

Special Appendix B
Transit Vision



Transit Vision

Recommended Network and 2040 Vision

November 2018

JARRETT WALKER + ASSOCIATES



Memphis 3.0 Transit Vision

Recommended Network and 2040 Vision

NOVEMBER 2018

For Innovate Memphis and the City of Memphis

JARRETT WALKER + ASSOCIATES



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1 Introduction

Introduction

What is the Transit Vision?

The Memphis 3.0 Transit Vision is part of the Memphis 3.0 comprehensive planning process, a process that will develop a new vision to guide the growth and development for the third century of Memphis. The Transit Vision is being led by the City of Memphis and Innovate Memphis, in partnership with the Memphis Area Transit Authority (MATA).

The Memphis transit network has not been thoroughly redesigned in decades, and many of its features were designed for a city that is much different than today. Previous efforts to redesign the system, like the 2012 Short Term Plan, have not been implemented because of the natural challenges to making large changes to long established habits and systems.

In addition, there has been a pattern of disinvestment in transit over the last ten years, leading to less transit service. These factors have combined to reduce ridership on the transit system and create a sense of crisis over how and whether transit can or should be a relevant part of the city's life.

In this context, the City of Memphis and Innovate Memphis began a conversation in 2017 with stakeholders, riders, community members and elected officials about whether to change the city's transit network, in what direction the system should be changed, and how to invest in the future of transit in Memphis.

The goal of this process has been to

- Assess the existing transit network and the geometry of today's city;
- Engage the public, stakeholders and elected officials in a conversation about the goals of transit in Memphis;
- Develop recommendations for changing the transit network; and
- Consider the cost and financing options for improving transit in Memphis.

Ultimately, the City of Memphis wants a blueprint for how to change and grow the existing transit system to best meet the needs and goals of today's city, and develop a long-term plan for the future transit network that meets the needs of the Memphis of tomorrow.

This Transit Vision describes the outcome of the planning process including a Recommended Network for transit service in Memphis in the short-term (by 2022) and a long-term vision for transit expansion as the city grows and develops in line with its new comprehensive plan.

Recent Decline in Transit

In the past ten years, Memphis has experienced a slow-moving self-reinforcing decline in transit. The danger is that, if it is not halted, transit will *decline into irrelevancy*. (Memphis is not the only city that has experienced this.)

We can see evidence of this cycle in the levels of ridership and service hours (Figure 3 at right). From 2005 to 2015, MATA cut service by 22% and ridership fell by 28%. It is not at all surprising that ridership declines when service is cut. People cannot ride buses that don't run. The contributors to this process include:

- **Residential and job growth.** The region has grown slowly in population and jobs but more quickly in developed land area. Most new developments are far away from the transit network and from each other.
 - Triggered by population increases, Memphis crosses a threshold into a category of larger regions, and MATA starts receiving less federal funding.
 - Meanwhile, new development areas are much more expensive to serve with transit, because they are lower density and far away.
 - Service is cut, frequencies are reduced so that routes can be lengthened, and ridership drops predictably.
- **Cost increases.** The costs to MATA of delivering each hour of transit service has increased. Federal, State and City contributions have, in most years, not kept up with inflation.
 - MATA is able to put less service on the street, and ridership drops predictably.
- **Federal funding cuts.** MATA's share of federal funding has been reduced because ridership has dropped so much.
 - Service is cut, and ridership drops again, predictably.

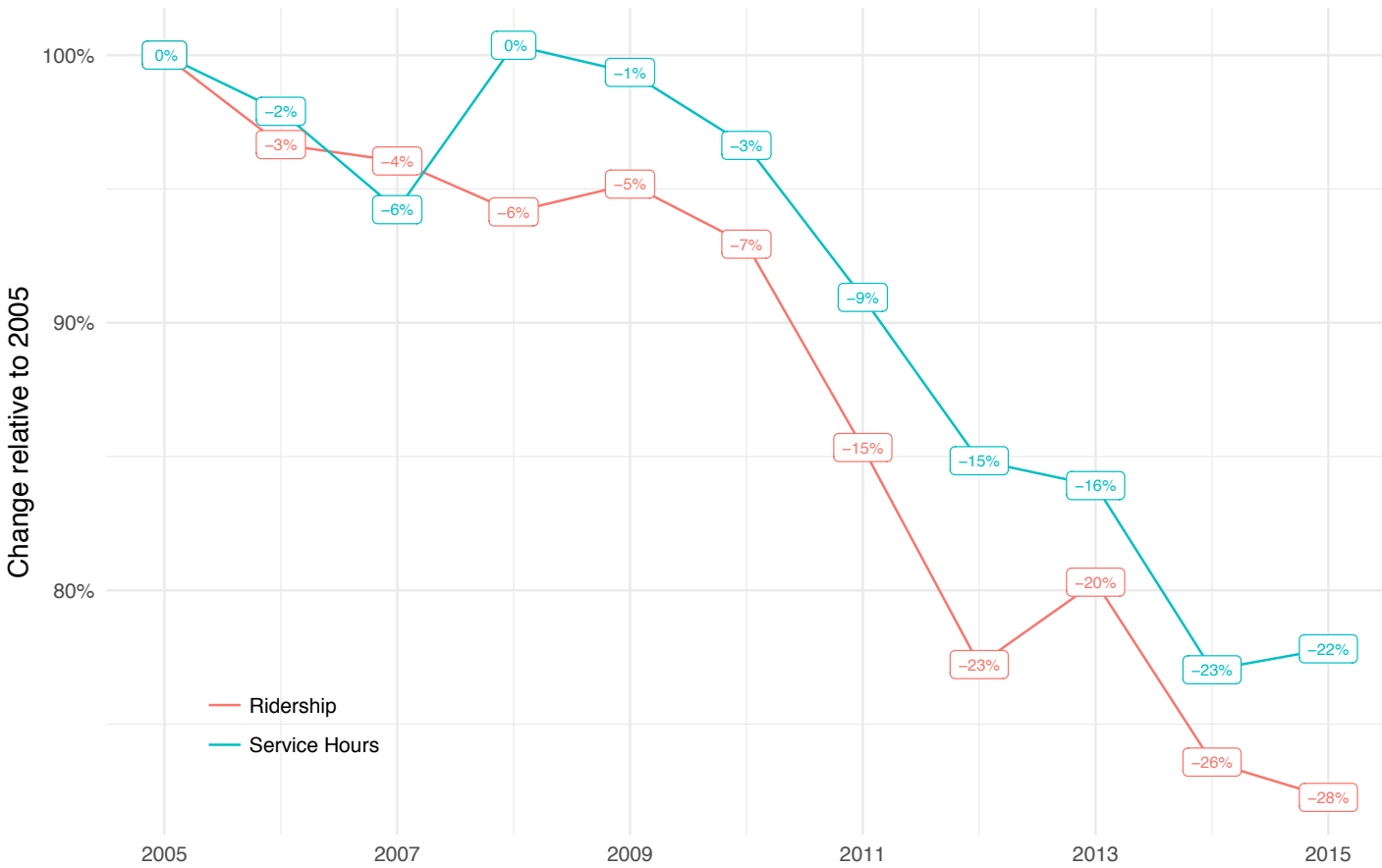


Figure 1: Changes in MATA's total service supply (service hours) and ridership between 2005 and 2015. Ridership fell nearly hand-in-hand as service was reduced over the years.

- **Development continues away from the existing network.** Because the transit network is useful to fewer and fewer people, there has been no incentive for developers and businesses to locate on it.
 - More growth happens in places that are hard to serve with useful transit.
- **And so on.**

The Memphis 3.0 Comprehensive Plan and Transit Vision aim to reverse the decline in transit service and ridership by reinvesting in service and shifting to transit-supportive land use policies.

Existing System

The map at right shows the existing transit network in Memphis. Every route is color-coded based on its frequency during midday on a weekday.

Low frequencies and limited hours of service are one of the main ways that transit fails to be useful, because it means service is simply not there when the customer needs to travel.

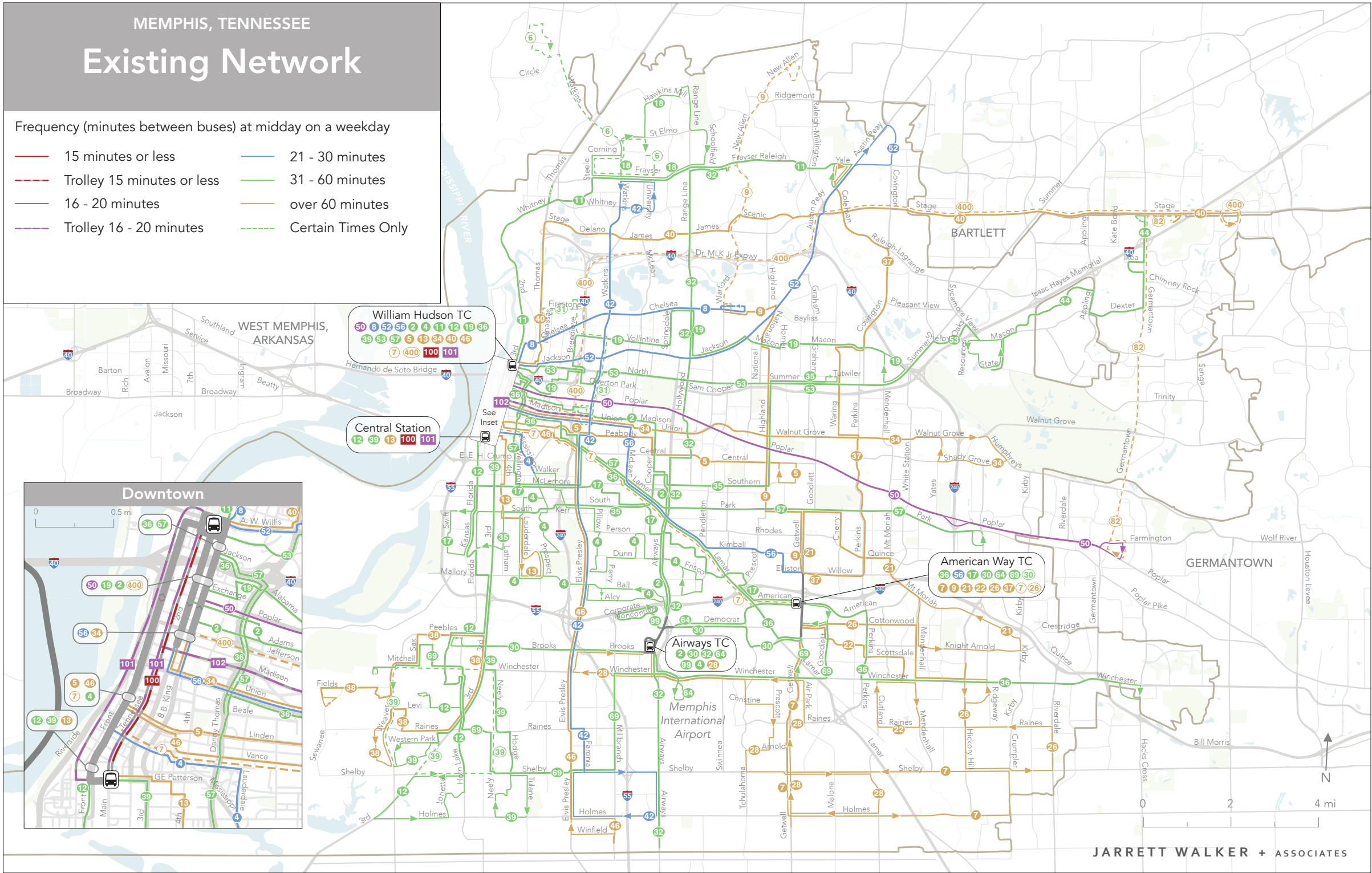
Frequent service:

- Reduces waiting time (and thus overall travel time).
- Improves reliability for the customer, because if something happens to your bus, another one is always coming soon.
- Makes transit service more legible, by reducing the need to consult a schedule.
- Makes transferring (between two frequent services) fast and reliable.

