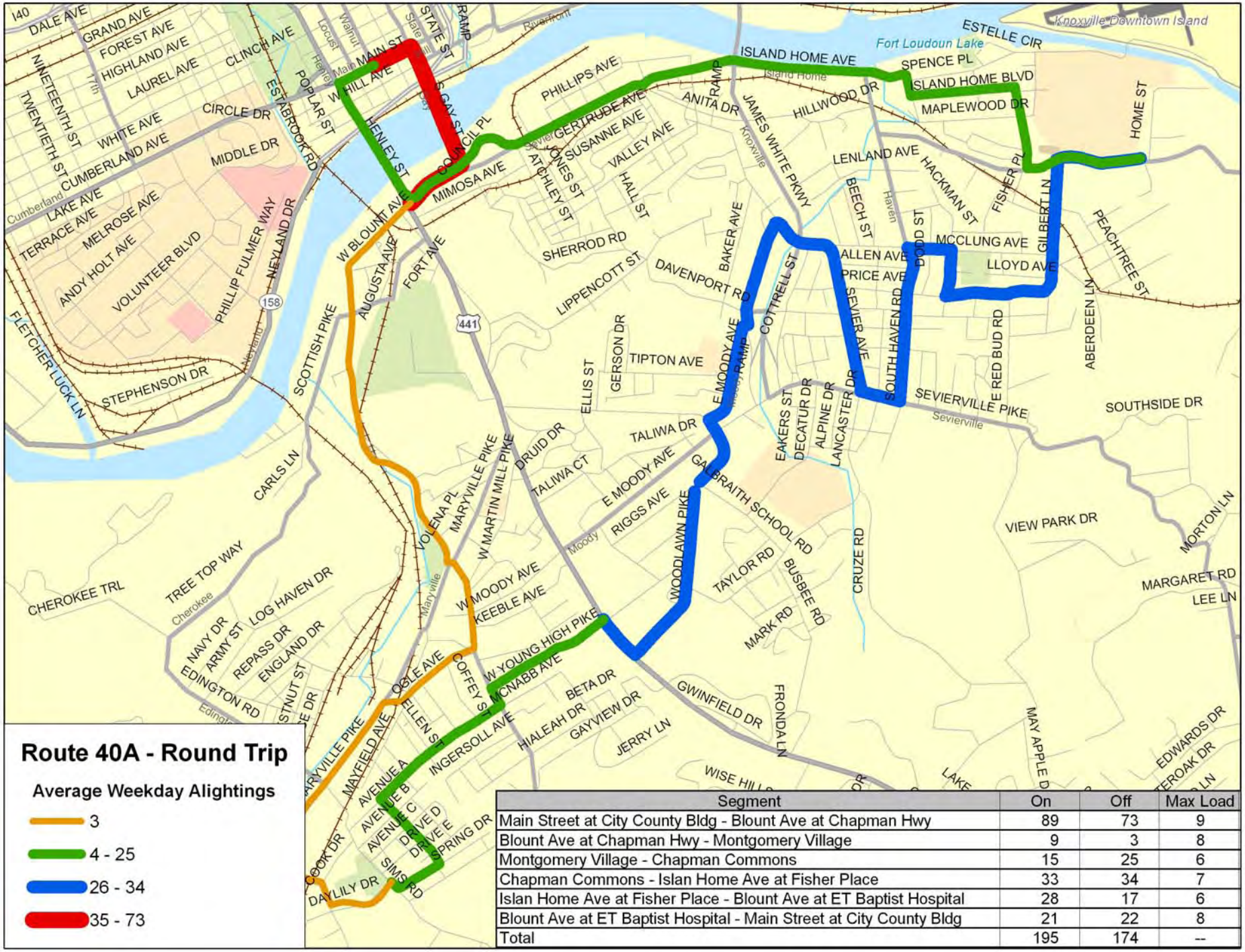
Segment	On	Off	Max Load
Main Street at City County Bldg - MLK Jr Ave at Harriett Tubman St	77	63	8
Harriett Tubman St at MLK - Elmwood St at Prentice Ave	23	21	6
Elmwood St at Prentice Ave - MLK Jr Ave at Oakland St	4	22	7
Oakland St at MLK Jr Ave - Ault St at Holston Dr	14	21	6
Total	118	127	--



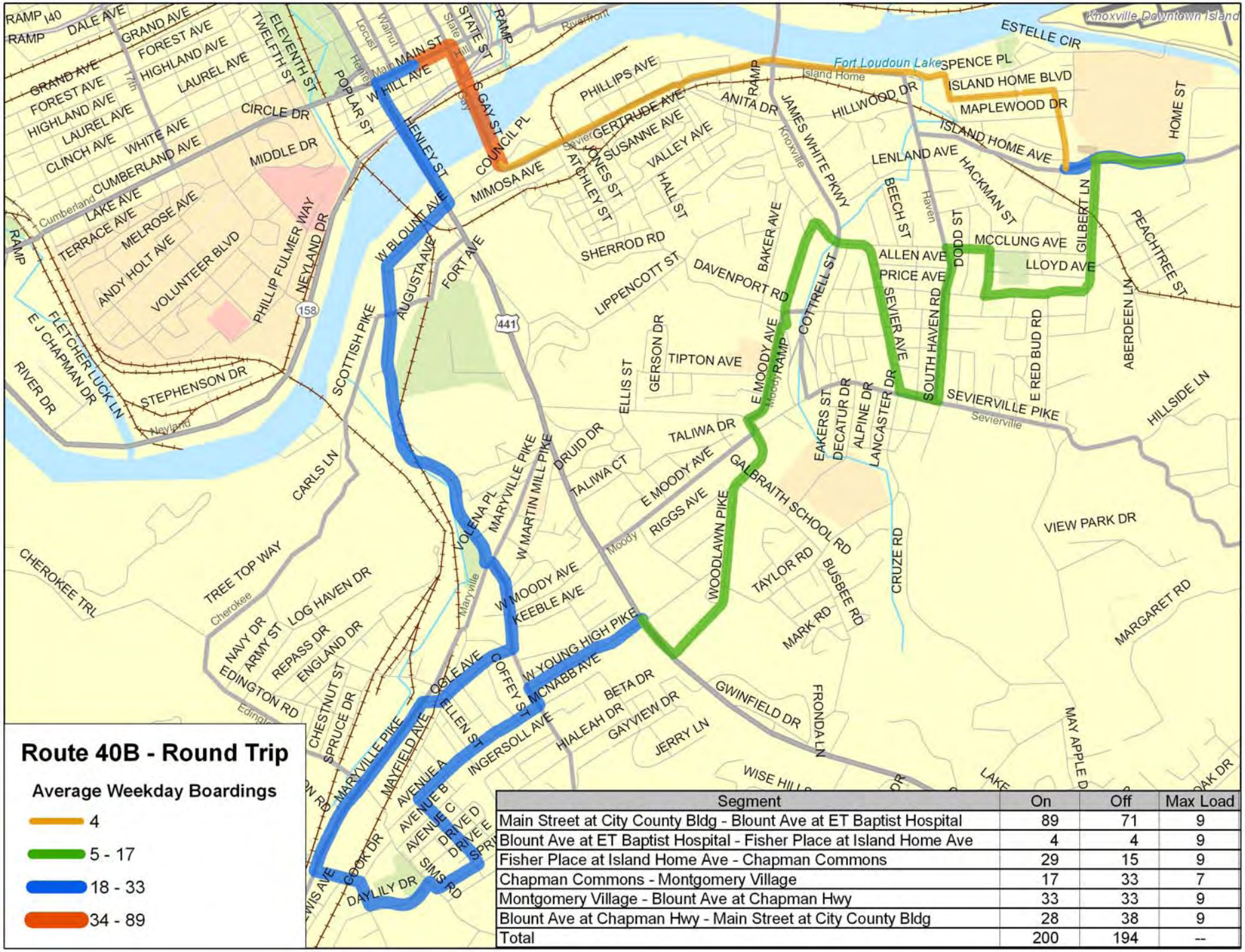
Segment	On	Off	Max Load
Main Street at City County Bldg - MLK Jr Ave at Harriett Tubman St	77	63	8
Harriett Tubman St at MLK - Elmwood St at Prentice Ave	23	21	6
Elmwood St at Prentice Ave - MLK Jr Ave at Oakland St	4	22	7
Oakland St at MLK Jr Ave - Ault St at Holston Dr	14	21	6
Total	118	127	--



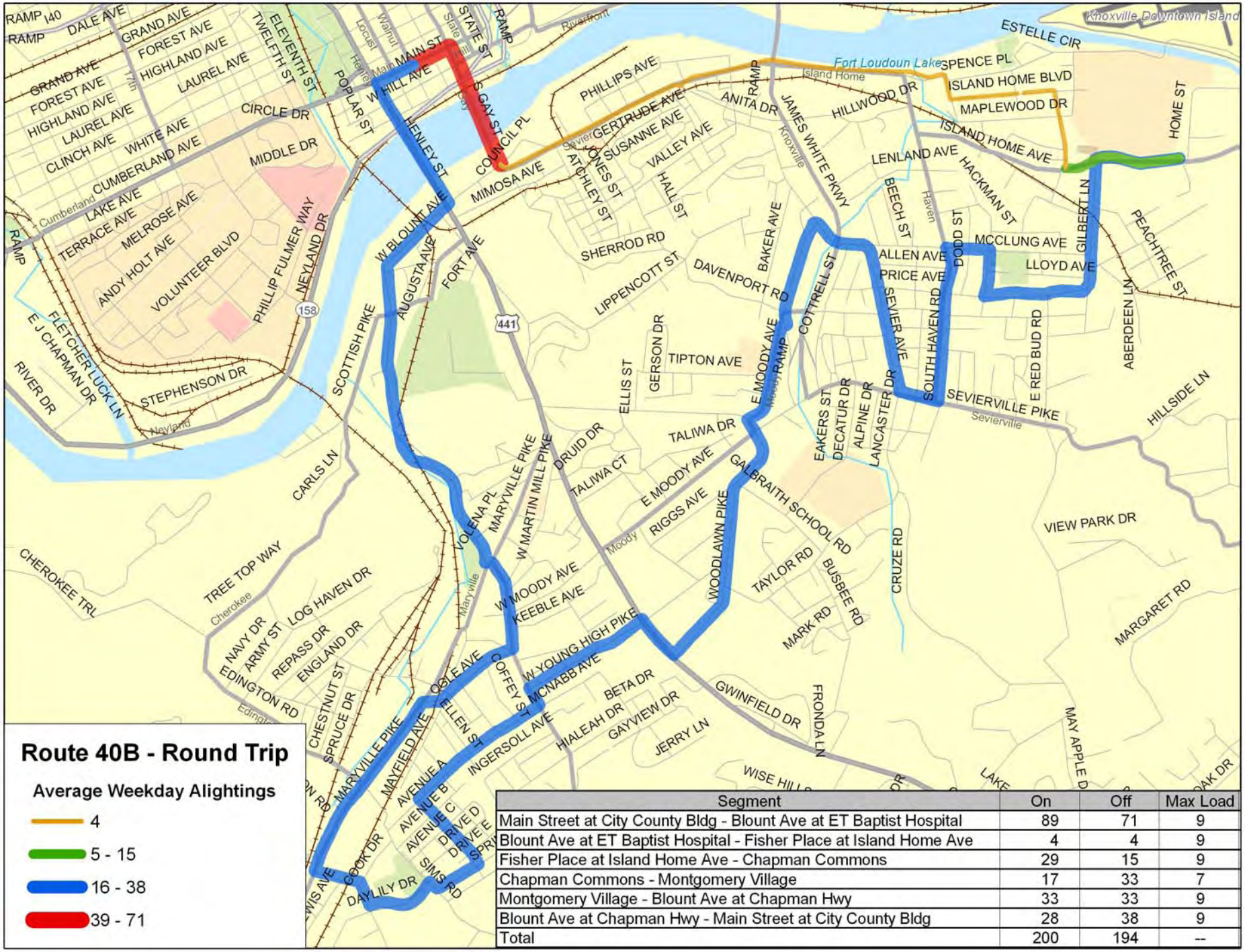
Segment	On	Off	Max Load
Main Street at City County Bldg - Blount Ave at Chapman Hwy	89	73	9
Blount Ave at Chapman Hwy - Montgomery Village	9	3	8
Montgomery Village - Chapman Commons	15	25	6
Chapman Commons - Islan Home Ave at Fisher Place	33	34	7
Islan Home Ave at Fisher Place - Blount Ave at ET Baptist Hospital	28	17	6
Blount Ave at ET Baptist Hospital - Main Street at City County Bldg	21	22	8
Total	195	174	--



