

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.

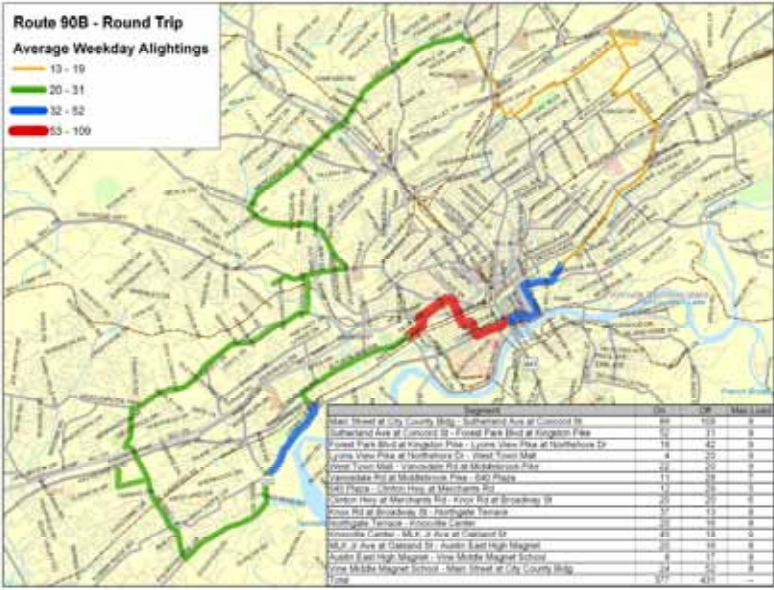
To review the complete set of boarding and alighting graphics prepared as a result of the survey, please refer to Appendix A.

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



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 than 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.

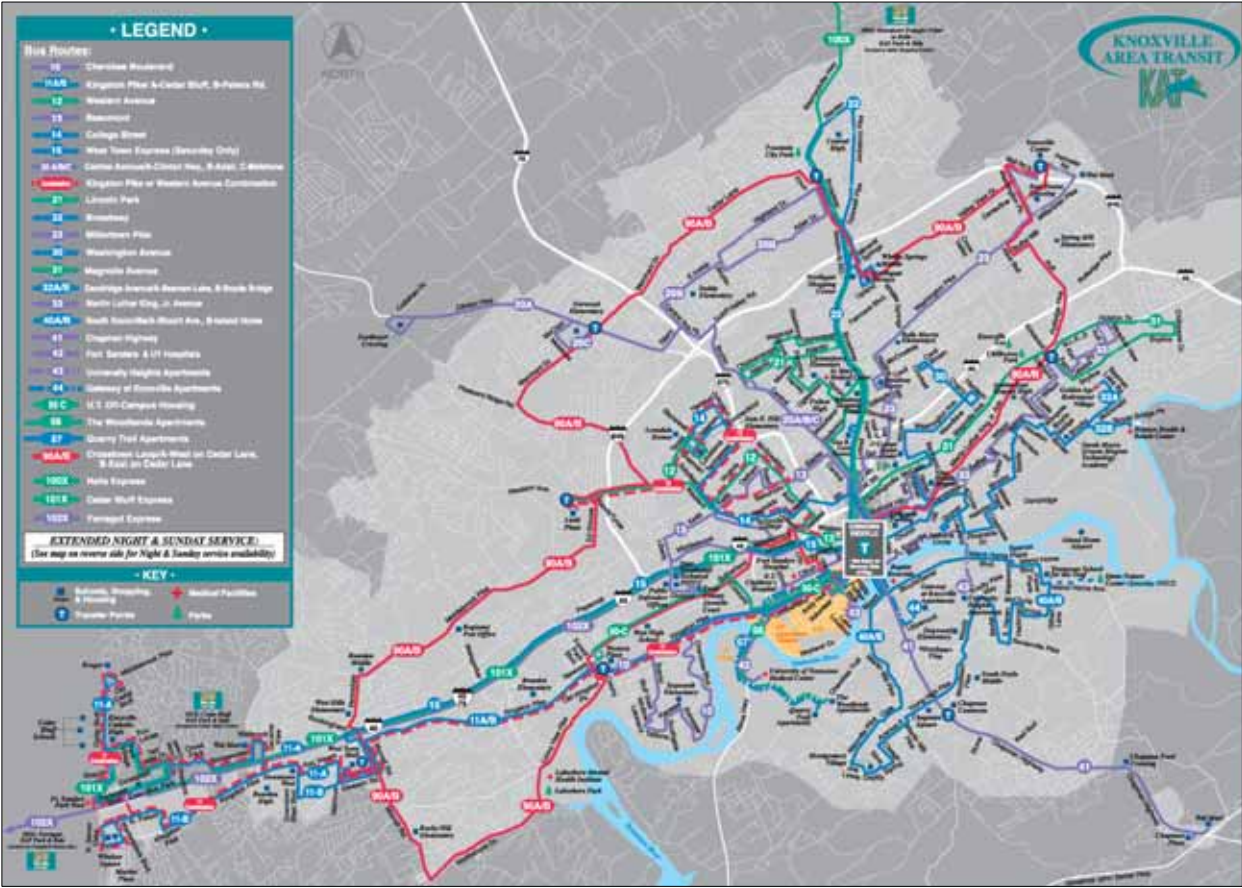
As a result of the workshops and subsequent refinements, the following routing changes are recommended as shown in Table 5-3.