The map at right reveals that only a few MATA routes offer 30-minute frequency; only one offers 20-minute frequency; and only the trolleys offer service every 15 minutes or better (which is the transit industry norm for calling something “frequent”).

The Existing Network devotes 40 percent of resources to service that one would expect to get high ridership relative to cost. The other 60 percent of resources is going to service that is not likely to get high ridership relative to cost, but is meeting other important goals, like covering low density areas with severe needs. For a deeper explanation of the rider-ship-coverage trade-off and balance between those two goals, see the *Choices Report*.

Figure 2: Existing System



Introduction

Short-Term Recommended Network

The Short-Term Recommended Network in this report is the result of conversations and the direction received from the public, stakeholders and elected officials about the values that Memphians want transit to achieve. The results of that conversation are documented in Chapter 2.

The conversation around changing the transit network began with general questions about how Memphis should balance key goals like ridership and coverage within existing resources or with more resources. These goals were described in our Choices Report, released in September 2017, available at the project home page: <http://www.memphis3point0.com/transit> or directly from [this link](#).

The conversation continued with a discussion and survey around four conceptual networks, two within the existing transit budget, and two with additional funding. The conceptual networks and their outcomes were described in our Concepts Report, released in November 2017, available at the project home page: <http://www.memphis3point0.com/transit> or directly from [this link](#).

The results of that conversation indicated that Memphians wanted to invest more in transit service and direct most of that new investment into higher frequency service that would increase ridership, but to also maintain the existing coverage of the existing network. So the project team produced a Draft Recommended Network in our April 2018 report available from [this link](#). In a survey about the Draft Recommended Network, we asked for feedback from the public about the proposal. The vast majority of respondents agreed that the proposed network would be better for Memphis than the existing network and supported more funding for transit service in the city.

Who designed this network?

The Recommended Network was designed through collaboration among City of Memphis planning and transportation staff, Innovate Memphis multimodal transportation staff, Memphis Area Transit Authority (MATA) staff, and consulting transit experts from Jarrett Walker + Associates.

This network represents some key choices about the future of transit in Memphis. Those choices were made not by the technical experts, but by Memphis stakeholders. The choices, and the many ways that people weighed in on them, are described in the next chapter.

How much more transit funding are we recommending?

Based on public and stakeholder input, the Recommended Network assumes that Memphis will invest more funding in transit to provide more service. The network is designed with the assumption that an additional \$26 million per year would be provided for transit operations and \$4 million for transit capital needs, for a total increase in investment of \$30 million per year. This funding level was chosen based on consultation with City, MATA and Innovate Memphis staff as a realistic assumption of what could be provided with additional funding from a mixture of revenue sources approved by the City or by voters.

The Recommended Network assumes the City will invest an additional \$30 million per year in transit.

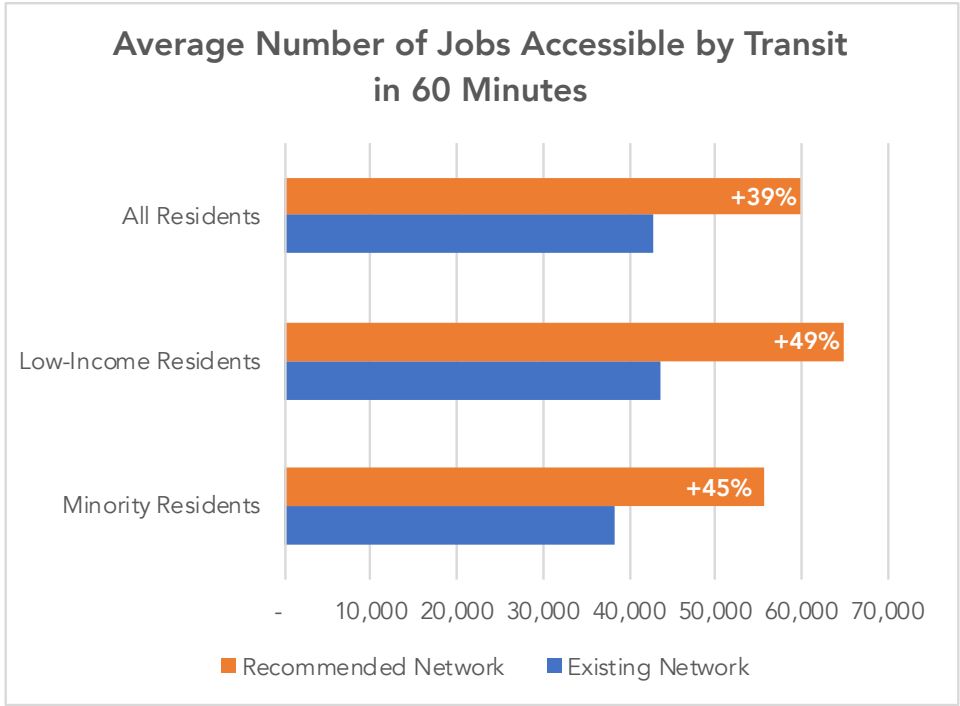
How does the Recommended Network perform?

For most people and most places in Memphis, the Recommended Network dramatically improves the jobs, people, and opportunities accessible by transit. It does this by providing more frequent service along the busiest and densest corridors and by rearranging service in some areas to consolidate low frequent routes into higher frequency service.

For the average Memphian, the number of jobs accessible by transit in an hour would increase by 39%. For low-income and minority residents, jobs access would increase, on average, by 49% and 45%, respectively.

The number of people and jobs that have access to some service would also increase with the Recommended Network. Access to frequent service would increase dramatically. An additional 79,000 people would have access to frequent service, increasing from 2% of people with the existing system to 14% with the Recommended Network. An additional 103,000 jobs would be near frequent service, increasing from 6% with the existing system to 25% with the Recommended Network.

Figure 3: Change in jobs accessible for all residents, low-income residents, and minority residents



Takeaway

For the average Memphian, the Recommended Network would increase the number of jobs accessible in one hour by 39% — an additional 17,000 jobs.

Introduction

Recommended Network

The Short-Term Recommended Network assumes a major increase in transit investment — an additional \$30 million per year. The additional resources are primarily invested in additional frequency with 70 percent of all resources spent on service expected to get high ridership relative to cost, while 30 percent of all resources are spent on service that is meant to provide coverage to areas where ridership is not likely to be high.

The Recommended Network would provide a high frequency grid network with high frequency service on two routes radiating from downtown: Union and Lamar plus 20 minute frequency on Poplar.

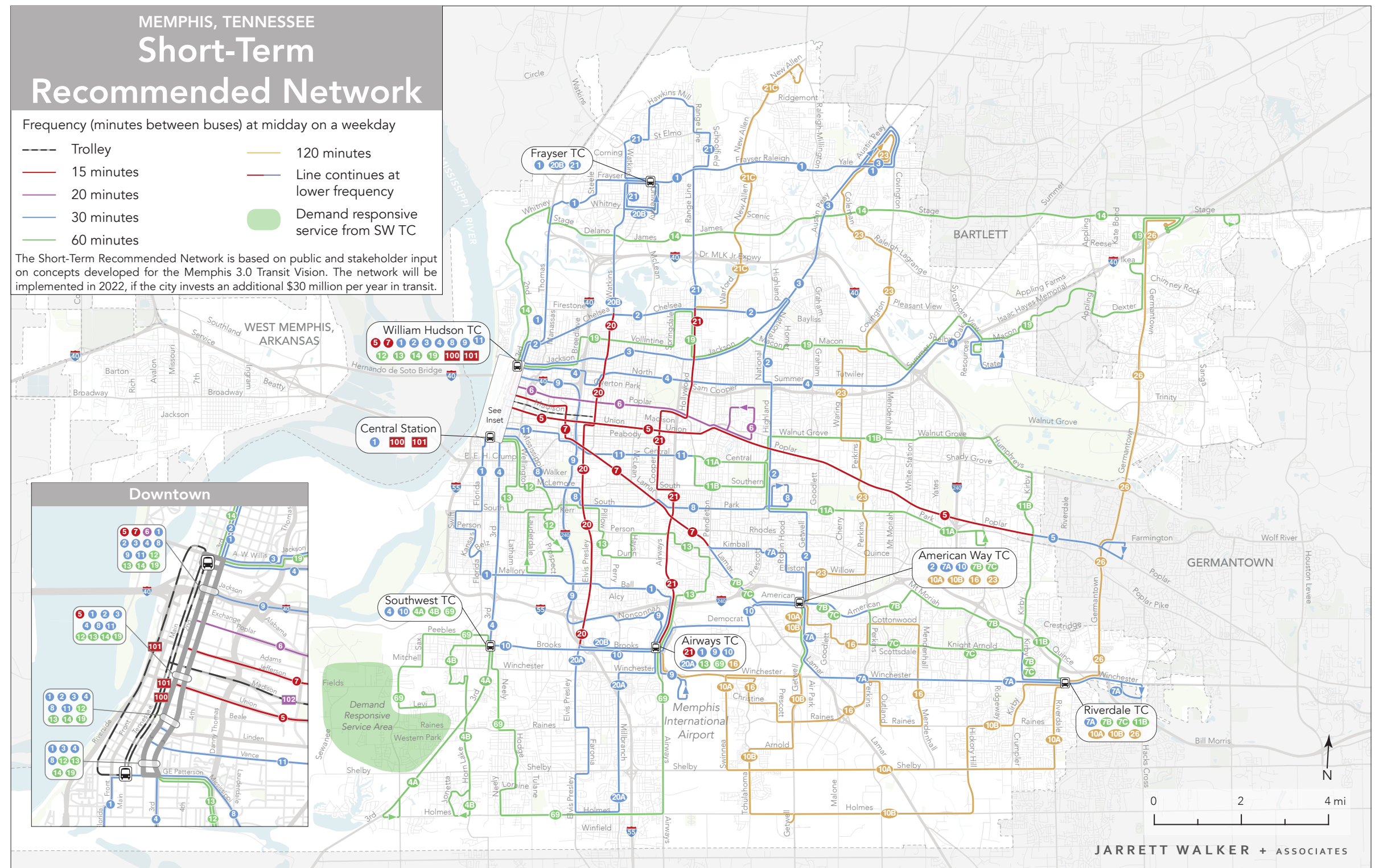
It would provide high frequency service on two north-south crosstown routes: the Watkins/Cleveland/Elvis Presley Boulevard corridor (similar to the current route 42) and the Hollywood/Cooper/Airways corridor (similar to the current route 32).

A benefit of this high frequency grid is how it makes moving around Memphis much easier. Where high frequency routes cross, transfers are fast and easy, so going from Prospect Park (Elvis Presley and Ball) to the Regalia Shopping Center (Poplar and Ridgeway) is much faster because the initial wait and the wait when transferring is much shorter.

The Recommended Network maintains coverage for nearly all parts of Memphis that currently have service, meaning that there is a route within a quarter mile. In some cases, the type of service changes, however.

For example, in far Southwest Memphis, fixed route service is replaced with demand responsive service that would connect to a new transit center near 3rd and Mitchell.

Figure 4: Short-Term Recommended Network



Introduction

The Transit–Land Use Planning Conversation

The 2040 Vision Network shown on the following page is the City’s contribution to a healthy conversation between land use and transportation planners in Memphis.

This new transit vision was influenced by the draft land use plan from the Memphis 3.0 process. The map at right shows land use designations from the Memphis 3.0 Comprehensive Plan and the Short-Term Recommended Network. A key feature of the land use plan is a focus on anchors as key centers of activity and development. Better connecting these anchors was a key aspect of the design of the 2040 Vision.