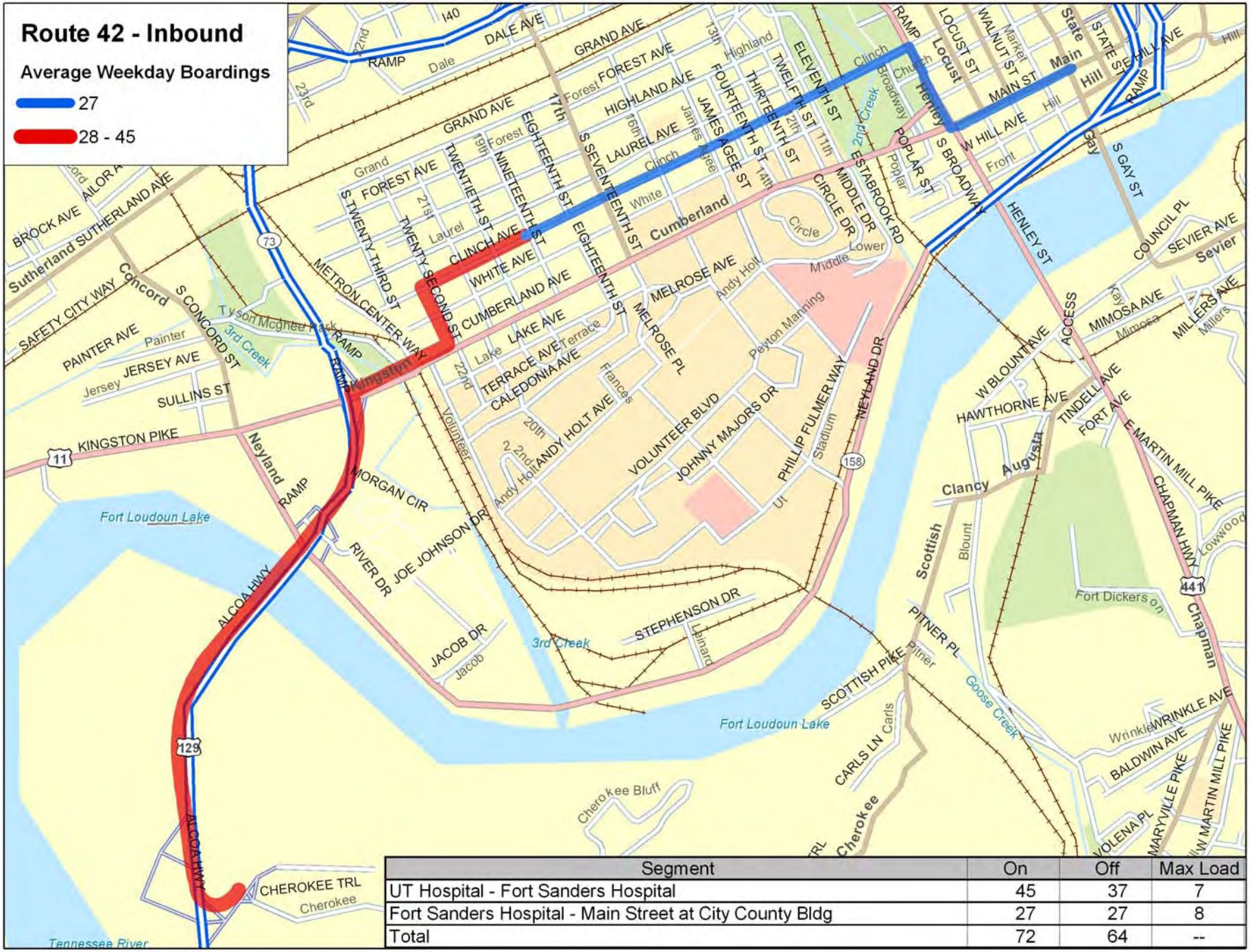
Segment	On	Off	Max Load
Main Street at City County Bldg - Blount Ave at Chapman Hwy	89	73	9
Blount Ave at Chapman Hwy - Montgomery Village	9	3	8
Montgomery Village - Chapman Commons	15	25	6
Chapman Commons - Islan Home Ave at Fisher Place	33	34	7
Islan Home Ave at Fisher Place - Blount Ave at ET Baptist Hospital	28	17	6
Blount Ave at ET Baptist Hospital - Main Street at City County Bldg	21	22	8
Total	195	174	--



Segment	On	Off	Max Load
Main Street at City County Bldg - Blount Ave at ET Baptist Hospital	89	71	9
Blount Ave at ET Baptist Hospital - Fisher Place at Island Home Ave	4	4	9
Fisher Place at Island Home Ave - Chapman Commons	29	15	9
Chapman Commons - Montgomery Village	17	33	7
Montgomery Village - Blount Ave at Chapman Hwy	33	33	9
Blount Ave at Chapman Hwy - Main Street at City County Bldg	28	38	9
Total	200	194	--



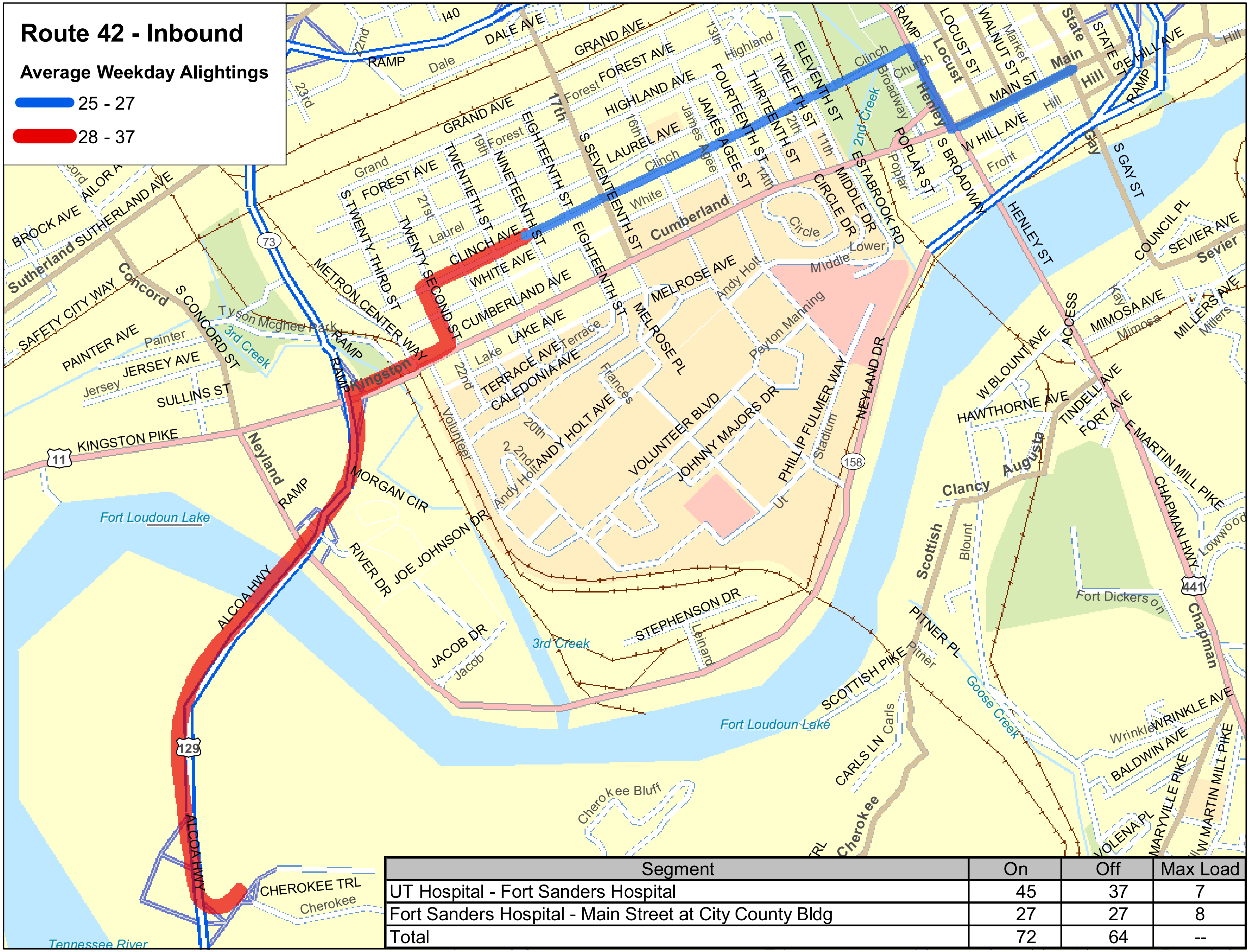
Segment	On	Off	Max Load
Main Street at City County Bldg - Blount Ave at ET Baptist Hospital	89	71	9
Blount Ave at ET Baptist Hospital - Fisher Place at Island Home Ave	4	4	9
Fisher Place at Island Home Ave - Chapman Commons	29	15	9
Chapman Commons - Montgomery Village	17	33	7
Montgomery Village - Blount Ave at Chapman Hwy	33	33	9
Blount Ave at Chapman Hwy - Main Street at City County Bldg	28	38	9
Total	200	194	--


Route 42 - Inbound
Average Weekday Boardings
27
28 - 45
Segment | On | Off | Max Load
UT Hospital - Fort Sanders Hospital | 45 | 37 | 7
Fort Sanders Hospital - Main Street at City County Bldg | 27 | 27 | 8
Total | 72 | 64 | --