Table 5-3
Route Change Recommendations

Route	Changes	Issues	Ridership Impacts	Cost Impacts	Schedule Adherence
10	<ul style="list-style-type: none"> ■ Terminates at Kingston-Scenic ■ Restructuring of route in Sequoyah Hills ■ Optional extension to Lakeshore Mental Health Hospital 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Consider using circulator (small bus) past West Towne Mall; create super stop on Kingston Pike at the end of the route. 	<ul style="list-style-type: none"> ■ Schedule adherence on the Kingston Pike route is a continuing problem 	Increase	Neutral	Improvement
12	<ul style="list-style-type: none"> ■ Combined with Route 14, named Route 14 	<ul style="list-style-type: none"> ■ 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	<ul style="list-style-type: none"> ■ Combined with Route 12, named Route 14 				
15	<ul style="list-style-type: none"> ■ Proposed for elimination as part of KAT's Saturday service proposals 	<ul style="list-style-type: none"> ■ Low ridership 			
19	<ul style="list-style-type: none"> ■ Route 20B becomes Route 19 		Possible	Savings	NA
20A/C	<ul style="list-style-type: none"> ■ Combined 20A and 20C, all trips make 20C route pattern; renamed Route 20. 	<ul style="list-style-type: none"> ■ Simplify routes, eliminate confusion 	Increase	Increase	Improvement
21	<ul style="list-style-type: none"> ■ Terminate at Broadway at Oglewood 	<ul style="list-style-type: none"> ■ Low ridership on northern portion of route; schedule adherence issue 	Possible	Savings	Improvement
22	<ul style="list-style-type: none"> ■ Add additional vehicle to route operation 	<ul style="list-style-type: none"> ■ Schedule adherence issue; indirect route alignment on north end of route 	Increase	Increase	Improvement
30	<ul style="list-style-type: none"> ■ No alignment change recommended; may consider elimination of interline with Route 42. 	<ul style="list-style-type: none"> ■ Use interline with route 42 to improve on-time performance of another route. 	NA	NA	Improvement
31	<ul style="list-style-type: none"> ■ Consider using circulator (small bus) on Skyline Drive; create super stop on Magnolia at the end of the route. 	<ul style="list-style-type: none"> ■ Would provide more neighborhood friendly service on Skyline Drive. ■ Would reinforce Magnolia trunk line as a primary route. 	Increase	Increase	Improvement
32	<ul style="list-style-type: none"> ■ Eliminate 32A; expand 32B (rename 32). 	<ul style="list-style-type: none"> ■ Route Simplification; eliminate redundant service 	Possible	Savings	NA
33	<ul style="list-style-type: none"> ■ Eliminate portion of alignment east of Kirkwood; extend to Knoxville Center on existing 90A/B alignment 	<ul style="list-style-type: none"> ■ Replace 90A/B in this area 	Possible	Increase	Improvement
90A/B	<ul style="list-style-type: none"> ■ Eliminate southern segments of 90A/B between Knoxville Center and Westtown Mall 	<ul style="list-style-type: none"> ■ 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)