A Healthy Long-Range Planning Conversation

Similar conversations happen between land use and road planning; between transit and road planning, and for other kinds of related planning activities

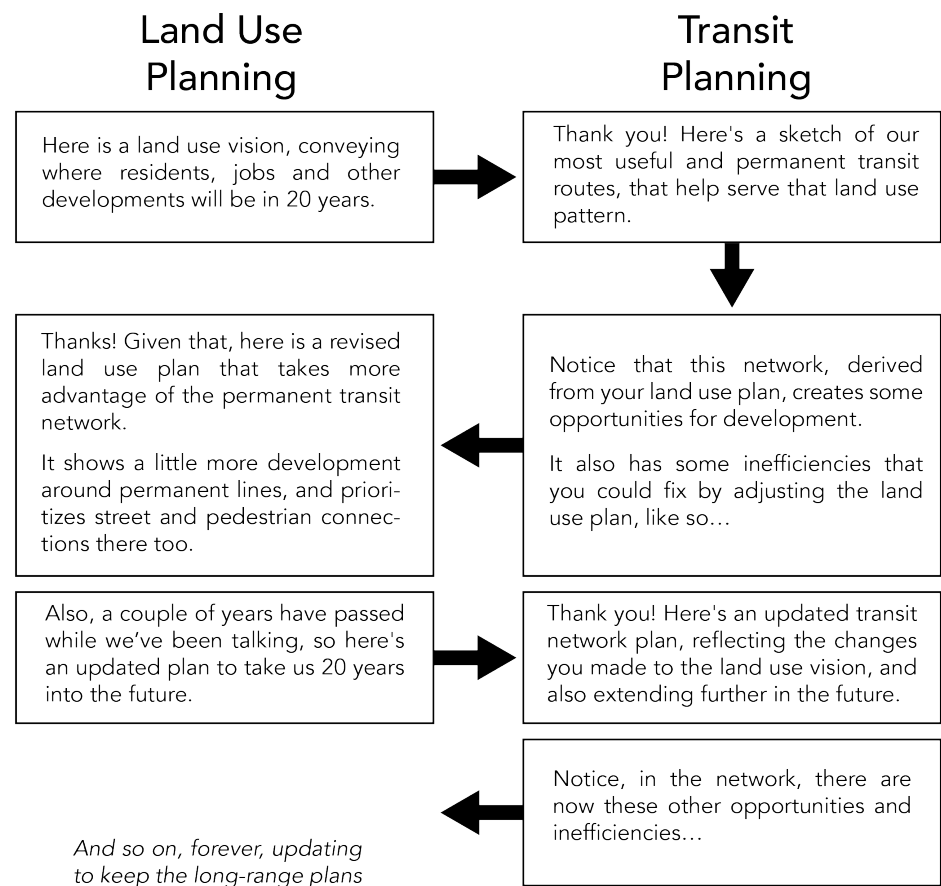
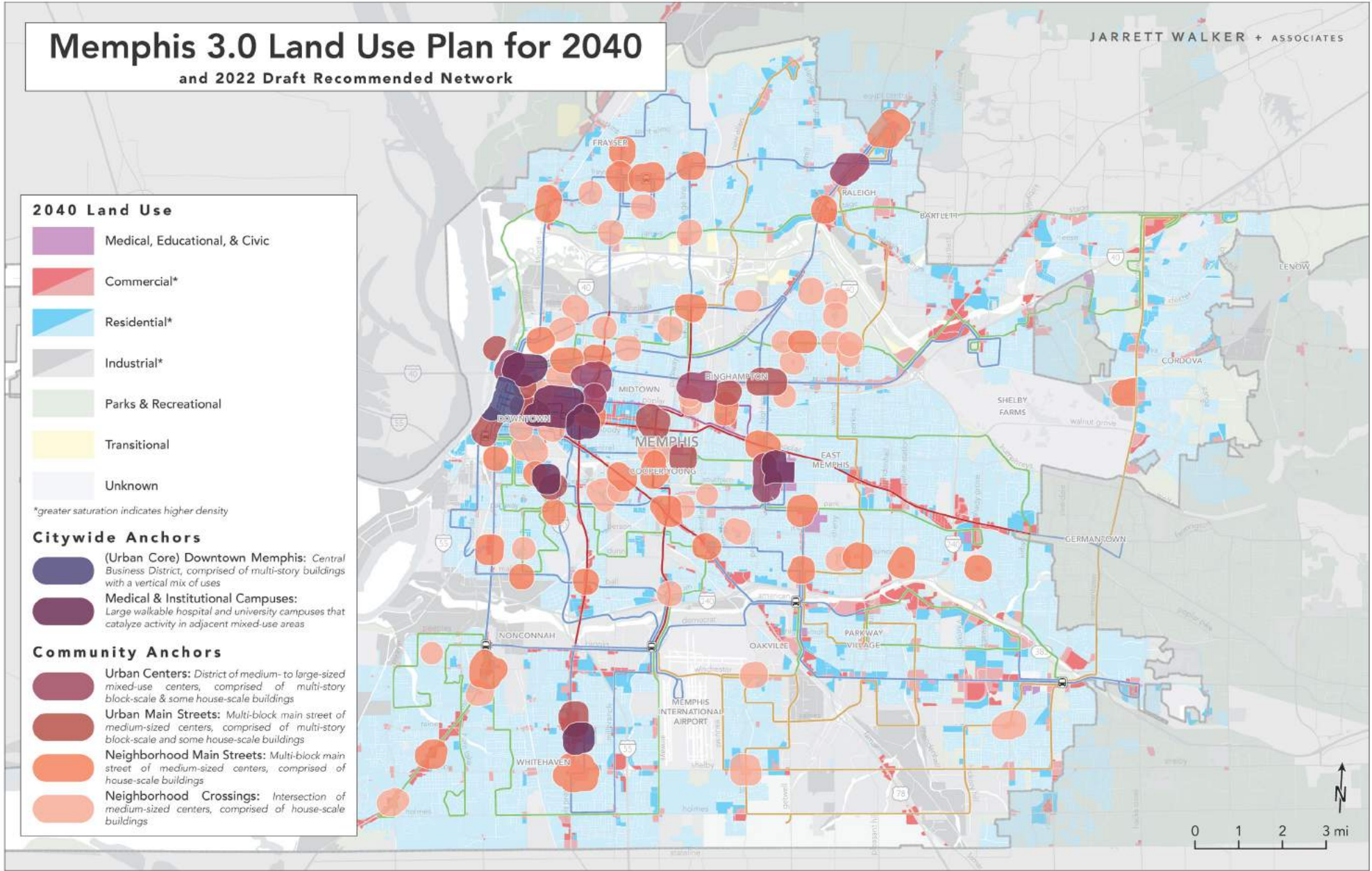


Figure 5: Memphis 3.0 Land Use Plan for 2040



Introduction

Long-Term Network for 2040

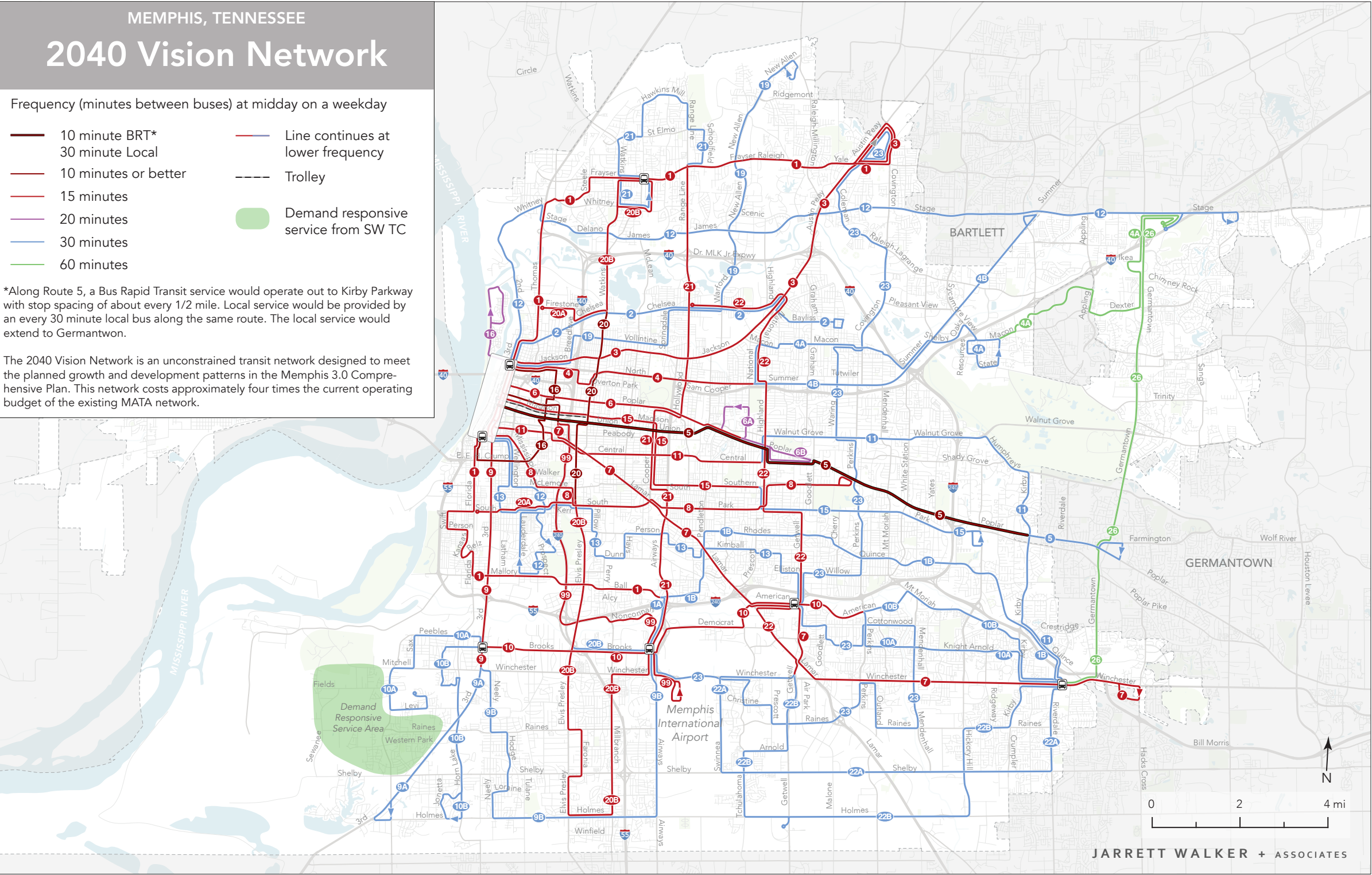
The 2040 Long-Term Network is designed to respond to the city's growth and land use plans, in order to improve transit in the areas most suited to cost-effective and high-rider-ship service and to improve service across areas most of the city.

This network will require about 4 times as much service as the existing MATA network, using 1,200,000 hours of service per year (rather than the 320,000 service hours required to operate the existing network). It will also require an expanded fleet of vehicles, additional staff, improved bus stops, and other infrastructure.

One of the key features of this network is its frequent grid (shown in red and maroon in the map at right). It allows someone to go from anywhere to anywhere on the grid, with a single fast transfer. In the 2040 Vision the frequent grid has been expanded across much more of the city. Additional frequent routes are added on numerous east-west corridors such as Frayser/Raleigh, Jackson Avenue, Summer Avenue, and Central Avenue. In addition a new north-south frequent crosstown route along the National/Highland/Getwell corridor from Airways Transit Center north to the Jackson Avenue corridor is added to improve access across the city.

With an expanded frequent grid, MATA can offer freedom and mobility to large numbers of people without needing to provide everyone with a one-seat-ride to the places they care about.

Figure 6: 2040 Transit Vision



2

How did we get here?

How did we get here?

Thus far, there have been two phases of public involvement in the Memphis 3.0 Transit Vision process.

In Phase 1, in the fall of 2017, Innovate Memphis, the City and consulting team presented people with abstract choices and trade-offs, and received people’s general guidance in response. During Phase 1, input was collected through nearly 1,000 responses to a web and paper survey of the general public and riders and through a Stakeholder Advisory Committee.

In Phase 2, from November 2017 through February 2018, the team presented people with four different, detailed Network Concepts for Memphis, and received people’s responses to the specific trade-offs and ideas shown in those Concepts. During Phase 2, input was collected through 1,200 responses to a web and paper survey of the general public and riders.