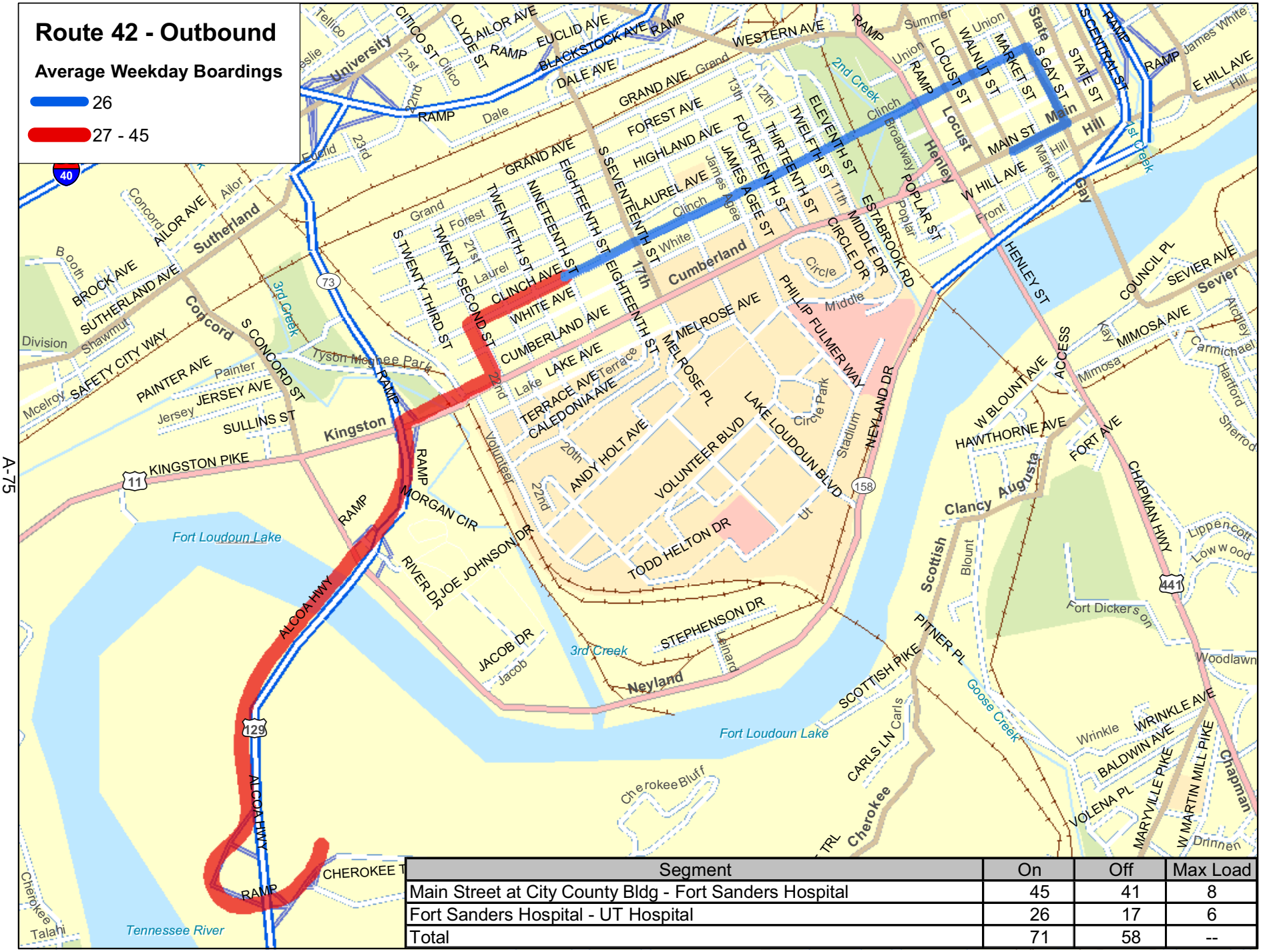
Route 42 - Inbound

Average Weekday Alightings

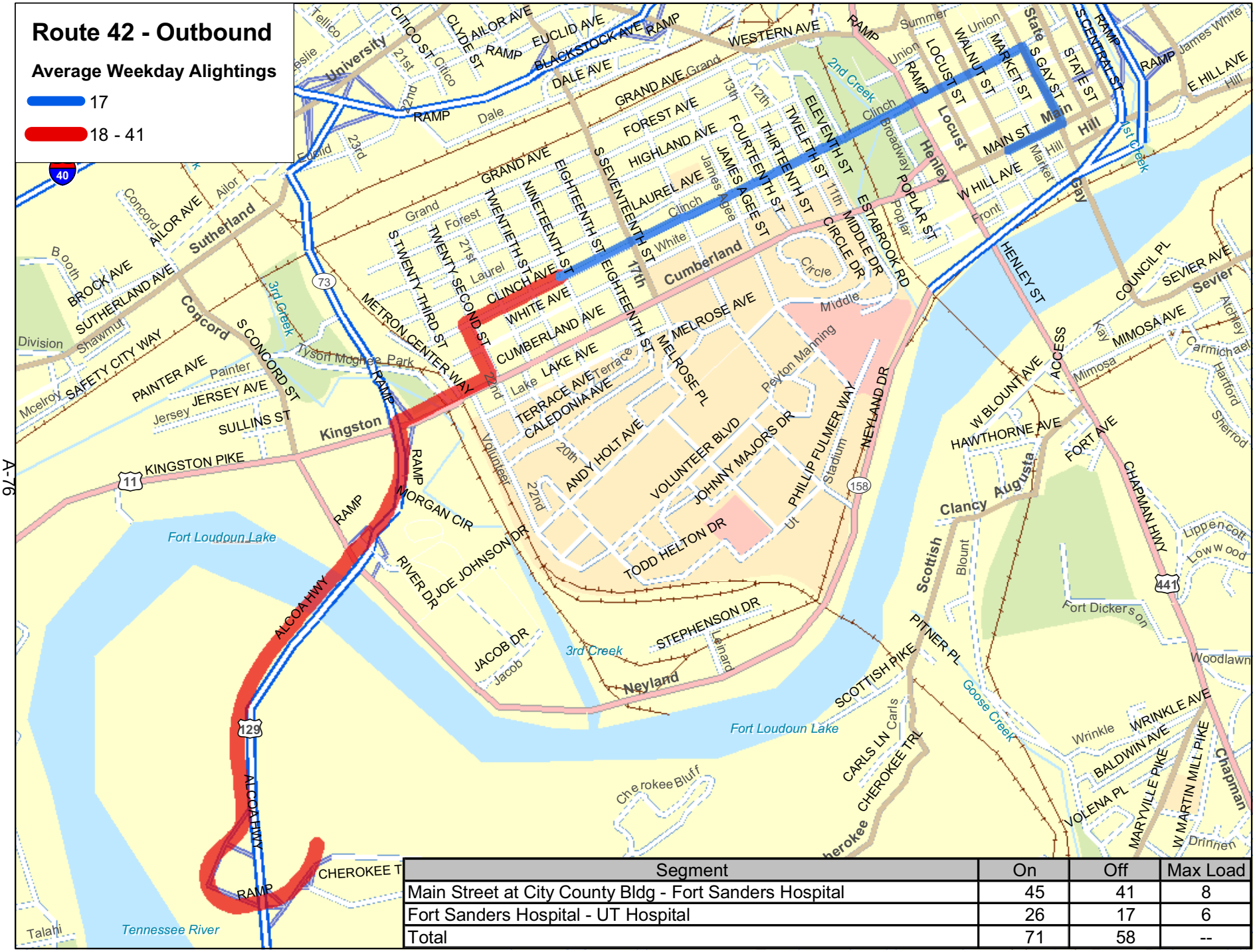
- 25 - 27 (blue)
- 28 - 37 (red)

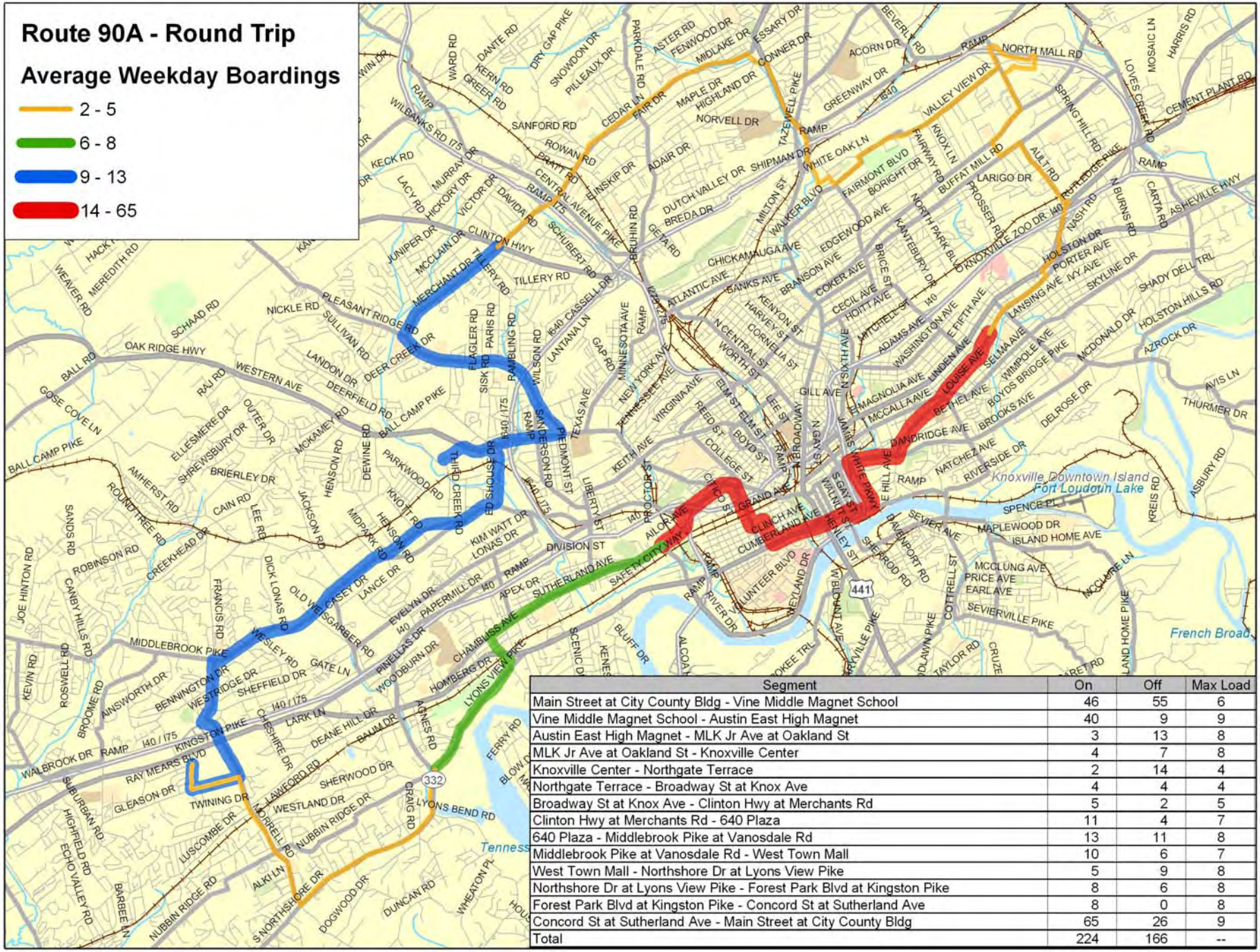


Segment	On	Off	Max Load
UT Hospital - Fort Sanders Hospital	45	37	7
Fort Sanders Hospital - Main Street at City County Bldg	27	27	8
Total	72	64	--