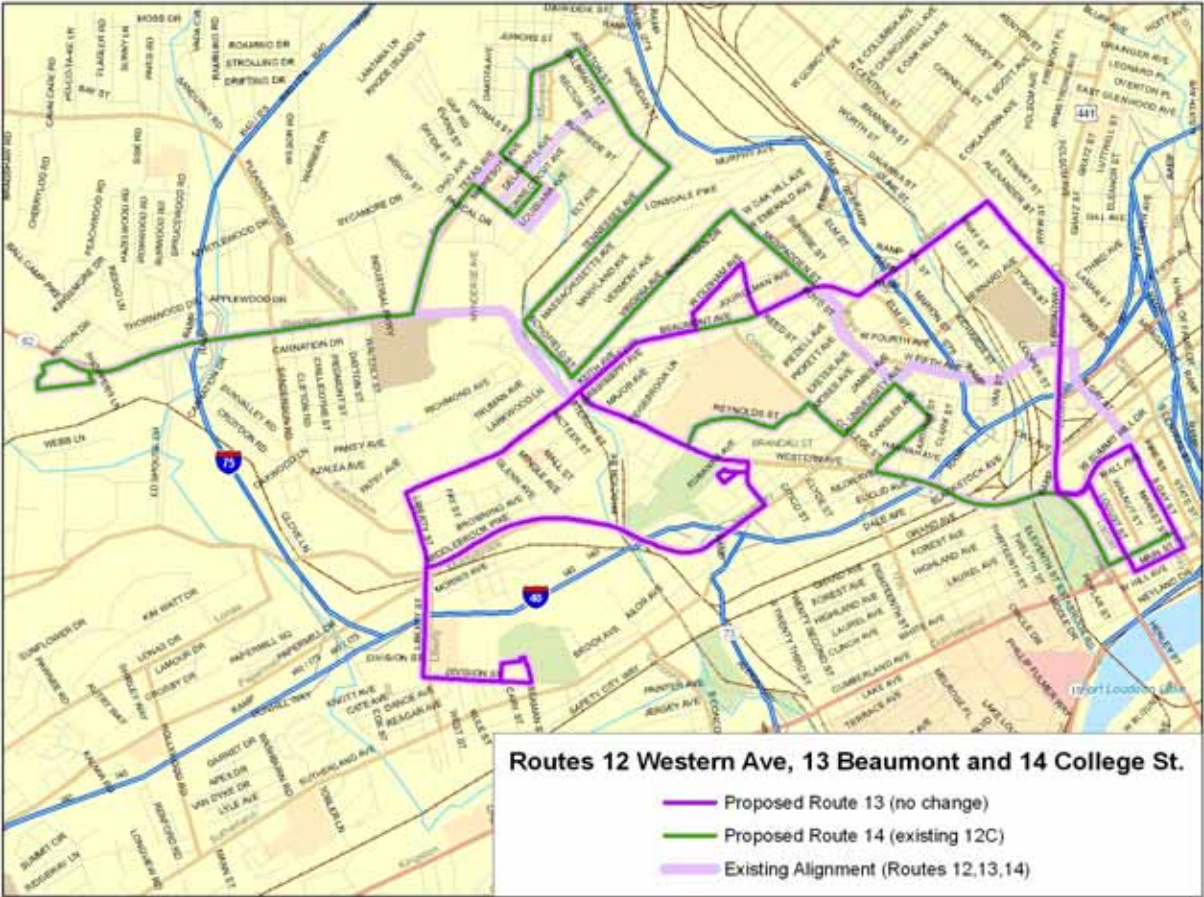
The Route 10, Cherokee, shown above, has for years been among the lowest performing routes in the system. The primary recommendation for this route is removal of part of the loop (shown in the shaded purple) on the outer edges of the Sequoyah Hills neighborhood. This would allow the route to still serve 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)