Input received during both of these phases was used, in early 2018, to develop this Short-Term Recommended Network.

Choices Report and Phase 1 Input

The Choices Report provided a lot of background on the existing system and then asked some key questions about what Memphians value about transit. These questions were posed to the general public in our Phase 1 Survey.

Walking vs. waiting

In any transit network, there is a basic trade-off between walking farther to service, or waiting longer for service.

A transit agency can concentrate its service into fewer, more frequent routes...but they will be spaced farther apart. Or it can spread its service out into more routes, that are closer together...but then they run infrequently. Within a fixed budget, the basic math of transit forces a trade-off between offering shorter waits and offering shorter walks.

When asked how they would like to see this trade-off made, Memphis stakeholders and members of the general public tended to support shorter waits and longer walks.

Takeaway

65% of public survey respondents and 71% of stakeholders mostly or definitely preferred shorter waits.

Figure 7: Most survey respondents preferred less waiting to less walking

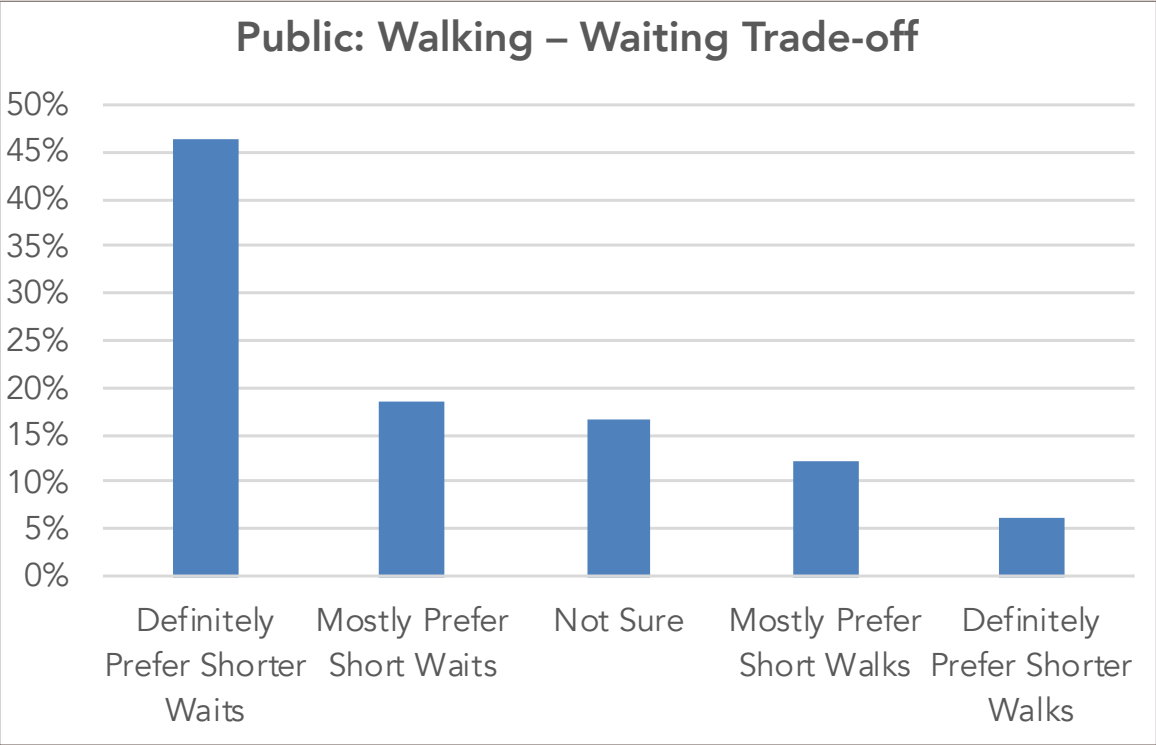
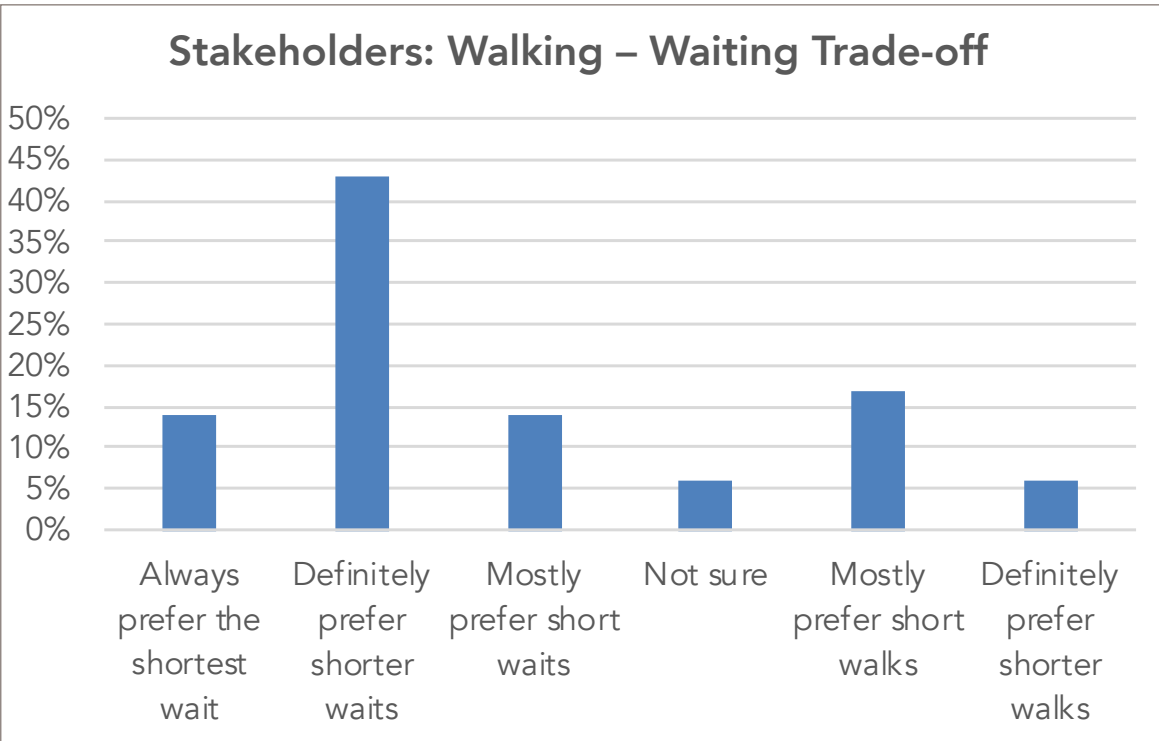


Figure 8: Most stakeholders preferred shorter waits even if it meant longer walks to transit



How did we get here?

Maximizing ridership vs. maximizing coverage

The trade-off between walking and waiting can also be described as a trade-off between maximizing ridership and maximizing coverage.

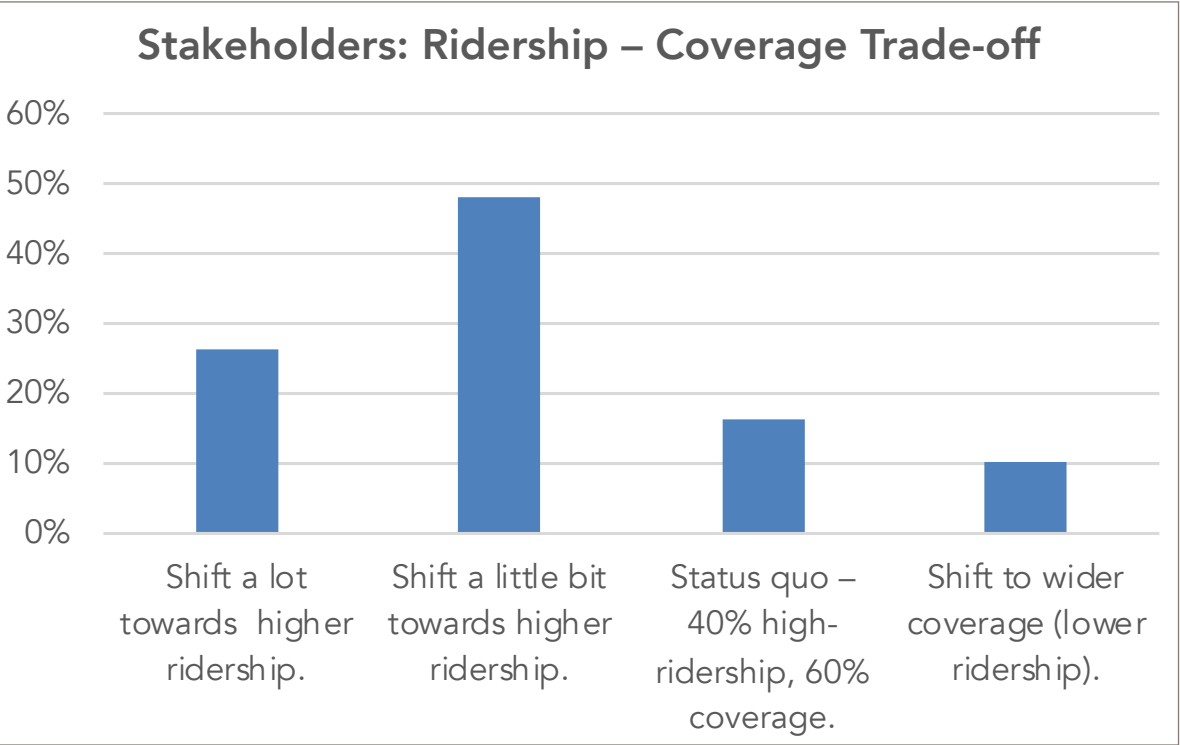
When transit agencies concentrate their service into fewer, but more frequent, routes, it nearly always leads to higher ridership. In addition, when transit agencies focus their service on the places and corridors where there are the most people and jobs, higher ridership is the typical result. Yet, within a fixed budget, this means less service can be spread out to cover everyone.

This trade-off between maximizing ridership (and frequency) and maximizing coverage was presented to people during the first phase of public input, in the *Choices Report* and in surveys.

Today, the City of Memphis and MATA spend about 40 percent of its budget pursuing high ridership, and 60 percent providing coverage in places where high ridership is not a reasonable expectation. The Stakeholder Committee was asked whether this was the right balance. Their responses are shown below. In general, most Stakeholder Committee members wanted to shift toward a higher ridership system.

In surveys of the public, the responses were less clear. Many people responded that they weren't sure. Slightly more people responded by saying they preferred or strongly preferred a high ridership system.

Figure 9: Stakeholders generally preferred a shift toward ridership and away from coverage



What do Memphians want new transit resources spent on?

In Phase 1, we also asked Memphians to prioritize their top three improvements for transit service if more money for transit was found. The top priority identified by respondents was higher frequency service on weekdays. The second was covering places that don't have service today. These results suggest that survey respondents would prioritize higher frequency service when adding more dollars to the transit budget. But adding coverage is still a high priority as it outweighed adding frequency in the evenings or on weekends.