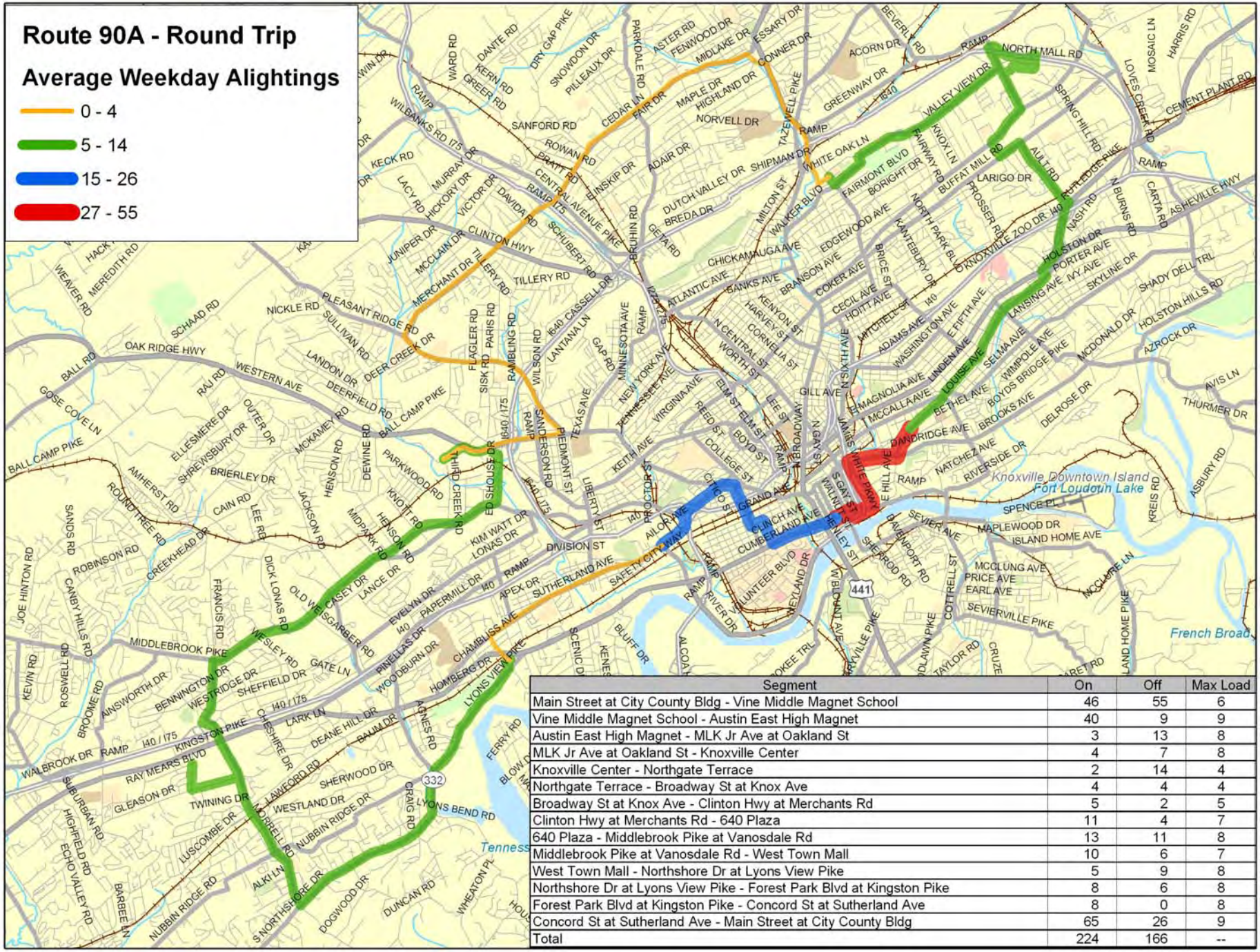


Segment	On	Off	Max Load
Main Street at City County Bldg - Fort Sanders Hospital	45	41	8
Fort Sanders Hospital - UT Hospital	26	17	6
Total	71	58	--

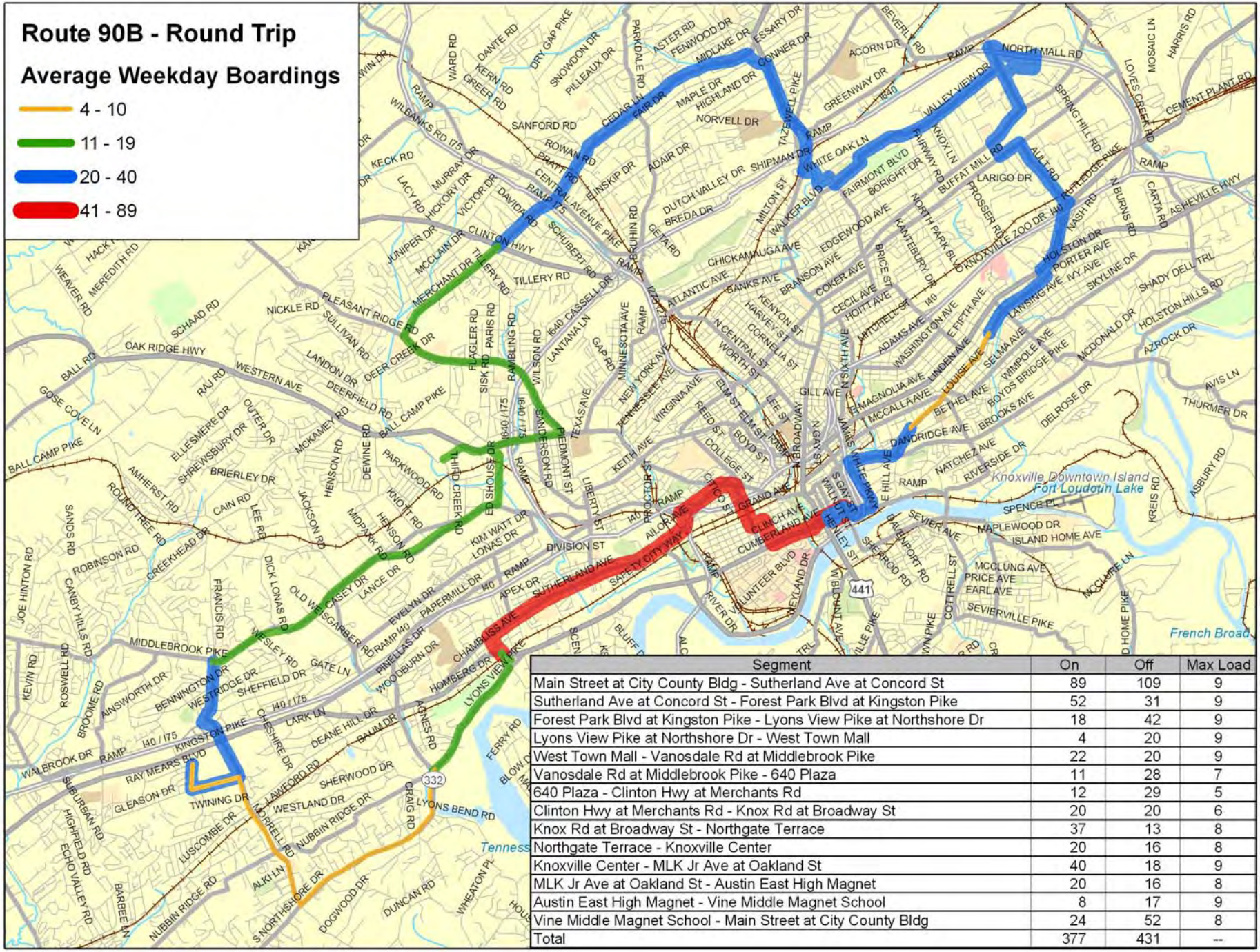

Route 42 - Outbound
Average Weekday Alightings
17
18 - 41
A-76
Segment | On | Off | Max Load
Main Street at City County Bldg - Fort Sanders Hospital | 45 | 41 | 8
Fort Sanders Hospital - UT Hospital | 26 | 17 | 6
Total | 71 | 58 | --



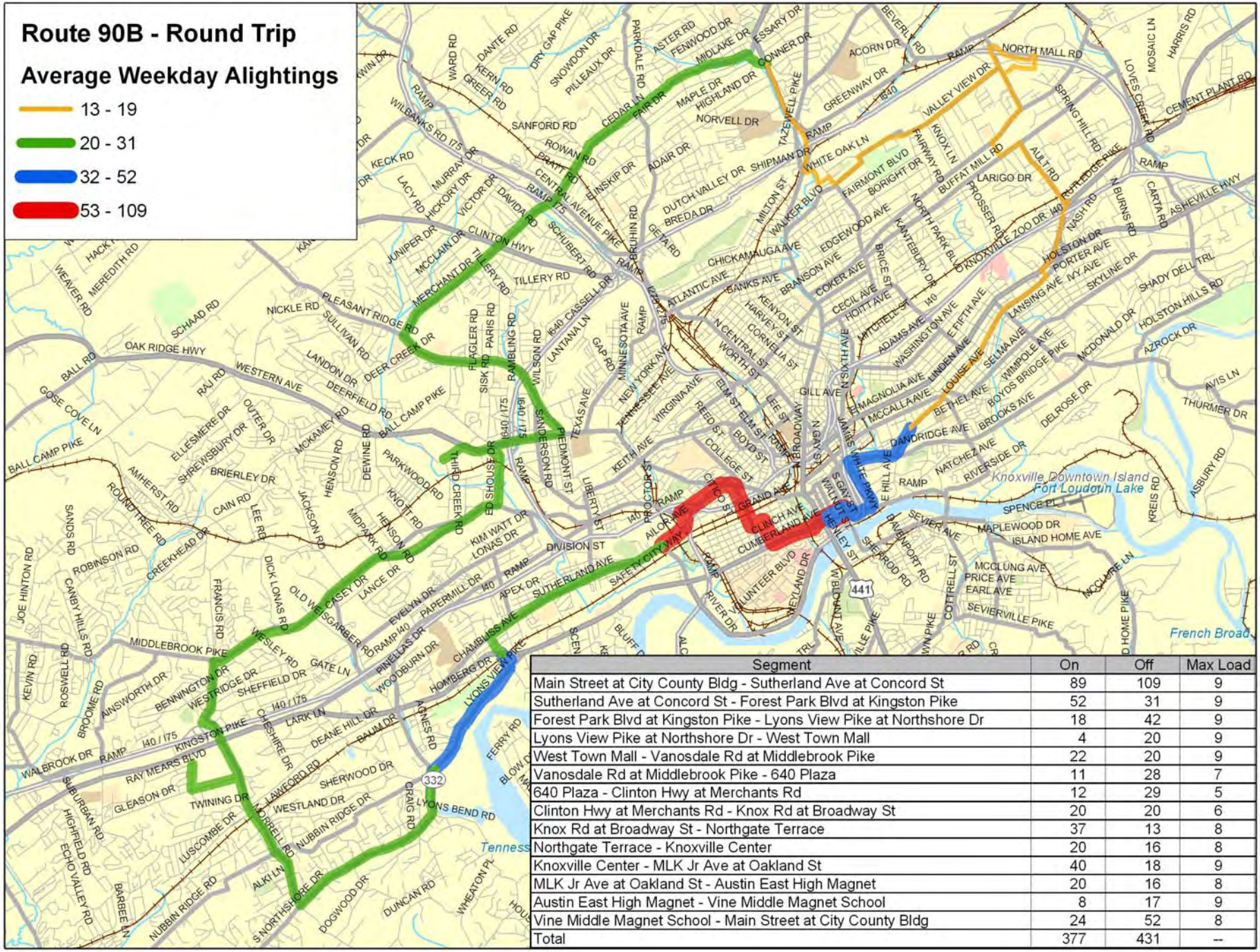
Segment	On	Off	Max Load
Main Street at City County Bldg - Vine Middle Magnet School	46	55	6
Vine Middle Magnet School - Austin East High Magnet	40	9	9
Austin East High Magnet - MLK Jr Ave at Oakland St	3	13	8
MLK Jr Ave at Oakland St - Knoxville Center	4	7	8
Knoxville Center - Northgate Terrace	2	14	4
Northgate Terrace - Broadway St at Knox Ave	4	4	4
Broadway St at Knox Ave - Clinton Hwy at Merchants Rd	5	2	5
Clinton Hwy at Merchants Rd - 640 Plaza	11	4	7
640 Plaza - Middlebrook Pike at Vanosdale Rd	13	11	8
Middlebrook Pike at Vanosdale Rd - West Town Mall	10	6	7
West Town Mall - Northshore Dr at Lyons View Pike	5	9	8
Northshore Dr at Lyons View Pike - Forest Park Blvd at Kingston Pike	8	6	8
Forest Park Blvd at Kingston Pike - Concord St at Sutherland Ave	8	0	8
Concord St at Sutherland Ave - Main Street at City County Bldg	65	26	9
Total	224	166	--