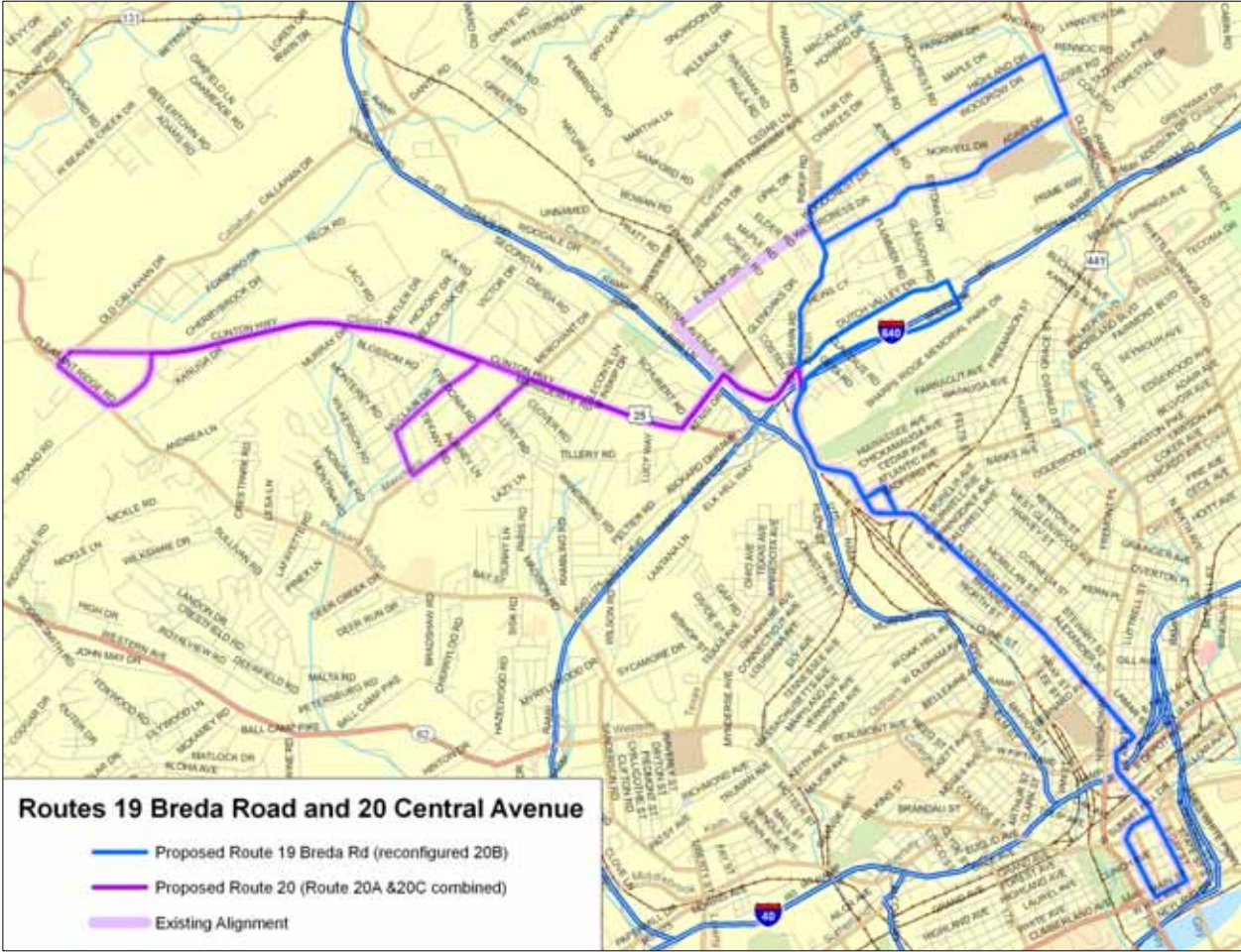
The primary recommendation on this route is putting in place a circulator on the west side of the route beginning at Wal-Mart. This would allow the main trunk of the route to avoid the heavy traffic in the commercial area and allow it to operate on a more regular basis. It currently has significant problems 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)