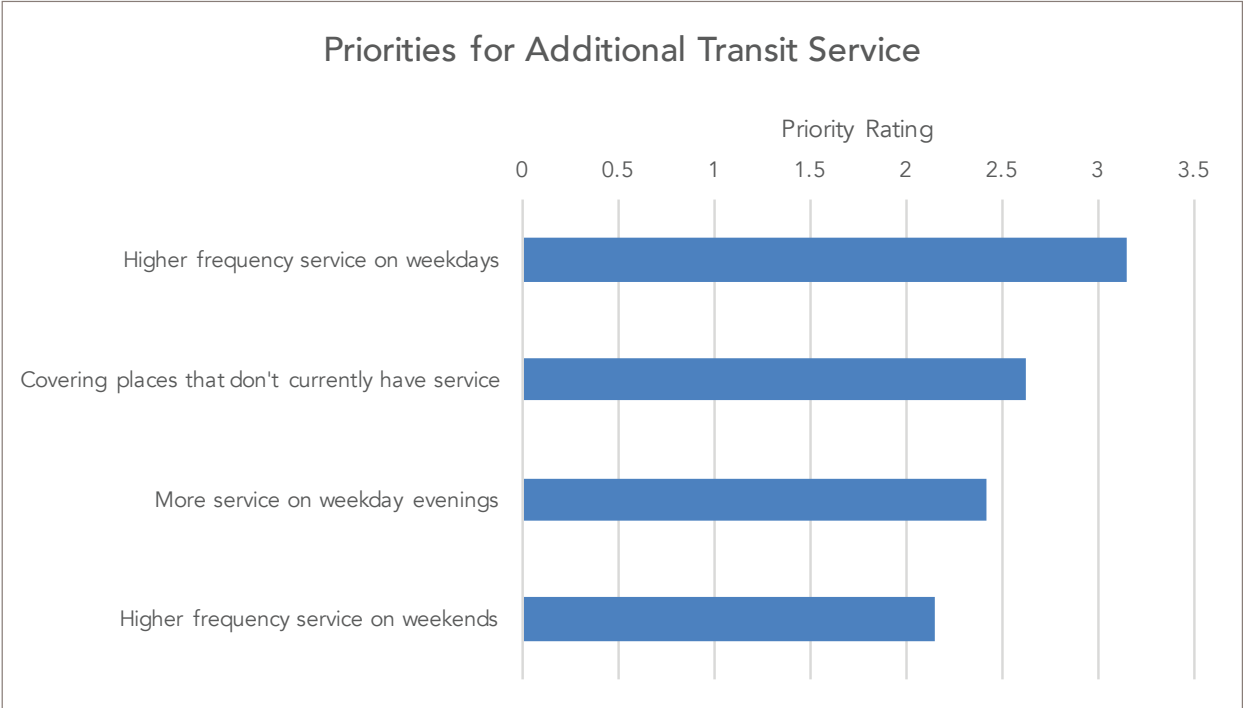
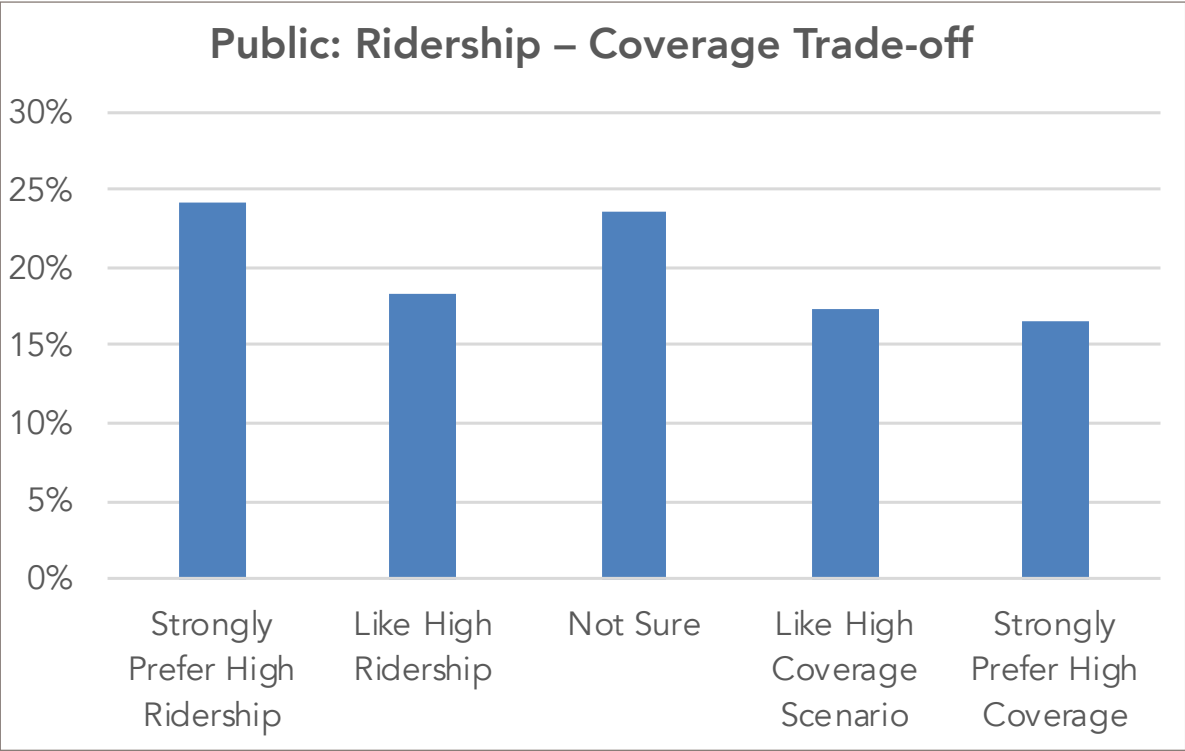


Figure 11: Public survey respondents rated higher frequency on weekdays as the top priority for new investment

Figure 10: Many respondents were unsure about the Ridership – Coverage trade-off in Phase 1



How did we get here?

Concepts

In order to help people understand key trade-offs and develop confident opinions, the consulting team created four different “Network Concepts.”

These four Concepts illustrated two separable choices, as illustrated in the square below:

- How should Memphis balance ridership and coverage goals? (And, relatedly, how should walking and waiting be traded-off?)
- How much should Memphis invest in transit service.

Understanding that everyone’s preference would be for higher frequency *and* wider geographic coverage, both are simply not possible within the existing budget. And even with additional funding, having more frequency means that the ability to expand coverage is limited.

The existing budget is already being used effectively by the agency to deliver existing levels of frequency and coverage. There are no significant “inefficiencies” or “low-hanging fruit” that would allow MATA to meet such demands with existing resources. So any higher frequencies or coverage of new neighborhoods would have to come at the expense of service elsewhere, unless additional funding was provided for transit.

There were two concepts that assumed the existing level of transit funding:

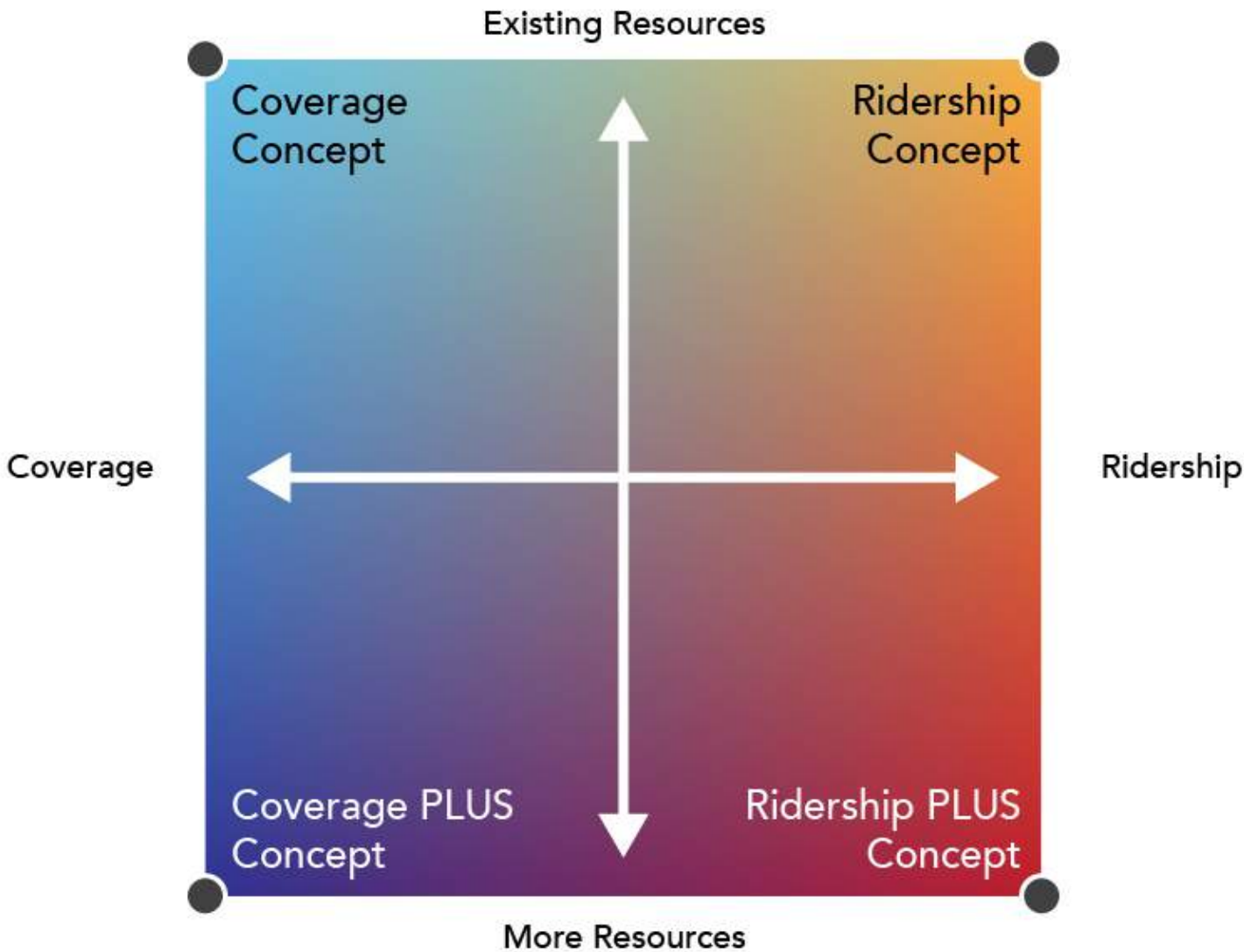
- **Coverage Concept** - 40% Ridership, 60% Coverage: This concept is very similar to the existing system and matches the current way that resources are split between ridership and coverage.
- **Ridership Concept** - 80% Ridership, 20% Coverage: This is the most extreme change from the current network, with the highest ridership potential (without additional funding) but also the greatest reduction in low-ridership coverage services.

There were two concepts that assume additional funding for transit:

- **Coverage PLUS Concept** - 50% Ridership, 50% Coverage: This concept is similar to the existing system in its balance between ridership and coverage. With more resources, both coverage and frequency can be improved, with more focus on coverage.
- **Ridership PLUS Concept** - 80% Ridership, 20% Coverage: With more funding and a ridership focus, this concept shows how more frequency can provide better and faster connections within the core of Memphis, while maintaining coverage in less dense areas.