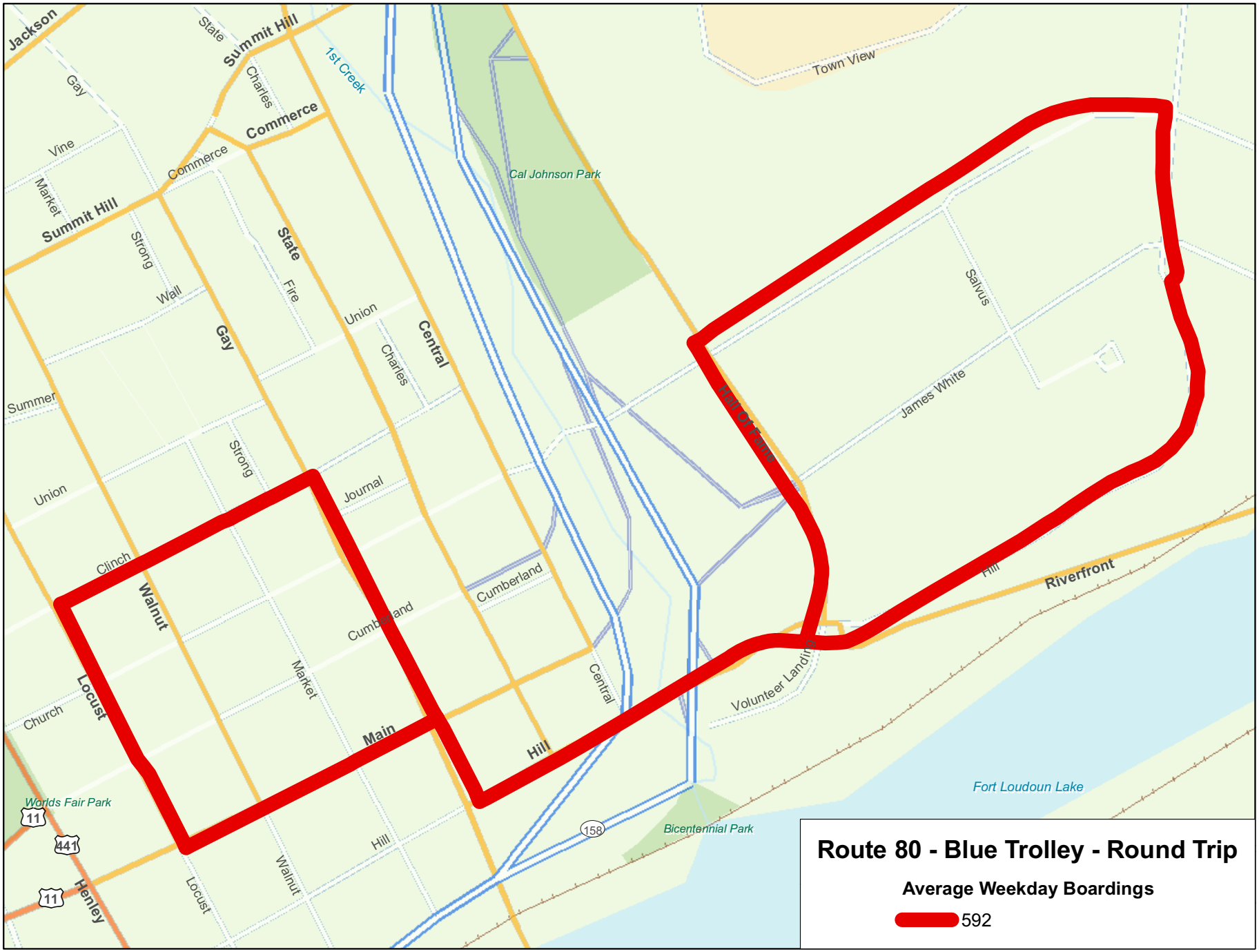
Segment	On	Off	Max Load
Main Street at City County Bldg - Vine Middle Magnet School	46	55	6
Vine Middle Magnet School - Austin East High Magnet	40	9	9
Austin East High Magnet - MLK Jr Ave at Oakland St	3	13	8
MLK Jr Ave at Oakland St - Knoxville Center	4	7	8
Knoxville Center - Northgate Terrace	2	14	4
Northgate Terrace - Broadway St at Knox Ave	4	4	4
Broadway St at Knox Ave - Clinton Hwy at Merchants Rd	5	2	5
Clinton Hwy at Merchants Rd - 640 Plaza	11	4	7
640 Plaza - Middlebrook Pike at Vanosdale Rd	13	11	8
Middlebrook Pike at Vanosdale Rd - West Town Mall	10	6	7
West Town Mall - Northshore Dr at Lyons View Pike	5	9	8
Northshore Dr at Lyons View Pike - Forest Park Blvd at Kingston Pike	8	6	8
Forest Park Blvd at Kingston Pike - Concord St at Sutherland Ave	8	0	8
Concord St at Sutherland Ave - Main Street at City County Bldg	65	26	9
Total	224	166	--

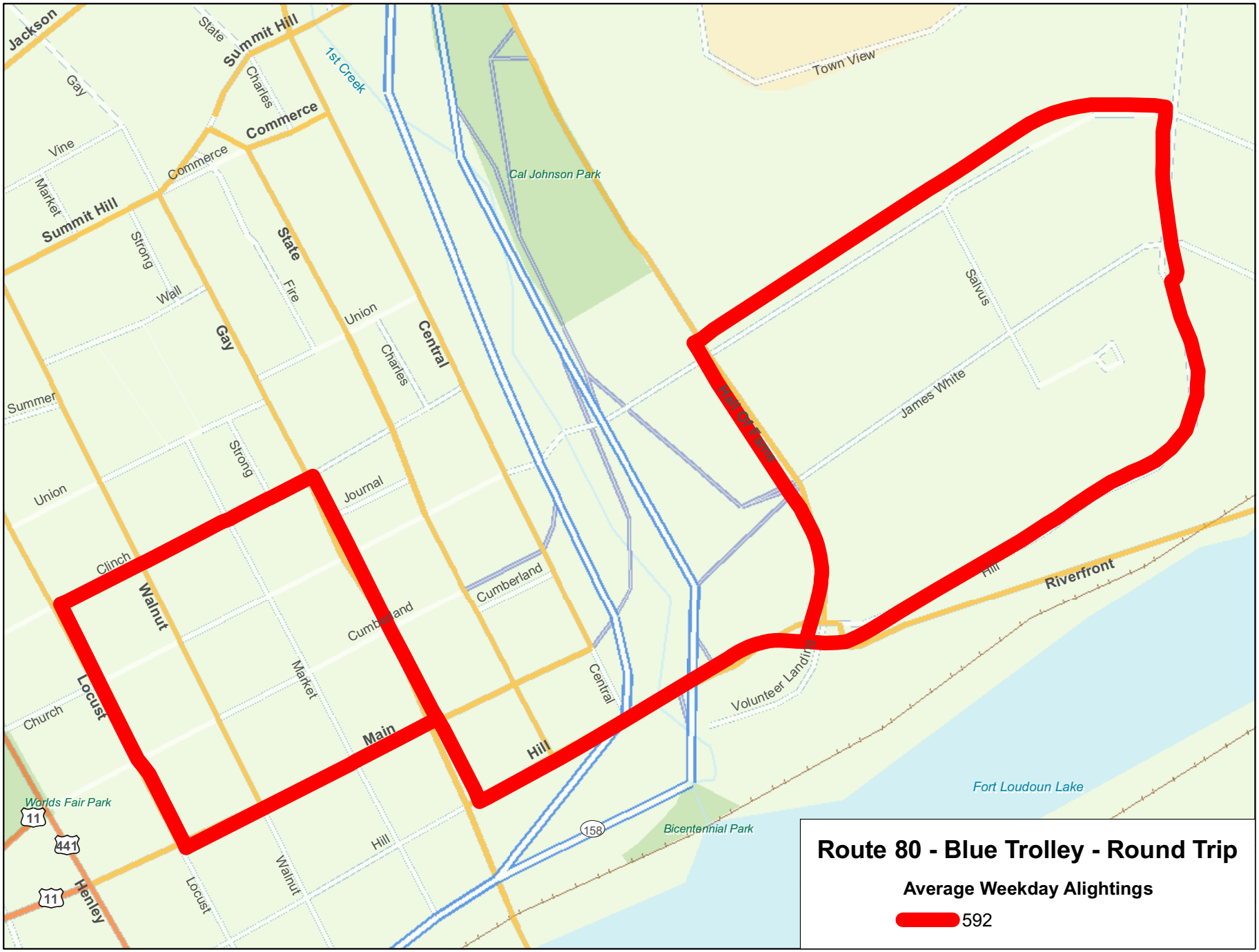


Segment	On	Off	Max Load
Main Street at City County Bldg - Sutherland Ave at Concord St	89	109	9
Sutherland Ave at Concord St - Forest Park Blvd at Kingston Pike	52	31	9
Forest Park Blvd at Kingston Pike - Lyons View Pike at Northshore Dr	18	42	9
Lyons View Pike at Northshore Dr - West Town Mall	4	20	9
West Town Mall - Vanosdale Rd at Middlebrook Pike	22	20	9
Vanosdale Rd at Middlebrook Pike - 640 Plaza	11	28	7
640 Plaza - Clinton Hwy at Merchants Rd	12	29	5
Clinton Hwy at Merchants Rd - Knox Rd at Broadway St	20	20	6
Knox Rd at Broadway St - Northgate Terrace	37	13	8
Northgate Terrace - Knoxville Center	20	16	8
Knoxville Center - MLK Jr Ave at Oakland St	40	18	9
MLK Jr Ave at Oakland St - Austin East High Magnet	20	16	8
Austin East High Magnet - Vine Middle Magnet School	8	17	9
Vine Middle Magnet School - Main Street at City County Bldg	24	52	8
Total	377	431	--



Segment	On	Off	Max Load
Main Street at City County Bldg - Sutherland Ave at Concord St	89	109	9
Sutherland Ave at Concord St - Forest Park Blvd at Kingston Pike	52	31	9
Forest Park Blvd at Kingston Pike - Lyons View Pike at Northshore Dr	18	42	9
Lyons View Pike at Northshore Dr - West Town Mall	4	20	9
West Town Mall - Vanosdale Rd at Middlebrook Pike	22	20	9
Vanosdale Rd at Middlebrook Pike - 640 Plaza	11	28	7
640 Plaza - Clinton Hwy at Merchants Rd	12	29	5
Clinton Hwy at Merchants Rd - Knox Rd at Broadway St	20	20	6
Knox Rd at Broadway St - Northgate Terrace	37	13	8
Northgate Terrace - Knoxville Center	20	16	8
Knoxville Center - MLK Jr Ave at Oakland St	40	18	9
MLK Jr Ave at Oakland St - Austin East High Magnet	20	16	8
Austin East High Magnet - Vine Middle Magnet School	8	17	9
Vine Middle Magnet School - Main Street at City County Bldg	24	52	8
Total	377	431	--