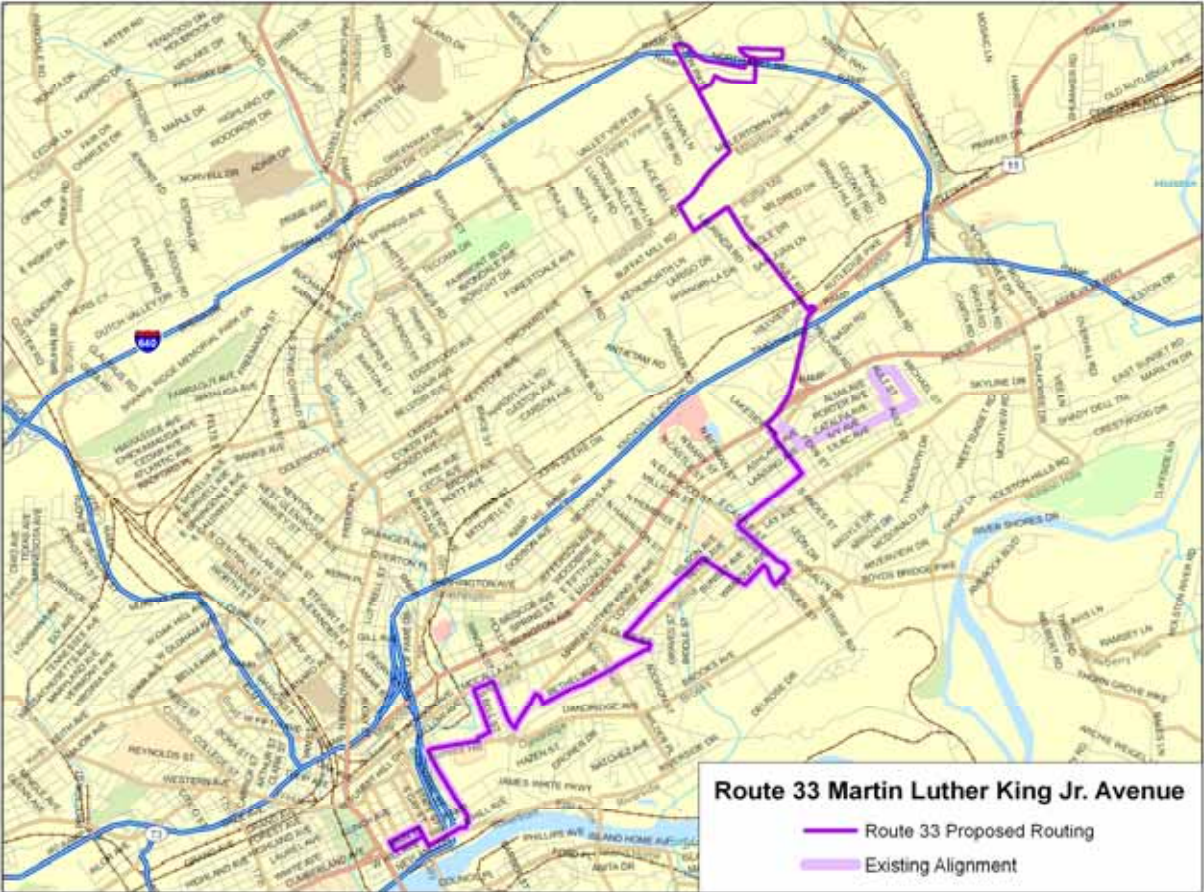
On the Lincoln Park route, there is a very lightly used area north of St. Mary’s Hospital. Overall, this route has also been one of the poorer performing routes in the system and has significant schedule adherence issues. This change should not have a major impact on ridership and will improve overall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