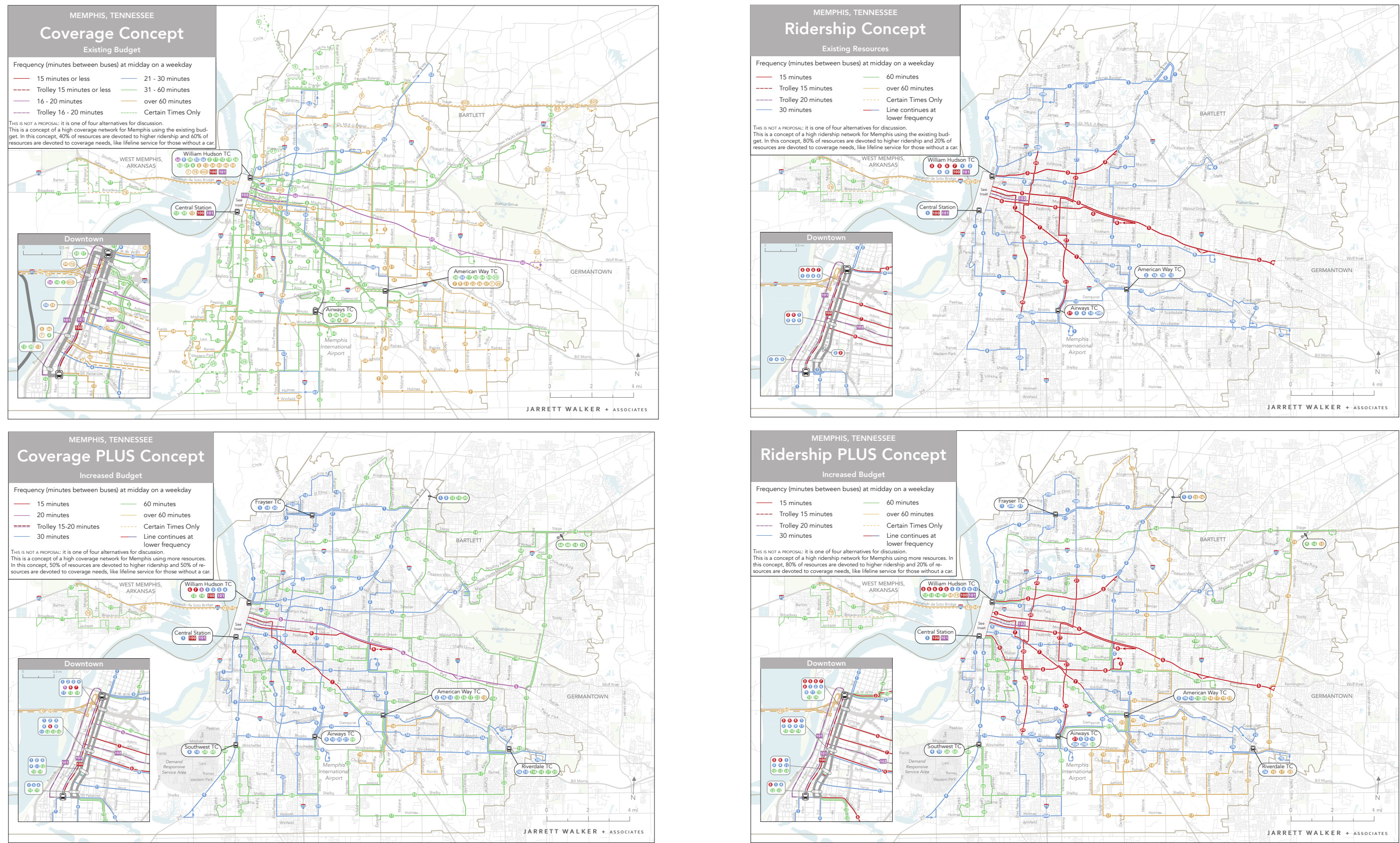
Maps of the Concepts are shown on the following page. For more detailed maps and analysis of how each concept would serve Memphis, see the *Concepts Report* at www.memphis3point0.com/transit.

Figure 12: Decision space showing where the four concepts are in the realm of choices for the Memphis transit network



How did we get here?

Figure 13: Maps of the four network concepts



How did we get here?

Response to Concepts

Ridership and Coverage, No Additional Funding

When presenting these concepts to the public and stakeholders, we asked them to respond first to whether they preferred the Coverage or Ridership Concepts and their responses are shown at the right.

When comparing the concepts with no additional funding, the general public responses were strongly split between the ends of the spectrum. The “definitely like the Ridership Concept best” answer received the highest response at about 41%. The “definitely like the Coverage Concept best” response received the second highest response at 27%. The median point of the responses is about the mid-point between the Ridership and Coverage Concepts.

Stakeholders tended to respond more in the middle. A plurality of stakeholders said they’d prefer a balance of 60% ridership and 40% coverage when comparing concepts with no additional funding. Slightly more stakeholders responded toward the coverage end, either at 40% or 50% ridership, as indicated by the slightly higher bars on the left side of the graph. Fewer stakeholders responded toward the ridership end, at 70% or 80% ridership, as indicated by the shorter bars on the right side of the graph. The median point of opinion from stakeholders was about 60% ridership.

Takeaway

Stakeholder and public responses indicate a willingness to shift to 60% Ridership and 40% Coverage, if there was no additional funding for transit.

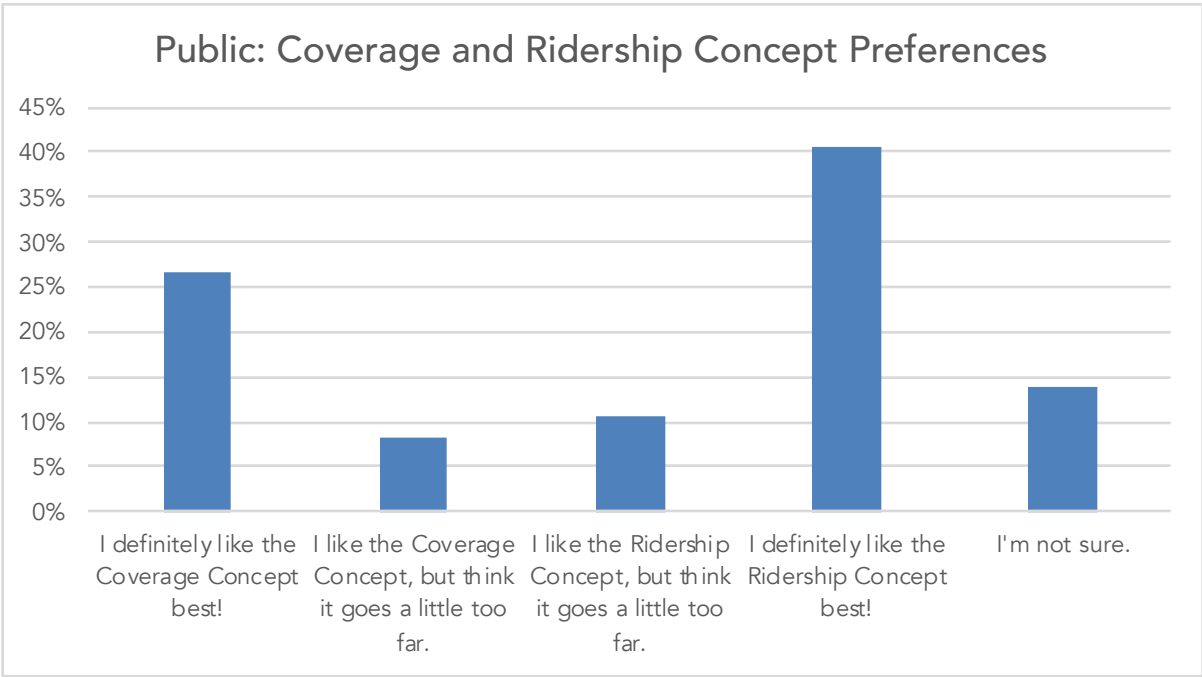


Figure 14: Public respondents diverged significantly on the Coverage and Ridership Concepts

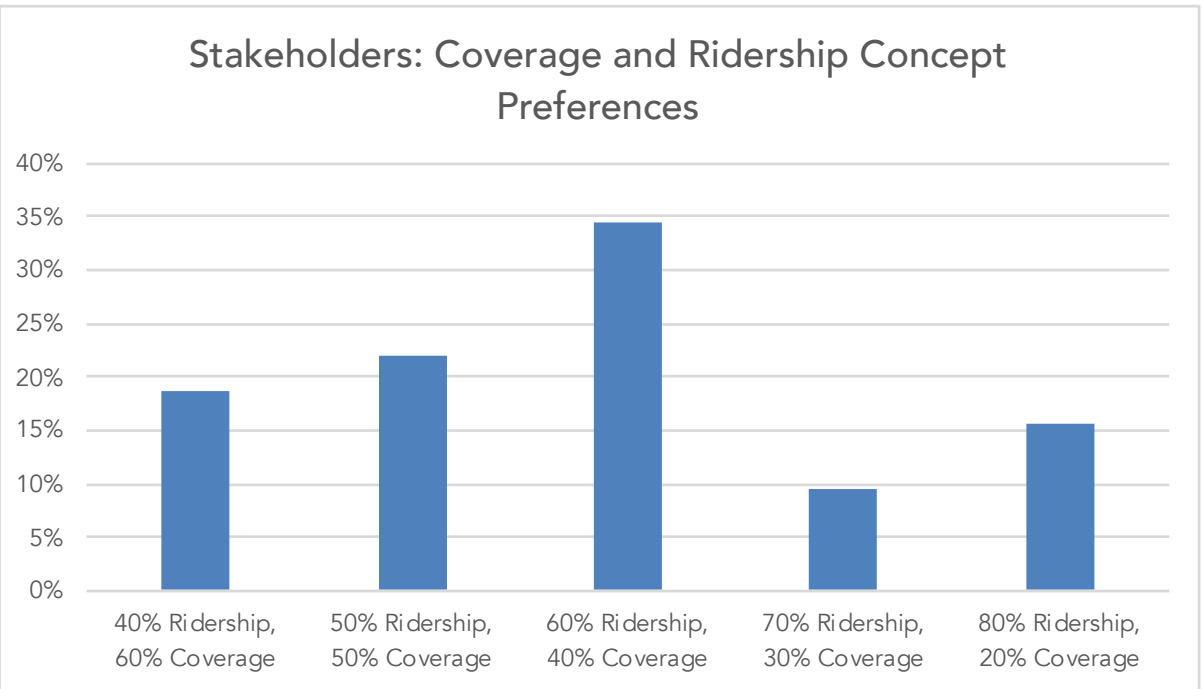


Figure 15: Stakeholder responses tended to be in the middle of the Coverage-Ridership Concepts

How did we get here?

Ridership PLUS and Coverage PLUS, With Additional Funding

When presenting these PLUS concepts (which assume an additional \$45 million per year for transit service) to the public and stakeholders, we asked them to respond to whether they preferred the Coverage PLUS or Ridership PLUS Concepts and their responses are shown at the right.

The general public responses were strongly toward the ridership end of the spectrum, with the “definitely like the Ridership PLUS Concept best” answer getting the highest response at 48%. The “definitely like the Coverage PLUS Concept best” response received the second highest responses, but only 23% of respondents chose that answer. The median point of the responses is closer to the Ridership PLUS Concept, at about 70% ridership focus and 30% coverage focus.

Stakeholders tended to diverge more in their responses to the PLUS Concepts. When we asked Stakeholders the same question we identified the percentage of resources that would go toward ridership goals and coverage goals in each concept and the answers in between.

Stakeholders split evenly at 25% of stakeholders wanting the Coverage PLUS Concept (50% ridership/50% coverage) and 25% of stakeholders wanting the Ridership PLUS Concept (80% ridership/20% coverage)

Almost a third of stakeholders wanted something in between the two concepts, with about 16% saying they would split resources at 60% ridership/40% coverage and another 16% saying they wanted to split resource at 70%/30%. About 12% said they wanted even more ridership focus, with resources split at 90% ridership/10% coverage. And 6% said they wanted to keep today’s split at 40% ridership/60% coverage.

Thus, stakeholders had a wide range of opinion on this question of how to invest if more funding were available. The median point of opinion, however, was about 70% of resources toward ridership and 30% toward coverage, which is similar to the median point of the public responses.

Takeaway

Stakeholder and public responses indicate a willingness to shift to 70% Ridership and 30% Coverage, if there was additional funding for transit.