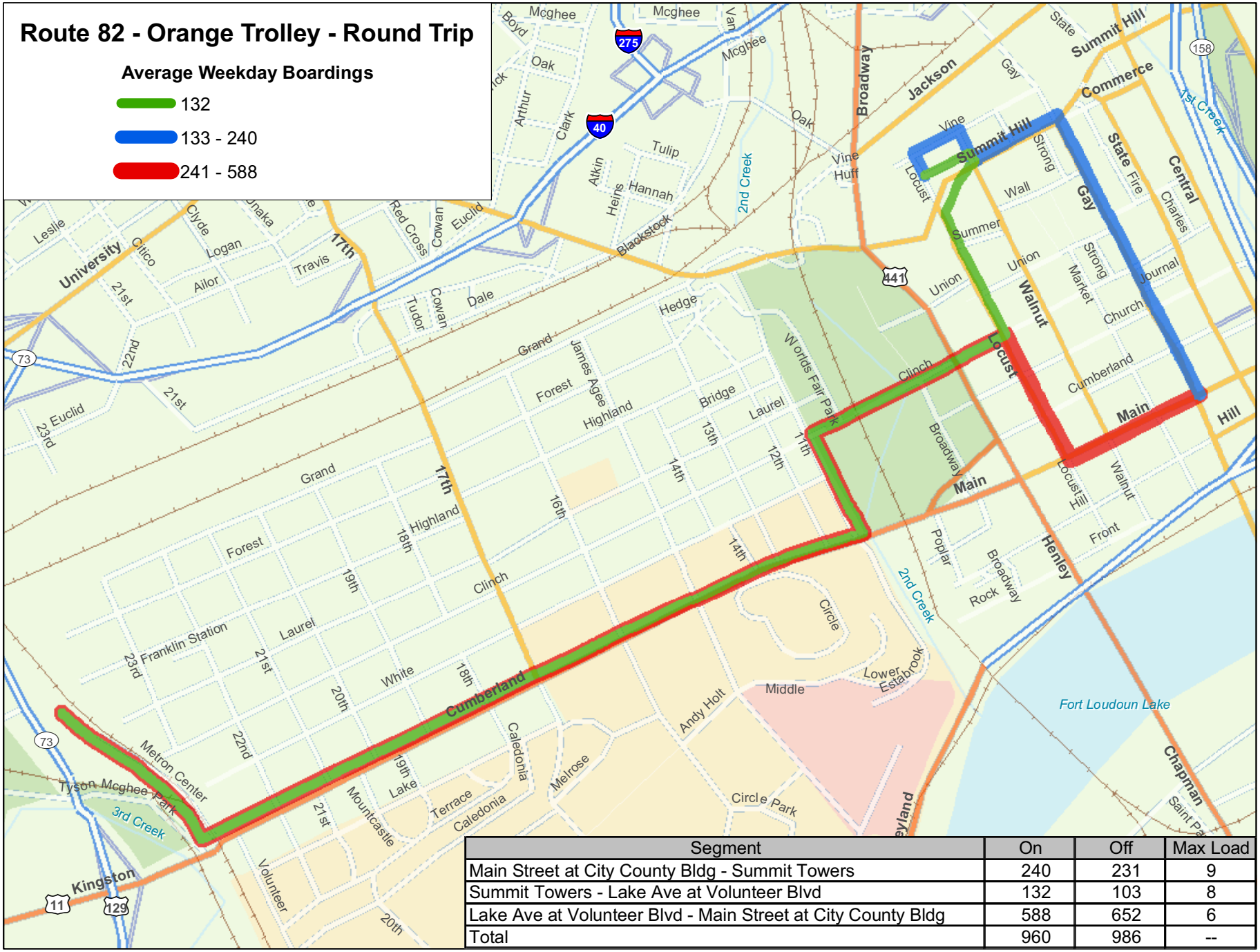

Jackson
State
Summit Hill
Gay
Charles
1st Creek
Commerce
Vine
Commerce
Market
Summit Hill
Strong
Wall
State
Fire
Union
Central
Gay
Charles
Summer
Strong
Journal
Union
Clinch
Walnut
Cumberland
Cumberland
Market
Locust
Church
Main
Hill
Central
Worlds Fair Park
11
441
11
Henley
Locust
Walnut
Hill
158
Bicentennial Park
Volunteer Landing
Fort Loudoun Lake
Hill
Riverfront
James White
Salvus
Town View
Cal Johnson Park
Hall of Fame
Route 80 - Blue Trolley - Round Trip
Average Weekday Boardings
592


Jackson
State
Summit Hill
Gay
Charles
1st Creek
Commerce
Vine
Commerce
Market
Summit Hill
Strong
Wall
State
Fire
Union
Central
Gay
Charles
Summer
Strong
Journal
Union
Clinch
Walnut
Cumberland
Cumberland
Market
Locust
Church
Main
Hill
Central
Worlds Fair Park
11
441
11
Henley
Locust
Walnut
Hill
158
Bicentennial Park
Fort Loudoun Lake
Volunteer Landing
Hill
Riverfront
Hall of Fame
James White
Salvus
Town View
Cal Johnson Park
Route 80 - Blue Trolley - Round Trip
Average Weekday Alightings
592

Route 82 - Orange Trolley - Round Trip

Average Weekday Boardings

- 132
- 133 - 240
- 241 - 588

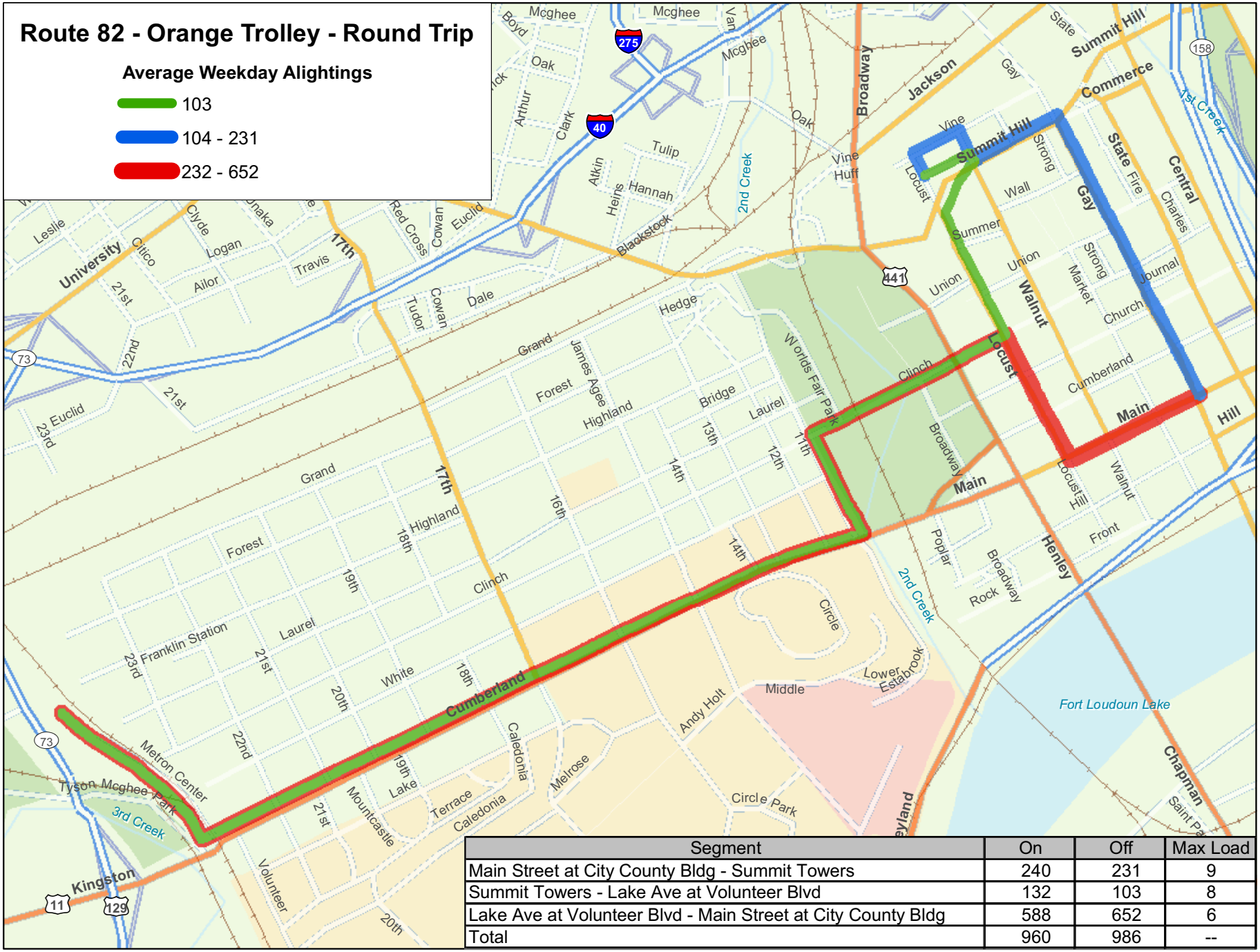


Segment	On	Off	Max Load
Main Street at City County Bldg - Summit Towers	240	231	9
Summit Towers - Lake Ave at Volunteer Blvd	132	103	8
Lake Ave at Volunteer Blvd - Main Street at City County Bldg	588	652	6
Total	960	986	--