Figure 5-9
Route 31 (Magnolia Avenue)



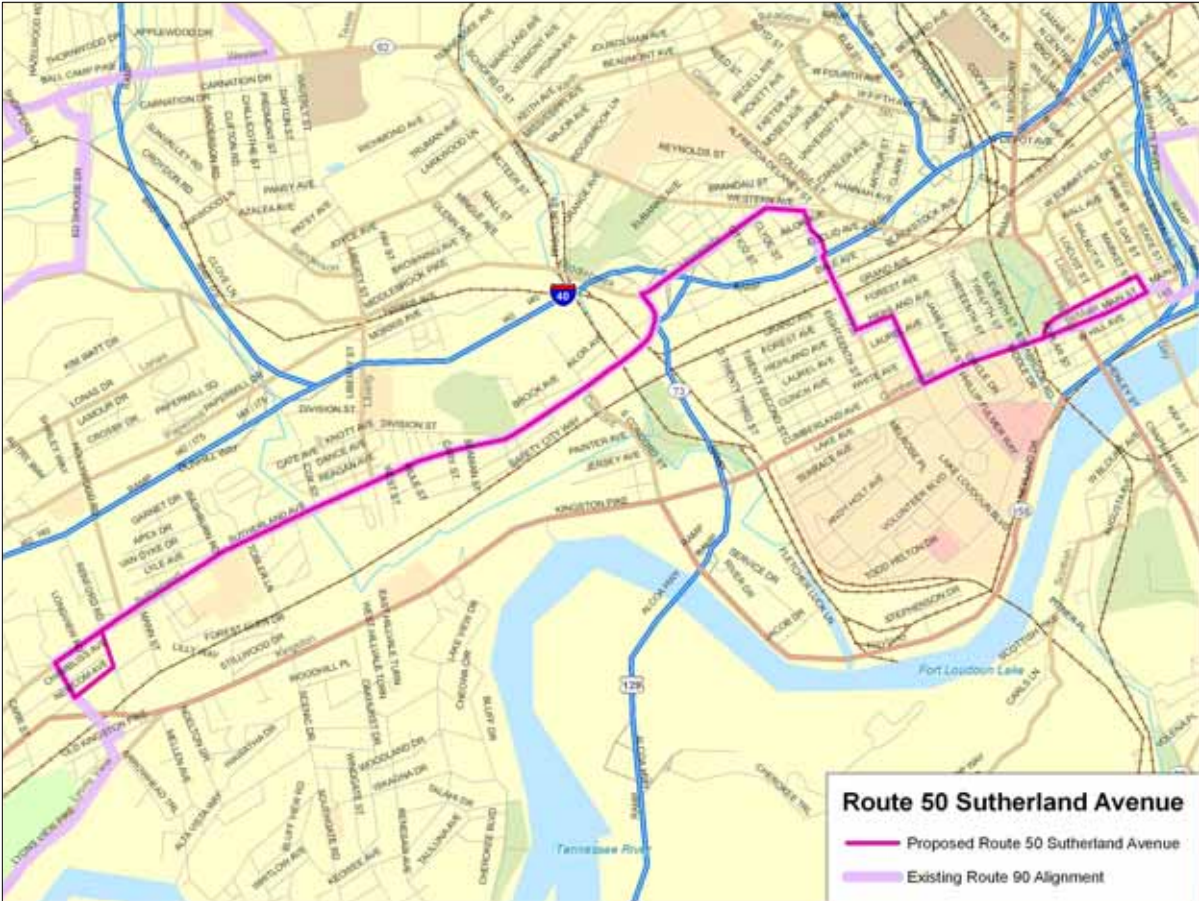
This route is one of the highest performing routes in the system and has been identified as a possible corridor for future high capacity transit. The primary recommendation is to create a shuttle extending from a superstop at the end of the route and having a shuttle operate on Skyline Drive, which is 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)