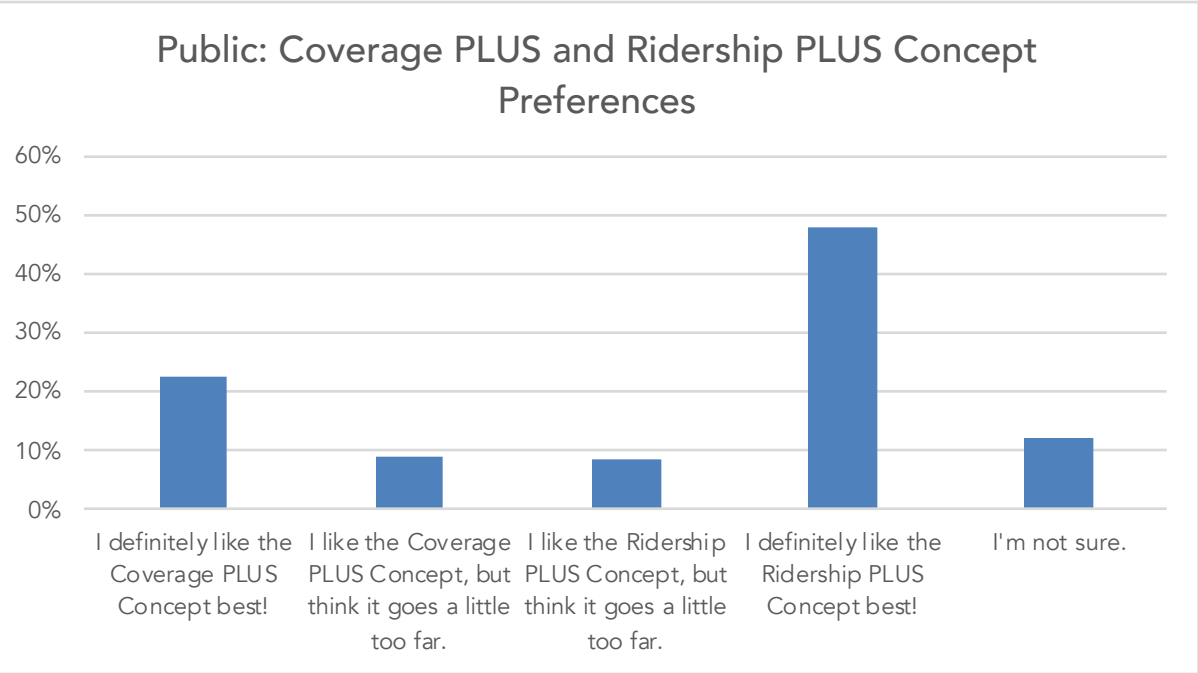


Figure 16: Public respondents strongly favored the Ridership PLUS Concept

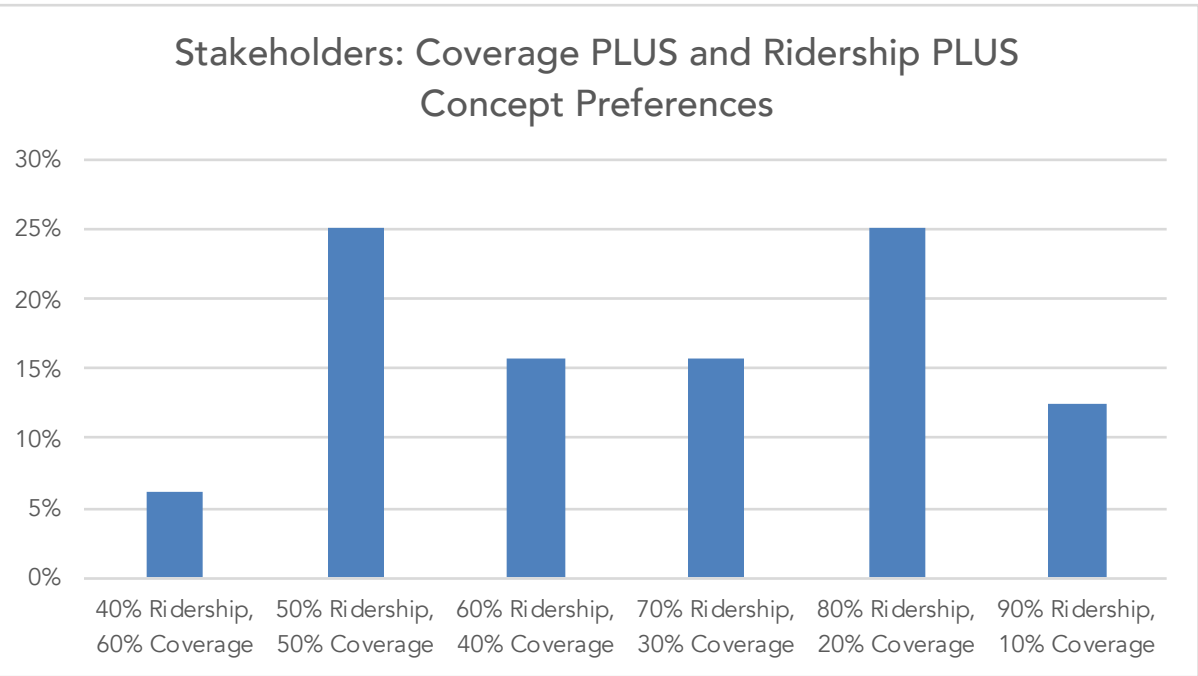


Figure 17: Stakeholders were more divided in the response to the Coverage PLUS and Ridership PLUS Concepts

How did we get here?

Additional funding for transit

We also asked about the willingness of people to pay for more transit service. The additional funding concepts assumed that an additional \$35 million per year would be provided for transit operations and \$10 million for transit capital needs. This funding level was chosen based on consultation with City, MATA and Innovate Memphis staff.

Therefore a key question to the public and stakeholders was, are you willing to pay enough to provide additional transit service? This question was asked in the following form:

“The Coverage PLUS and Ridership PLUS Concepts would both require additional funding for transit. That funding would have to come from some kind of local tax or revenue source. Thinking about your own preferences, how much on average per month would you be willing to pay for more transit service?”

The charts to the right show the responses from the public and from stakeholders. Nearly 80% of public respondents were willing to pay more to invest in transit service. The median response would equal about \$6-7 more per month to support transit.

If a sales tax source were the main revenue source to support expanded transit, a 0.5% sales tax would cost the average Memphis household about \$6-7 per month. And the total tax revenue would be sufficient to support an investment of about \$40 million per year.

Policy Direction

Based on the public and stakeholder input, the City, Innovate Memphis, and MATA staff worked with City leadership to determine the most appropriate policy direction for the Short-Term Recommended Network. The team decided to follow the general path of the public and stakeholder input and recommend a 70% Ridership/30% Coverage resource split with the assumption that an additional \$30 million per year would be invested in transit service. Of that \$30 million, we have assumed that \$4 million on average would go to capital improvements like new buses and improved shelters, while \$26 million per year would go to operating transit service. The exact balance between capital and operating would vary by year and depend on bus replacement and new bus needs.

Takeaway

Nearly 80% of public respondents were willing to pay more to invest in transit service.

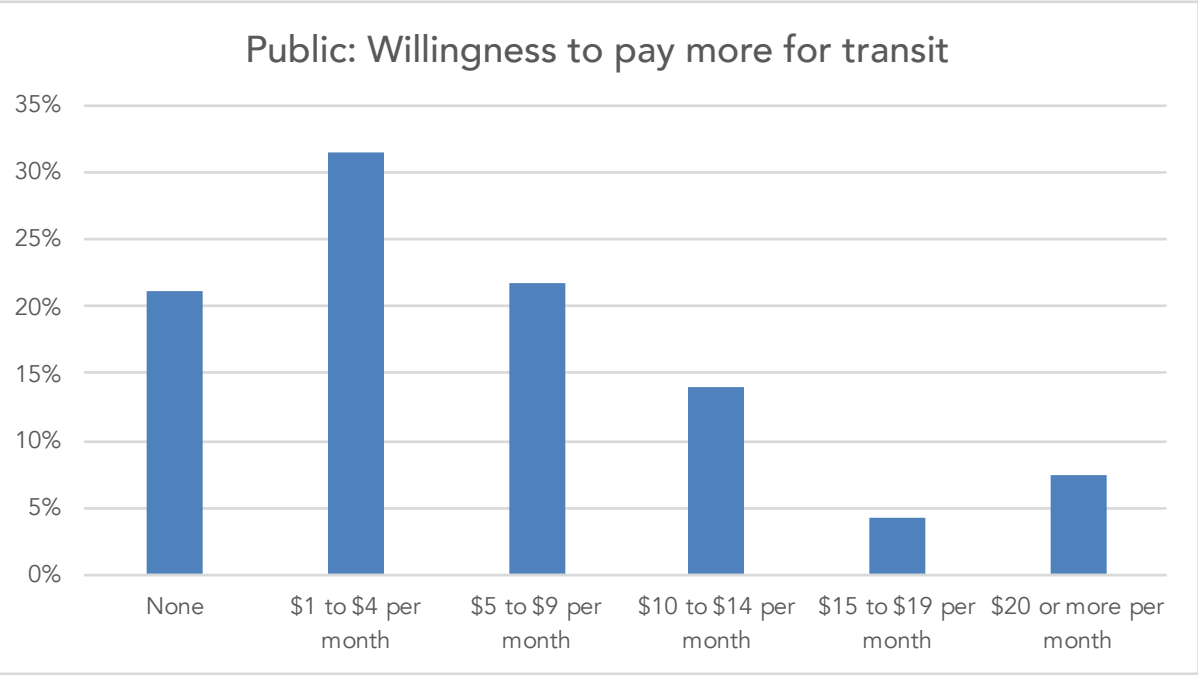


Figure 18: Nearly 80% of public survey respondents were willing to pay more to support transit investment

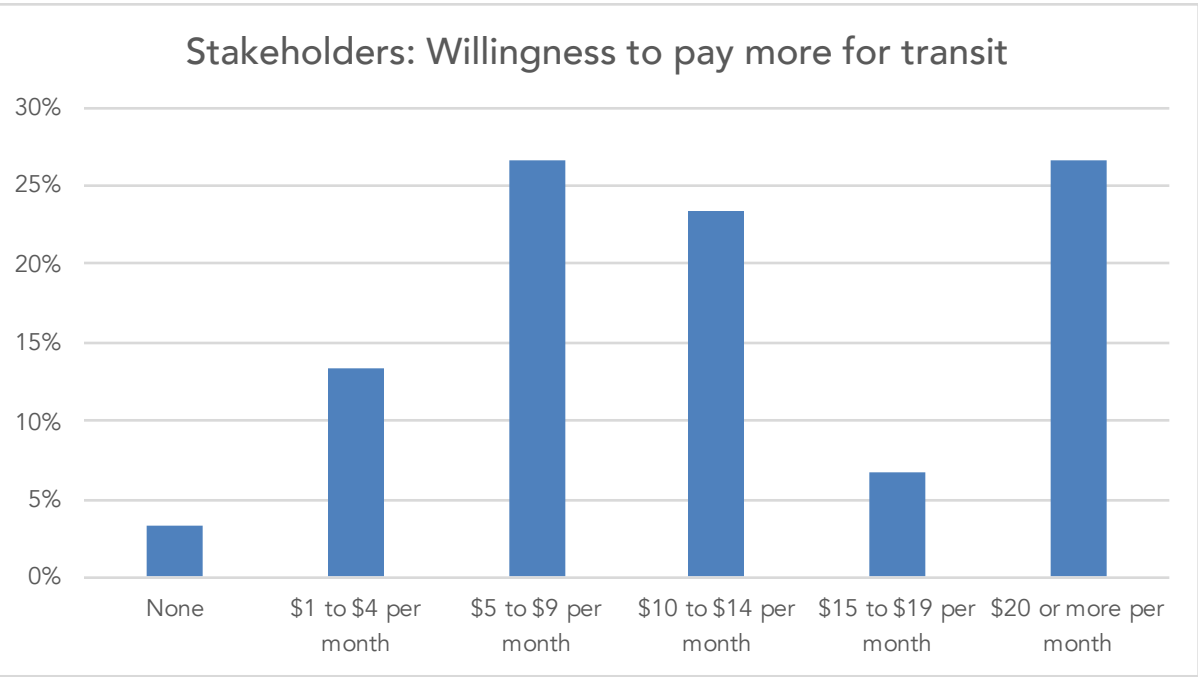


Figure 19: Nearly all stakeholders were willing to pay more to support more transit service

How did we get here?

Response to Recommended Network

When asked about the Draft Recommended Network, most survey respondents said the network would be better for them. This pattern of response is similar across all five questions about how people react to the Recommended Network. Large majorities of people agree that the network will be better for them, for people they know, for their neighborhood, and the city as a whole; and help them use transit for more trips.