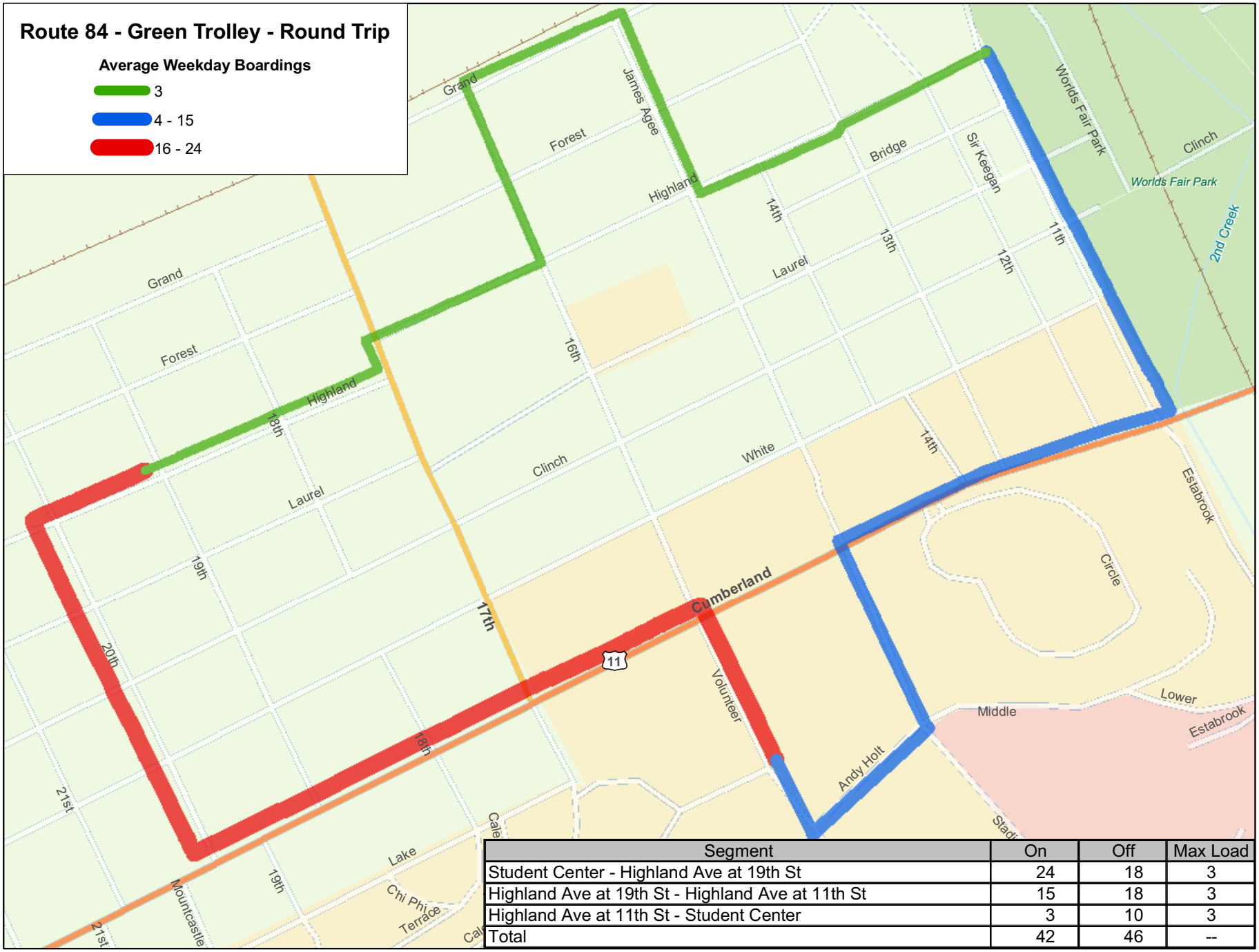
Route 82 - Orange Trolley - Round Trip

Average Weekday Alightings

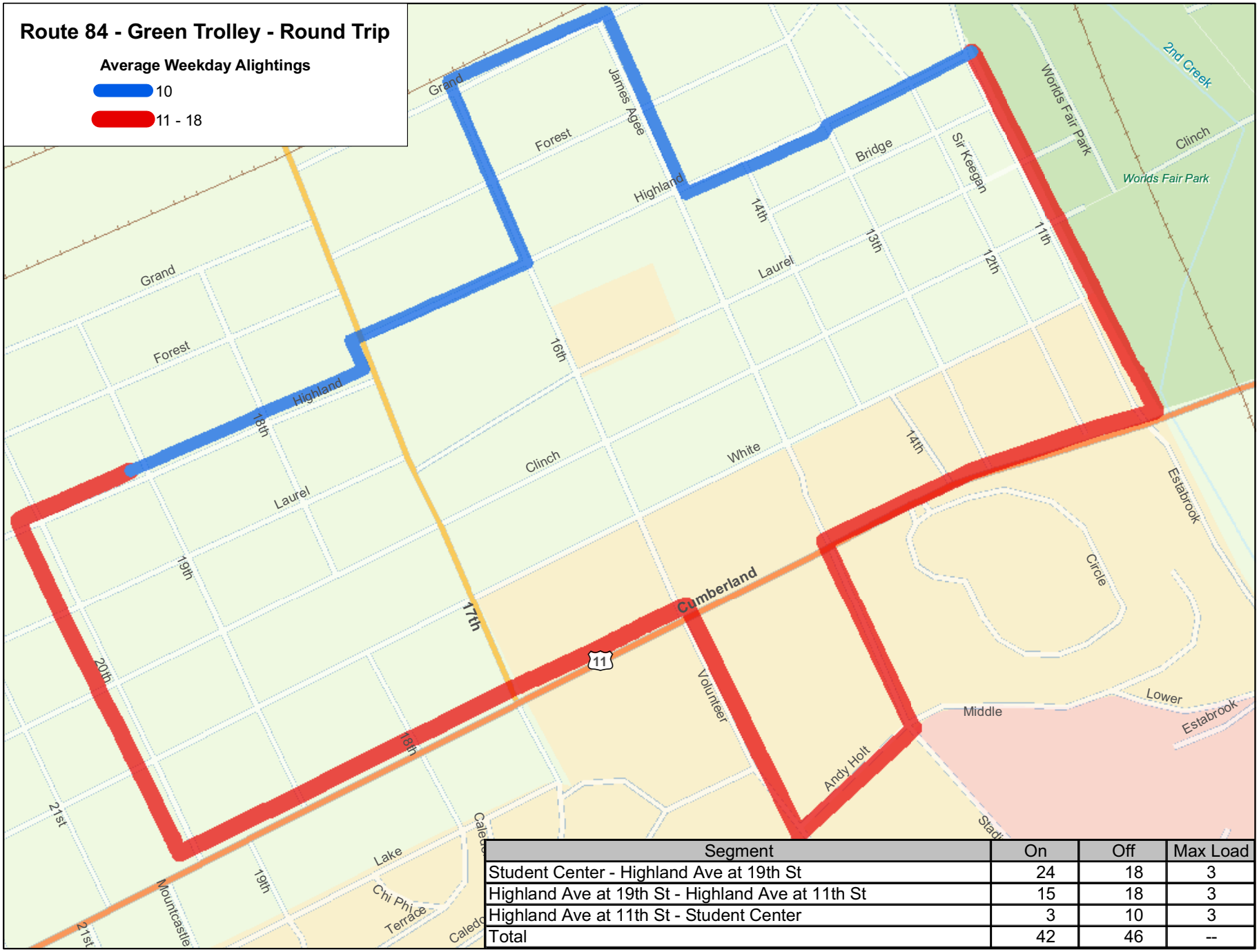
- 103
- 104 - 231
- 232 - 652



Segment	On	Off	Max Load
Main Street at City County Bldg - Summit Towers	240	231	9
Summit Towers - Lake Ave at Volunteer Blvd	132	103	8
Lake Ave at Volunteer Blvd - Main Street at City County Bldg	588	652	6
Total	960	986	--



Segment	On	Off	Max Load
Student Center - Highland Ave at 19th St	24	18	3
Highland Ave at 19th St - Highland Ave at 11th St	15	18	3
Highland Ave at 11th St - Student Center	3	10	3
Total	42	46	--

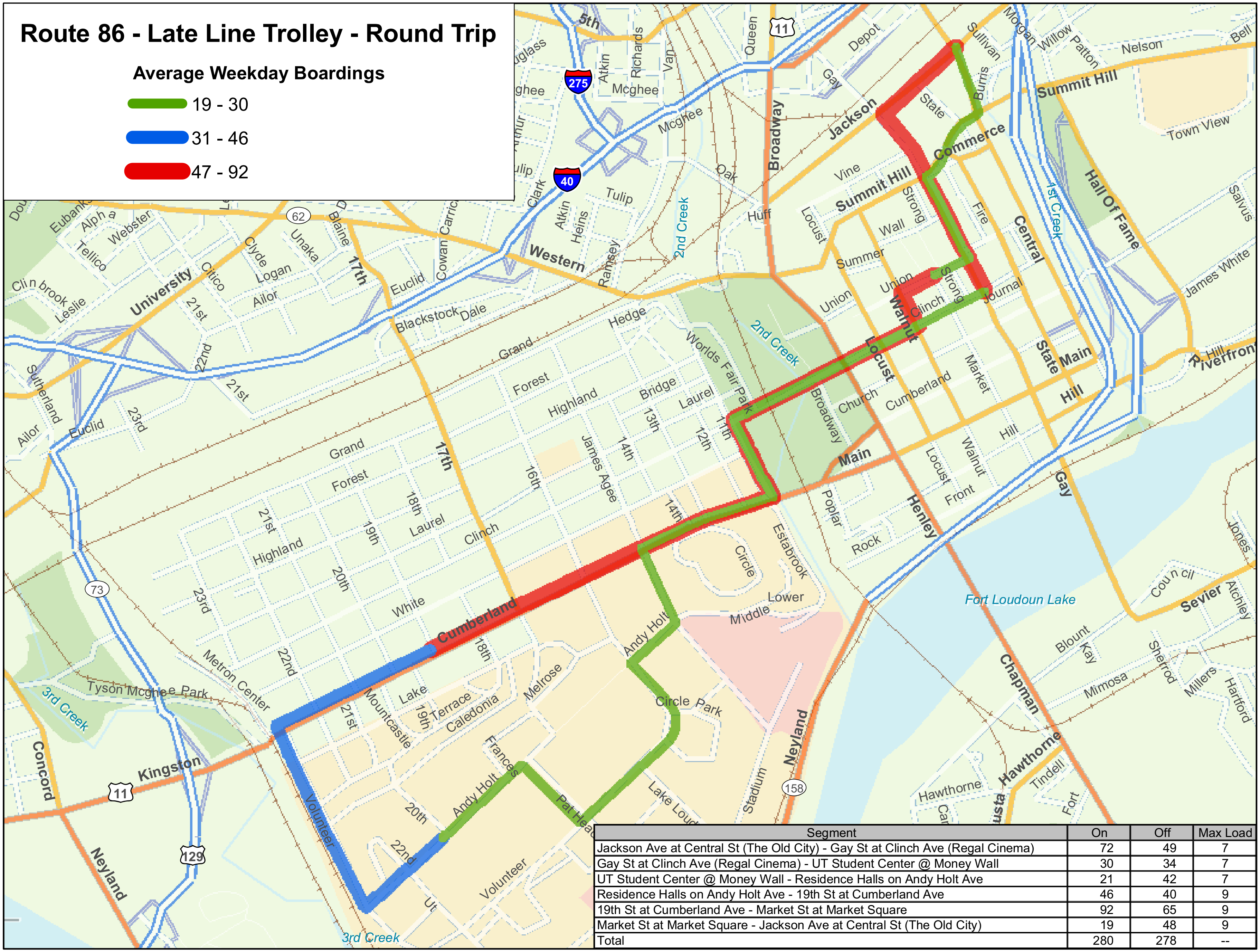


Segment	On	Off	Max Load
Student Center - Highland Ave at 19th St	24	18	3
Highland Ave at 19th St - Highland Ave at 11th St	15	18	3
Highland Ave at 11th St - Student Center	3	10	3
Total	42	46	--

Route 86 - Late Line Trolley - Round Trip

Average Weekday Boardings

- 19 - 30
- 31 - 46
- 47 - 92

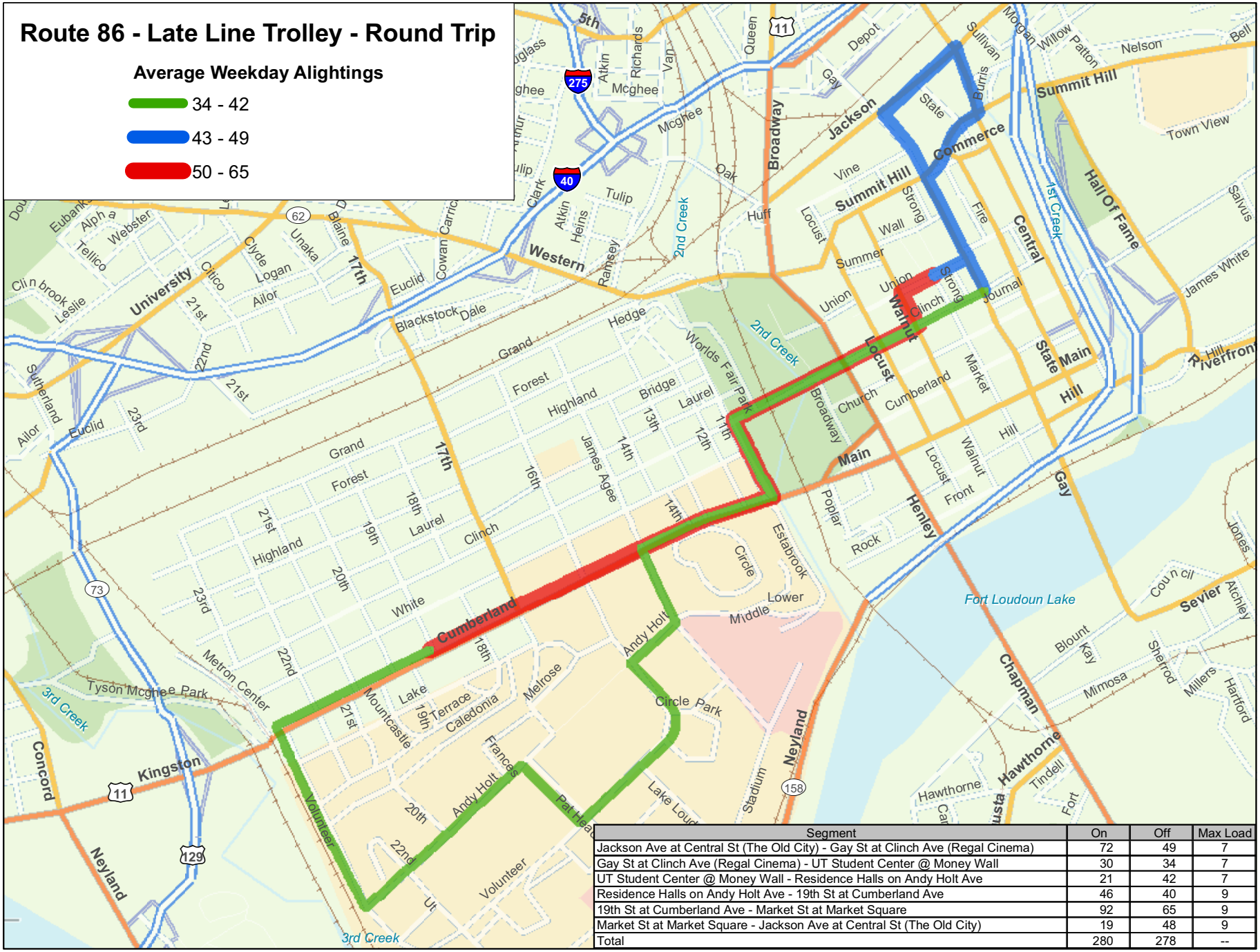


Segment	On	Off	Max Load
Jackson Ave at Central St (The Old City) - Gay St at Clinch Ave (Regal Cinema)	72	49	7
Gay St at Clinch Ave (Regal Cinema) - UT Student Center @ Money Wall	30	34	7
UT Student Center @ Money Wall - Residence Halls on Andy Holt Ave	21	42	7
Residence Halls on Andy Holt Ave - 19th St at Cumberland Ave	46	40	9
19th St at Cumberland Ave - Market St at Market Square	92	65	9
Market St at Market Square - Jackson Ave at Central St (The Old City)	19	48	9
Total	280	278	--