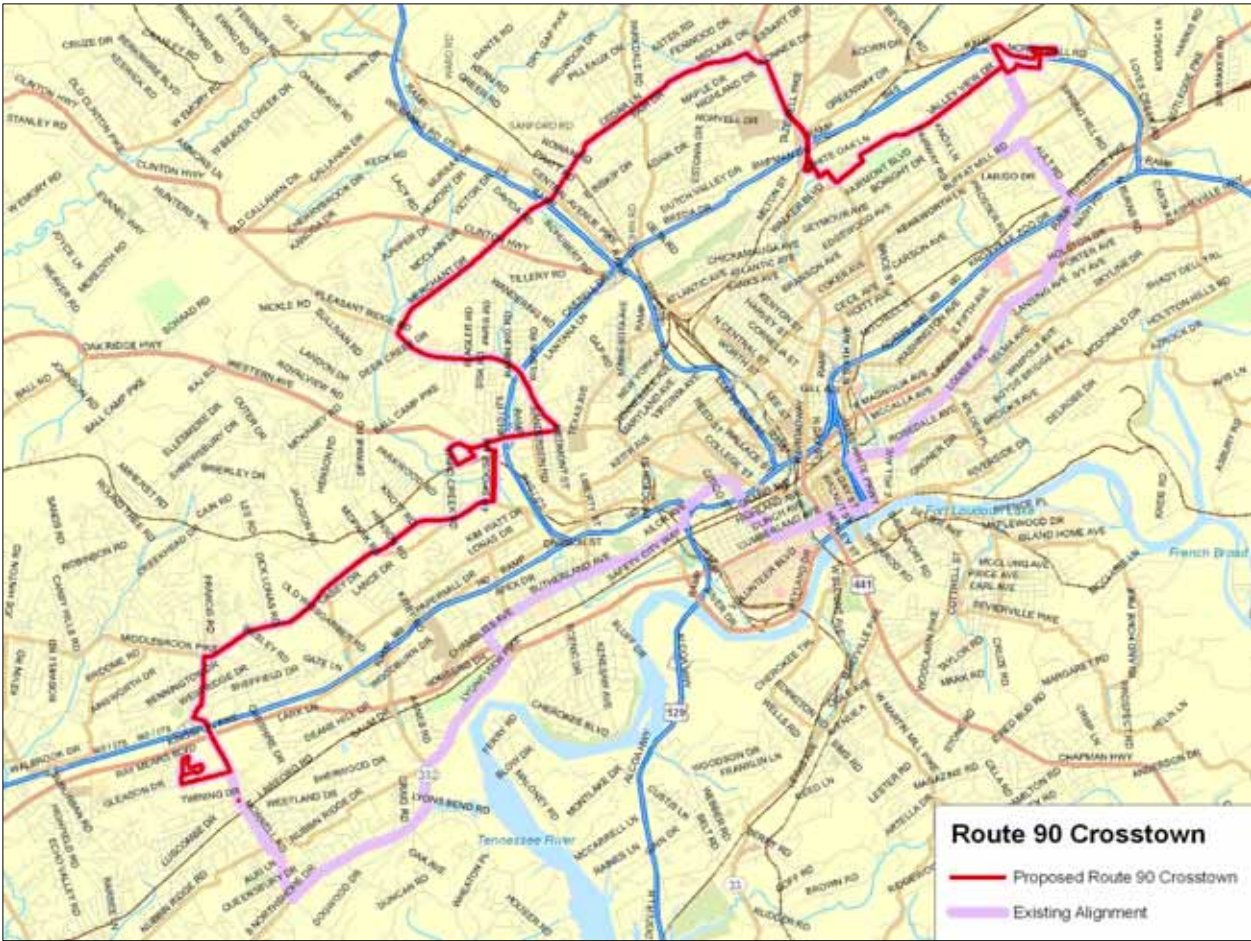
On this route a minor elimination of a deviation is recommended to help the route maintain its schedule. Based on the data and analysis during the workshops, this recommendation will not unduly affect riders in this area and there will still be good service coverage .