Route 86 - Late Line Trolley - Round Trip

Average Weekday Alightings

- 34 - 42
- 43 - 49
- 50 - 65



Segment	On	Off	Max Load
Jackson Ave at Central St (The Old City) - Gay St at Clinch Ave (Regal Cinema)	72	49	7
Gay St at Clinch Ave (Regal Cinema) - UT Student Center @ Money Wall	30	34	7
UT Student Center @ Money Wall - Residence Halls on Andy Holt Ave	21	42	7
Residence Halls on Andy Holt Ave - 19th St at Cumberland Ave	46	40	9
19th St at Cumberland Ave - Market St at Market Square	92	65	9
Market St at Market Square - Jackson Ave at Central St (The Old City)	19	48	9
Total	280	278	--

Appendix B

On-board Survey Results
October 2008

Trolley Survey Results

Route Collected

Response	Number	Percent
Blue	53	24.3
Green	34	15.6
Orange	82	37.6
Purple	49	22.5
Total	218	100.0

Where are you coming from?

Response	Number	Percent
Work	25	11.5
Home	118	54.1
Business Appointment	1	0.5
Personal or Medical Appointment	1	0.5
School	12	5.5
Shopping	7	3.2
Recreation/Entertainment	38	17.4
Other	16	7.3
Total	218	100.0

Where are you going to?

Response	Number	Percent
Work	63	28.9
Home	33	15.1
Hotel	1	0.5
Business Appointment	6	2.8
Personal or Medical Appointment	3	1.4
School	22	10.1
Shopping	4	1.8
Recreation/Entertainment	45	20.6
Other	41	18.8
Total	218	100.0

How did you get to where you boarded the trolley?

Response	Number	Percent
Walked	169	77.5
Dropped off by auto	7	3.2
Drove a car	19	8.7
Transferred from a KAT bus or trolley	22	10.1
Bicycle	1	0.5
Other	0	0.0
Total	218	100.0

Transferred from route…

Response	Number	Percent
10	2	9.1
11A/B	2	9.1
13	1	4.5
22	1	4.5
23	2	9.1
28	1	4.5
31	2	9.1
33	4	18.2
40A/B	1	4.5
41	2	9.1
101X	1	4.5
Blue Trolley	2	9.1
Orange Trolley	1	4.5
Total	22	100.0

How will you get to your final destination?

Response	Number	Percent
Walk	183	83.9
Picked up by auto	0	0.0
Drive a car	3	1.4
Transfer to a KAT bus or trolley	31	14.2
Bicycle	1	0.5
Other	0	0.0
Total	218	100.0

Transferred to route…

Response	Number	Percent
11A/B	7	24.1
13	1	3.4
14	1	3.4
22	1	3.4
31	3	10.3
33	1	3.4
40A/B	2	6.9
41	3	10.3
50	1	3.4
90A/B	1	3.4
Blue Trolley	4	13.8
Green Trolley	1	3.4
Orange Trolley	3	10.3
Total	29	100.0

How often do ride the KAT trolleys?

Response	Number	Percent
Every day	104	48.1
Two or three times a week	72	33.3
Two or three times a month	28	13.0
Once a month or less	12	5.6
Total	216	100.0

Overall, how would you rate KAT Trolley service?

Response	Number	Percent
Excellent	84	38.9
Good	98	45.4
Fair	32	14.8
Poor	2	0.9
Total	216	100.0

KAT is experiencing significant increases in costs due to the price of fuel. KAT may have to add a small fare (i.e., $.25). Would you use the trolleys as much as you do now if KAT charged a fare?

Response	Number	Percent
Yes	113	52.1
No	104	47.9
Total	217	100.0

Are you?

Response	Number	Percent
Male	142	65.1
Female	76	34.9
Total	218	100.0

Are you?

Response	Number	Percent
Under 18	1	0.7
18 to 34	107	75.9
34 to 64	31	22.0
65 years and older	2	1.4
Total	141	100.0

Are you a licensed driver and able to drive?

Response	Number	Percent
Yes	159	73.3
No	58	26.7
Total	217	100.0

How many vehicles are owned or leased by members of your household?

Response	Number	Percent
None	76	35.0
One	49	22.6
Two	52	24.0
Three or more	40	18.4
Total	217	100.0

How many people are in your household?

Response	Number	Percent
One	49	22.8
Two	79	36.7
Three	45	20.9
Four	33	15.3
Five or more	9	4.2
Total	215	100.0

How many of these household members are employed?

Response	Number	Percent
One	74	37.2
Two	79	39.7
Three	28	14.1
Four or more	16	8.0
None	2	1.0
Total	199	100.0

Is your approximate household income…

Response	Number	Percent
Less than $10,000	21	15.9
Between $10,000 and $25,000	47	35.6
Between $25,000 and $50,000	39	29.5
Over $50,000	25	18.9
Total	132	100.0

Fixed Route Survey Results

Route Collected

Response	Number	Percent
10	11	2.3
11A/B	40	8.5
12	17	3.6
13	10	2.1
14	19	4.0
15	11	2.3
20A/B	22	4.7
21	6	1.3
22	22	4.7
23	5	1.1
30	11	2.3
31	33	7.0
32A/B	25	5.3
33	11	2.3
40A/B	14	3.0
41	54	11.5
42	4	0.8
43	11	2.3
44	14	3.0
50	23	4.9
90A/B	29	6.2
100X	11	2.3
101X	32	6.8
102X	29	6.2
103X	2	0.4
104X	5	1.1
Total	471	100.0

Where are you coming from?

Response	Number	Percent
Work	85	18.0
Home	263	55.8
Business Appointment	6	1.3
Personal or Medical Appointment	14	3.0
School	30	6.4
Shopping	30	6.4
Other	43	9.1
Total	471	100.0

Where are you going to?

Response	Number	Percent
Work	159	33.8
Home	159	33.8
Business Appointment	8	1.7
Personal or Medical Appointment	10	2.1
School	37	7.9
Shopping	39	8.3
Recreation/Entertainment	3	0.6
Other	56	11.9
Total	471	100.0

Where did you get on this bus?

Response	Number	Percent
Downtown Transfer Point	163	35.4
Other	297	64.6
Total	460	100.0

How did you get to where you boarded the bus?

Response	Number	Percent
Walked	309	66.6
Dropped off by auto	13	2.8
Drove a car	36	7.8
Transferred from a KAT bus or trolley	97	20.9
Bicycle	5	1.1
Other	4	0.9
Total	464	100.0

Transferred from route…

Response	Number	Percent
1	1	1.4
11A/B	7	9.6
12	2	2.7
13	5	6.8
14	3	4.1
20A/B	7	9.6
21	2	2.7
22	8	11.0
23	2	2.7
30	1	1.4
31	6	8.2
32	5	6.8
33	2	2.7
40A/B	5	6.8
41	10	13.7
42	1	1.4
50C	1	1.4
90A/B	3	4.1
Orange Trolley	2	2.7
Total	73	100.0

Where will you get off the bus?

Response	Number	Percent
Downtown Transfer Point	121	26.2
Other	340	73.8
Total	461	100.0

How will you get to your final destination?

Response	Number	Percent
Walk	310	66.1
Picked up by auto	6	1.3
Drive a car	26	5.5
Transfer to a KAT bus or trolley	118	25.2
Bicycle	5	1.1
Other	4	0.9
Total	469	100.0

Transferred to route…

Response	Number	Percent
11A/B	10	17.2
12	3	5.2
20	3	5.2
21	1	1.7
22	2	3.4
23	2	3.4
30	3	5.2
31	6	10.3
32	2	3.4
33	1	1.7
40A/B	3	5.2
41	13	22.4
42	2	3.4
90A/B	4	6.9
Green Trolley	1	1.7
Orange Trolley	2	3.4
Total	58	100.0

How often do you make this specific trip?

Response	Number	Percent
Every day	264	56.9
Two or three times a week	106	22.8
Two or three times a month	54	11.6
Once a month or less	40	8.6
Total	464	100.0

How did you pay for this trip?

Response	Number	Percent
Cash Fare	145	31.1
Monthly Pass	187	40.1
Free Seniors Freedom ID	42	9.0
Shop & Ride Ticket	2	0.4
Single Ride Ticket	13	2.8
Student Semester Pass	75	16.1
Transfer	2	0.4
Total	466	100.0

Are you a licensed driver and able to drive?

Response	Number	Percent
Yes	249	55.2
No	202	44.8
Total	451	100.0

How many vehicles are owned or leased by members of your household?

Response	Number	Percent
None	230	51.7
One	96	21.6
Two	79	17.8
Three or more	40	9.0
Total	445	100.0

How often do you ride the KAT buses for all purposes?

Response	Number	Percent
Every day	204	44.8
Monday through Friday	145	31.9
Two or three times a week	73	16.0
Two or three times a month	20	4.4
Once a month or less	13	2.9
Total	455	100.0

Overall, how would you rate KAT bus service?

Response	Number	Percent
Excellent	107	23.3
Good	263	57.3
Fair	78	17.0
Poor	11	2.4
Total	459	100.0

How often do KAT buses run on time?

Response	Number	Percent
Always	94	20.4
Usually	319	69.3
Seldom	41	8.9
Don't know/no opinion	6	1.3
Total	460	100.0

KAT is experiencing significant increases in costs due to the price of fuel. KAT may have to raise fares to help cover these costs. Would this affect how much you use KAT if the full cash fare was raised to $1.50?

Response	Number	Percent
Yes	85	18.6
No	373	81.4
Total	458	100.0

Are you?

Response	Number	Percent
Male	231	52.5
Female	209	47.5
Total	440	100.0

Are you?

Response	Number	Percent
Under 18	5	1.1
18 to 34	176	40.4
34 to 64	216	49.5
65 years and older	39	8.9
Total	436	100.0

Are you?

Response	Number	Percent
White	230	51.3
African American	202	45.1
Hispanic	8	1.8
Other	8	1.8
Total	448	100.0

How many people are in your household?

Response	Number	Percent
One	96	25.0
Two	142	37.0
Three	79	20.6
Four	43	11.2
Five or more	24	6.3
Total	384	100.0

How many of these household members are employed?

Response	Number	Percent
One	130	33.8
Two	124	32.2
Three	32	8.3
Four or more	15	3.9
Student	78	20.3
None	6	1.6
Total	385	100.0

Is your approximate household income…

Response	Number	Percent
Less than $10,000	73	28.9
Between $10,000 and $25,000	35	13.8
Between $25,000 and $50,000	119	47.0
Over $50,000	26	10.3
Total	253	100.0