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)

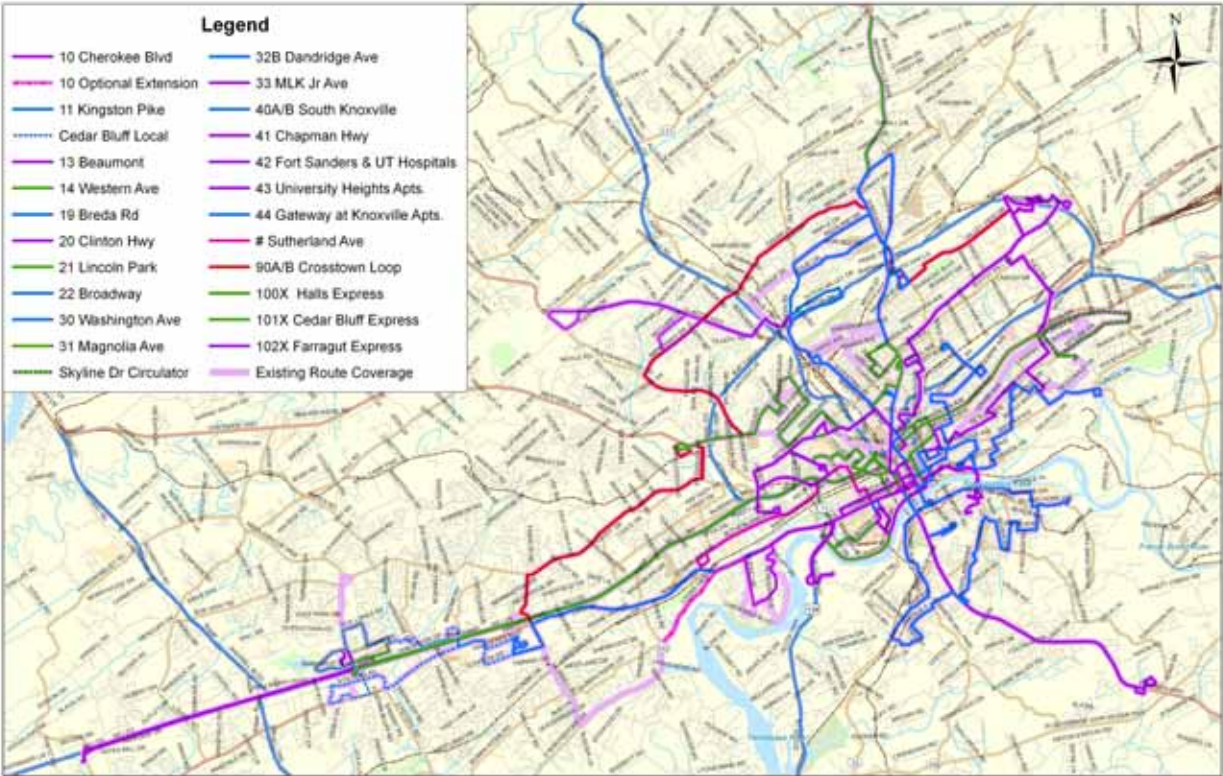


The Route 90 Crosstown Route is carries the most passengers but also consumes the most resources of any route in the system. The proposed recommendation for this route is to eliminate the southern portion of the route so that the route essentially is traveling from Knoxville Center Mall to West Town 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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