When looked at by race, income, age, and the history of riding transit, nearly all subgroups had a net positive reaction to the Recommended Network. The only exception were people over 65 years old, where 40% of respondents agreed that the network would be good for the city and 40% disagreed, while 19% weren't sure. This age group had the smallest sample size (only 48 respondents) and therefore the results for this subgroup are less reliable.

Since the Recommended Network requires a major investment in service, we also asked if respondents were willing to support the additional cost of new and improved transit service. Overall 77% of respondents are willing to pay something for improved transit services. Of all respondents, 32% would be willing to pay \$1 to \$3 dollars more per month, 20% would be willing to pay \$4 to \$6 dollars per month, and 12% would be willing to pay \$7 to \$9 dollars per month. Among all respondents, 23% were unwilling to pay for improved transit services.

Given the strong positive response to the Draft Recommended Network and support for investment in it, City, MATA, and Innovate Memphis Staff decided to keep the Draft Recommended Network as the Final Short-Term Recommended Network and to develop a 2040 Vision that built on the strengths of the frequent network elements in the Short-Term Recommended Network.

Takeaway

Nearly 70% of public respondents thought the Recommended Network was better for the city and 77% were willing to pay more to invest in the Recommended Network.

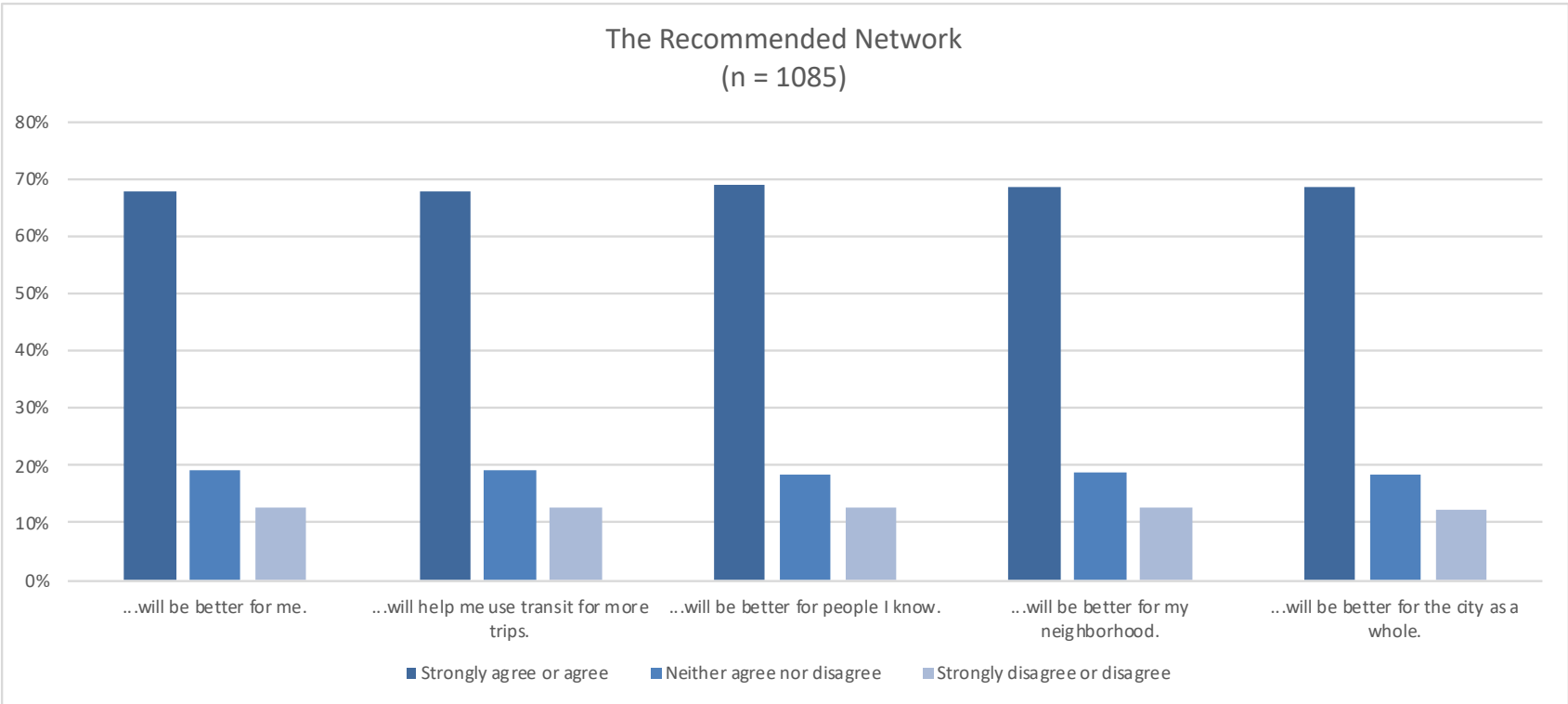


Figure 20: Among the more than 1,000 survey respondents, nearly 70% agreed that the Recommended Network would be better for the city, their neighborhood, and themselves.

Willing to pay more per month for improved transit

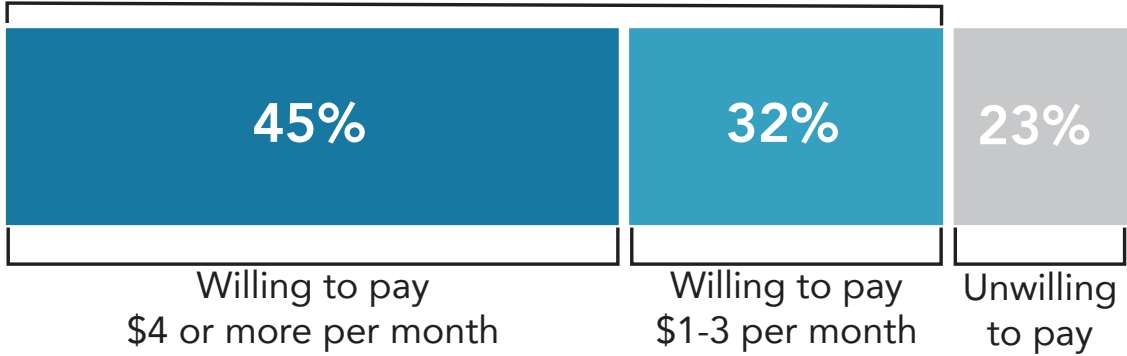


Figure 21: About 77% of respondents were willing to pay more to invest in better transit service.

3

Short-Term Recommended Network

Short-Term Recommended Network

In this chapter, we present maps of the Short-Term Recommended Network, and information about how it would operate and how well it meets different goals.

This Network was developed by a team of technical experts from the City of Memphis, Innovate Memphis, MATA, and consulting firms. The policies that guided the design of this network are based on public input on key transit choices, as described in the previous chapter.

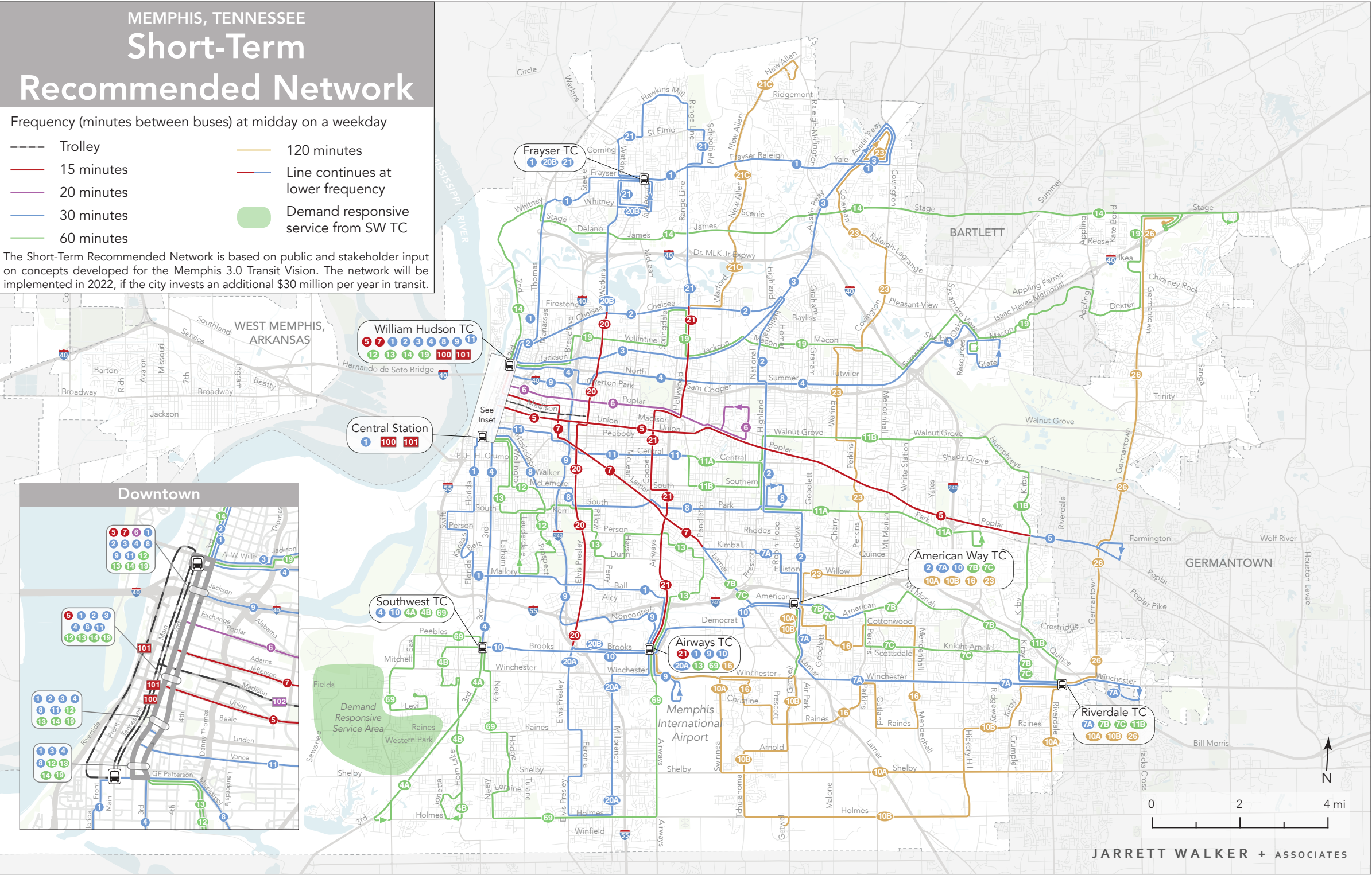
The maps on the following pages show the network at the citywide and downtown scales. The table shows the frequency of each route, and its branches, over the hours of each day and the days of each week.

Policy basis

This network is designed to fulfill a policy direction that:

- About 70% of the transit budget in the City of Memphis should be spent on maximizing ridership.
- The remaining 30% should be spent covering those places where transit service is valued, even if ridership relative to cost is low.
- The City, either through a ballot measure or other method, will invest an additional \$30 million per year in transit service.

Figure 22: Short-Term Recommended Network



Short-Term Recommended Network

Design principles

In addition to public input, certain principles of good transit design are reflected in the Short-Term Recommended Network.

Consistent route spacing

The spacing between parallel routes should be consistent across the city, to the extent that the street network allows it. However, major barriers to walking (such as uncrossable roads, or a lack of through-streets) may sometimes argue for closer or wider spacing between routes.

Directness

Routes are designed to be as direct as possible between major activity centers.

Consistent frequencies

Routes will have consistent headways, or frequencies. This means that the number of minutes between arriving buses will be consistent for long periods of the day.

Whenever possible, routes will have “clockface” frequencies that divide evenly into an hour: every 10, 15, 20, 30 or 60 minutes. A bus that comes every half hour will arrive predictably, at approximately 7:02 am, 7:32 am, 8:02 am, 8:32 am, and so on.

Consistent pulsing

Consistent frequencies will also help provide consistent pulsing. A transfer between low-frequency routes can be appealing if the routes are designed to meet one another at the same time and the same place, in a recurring pattern.

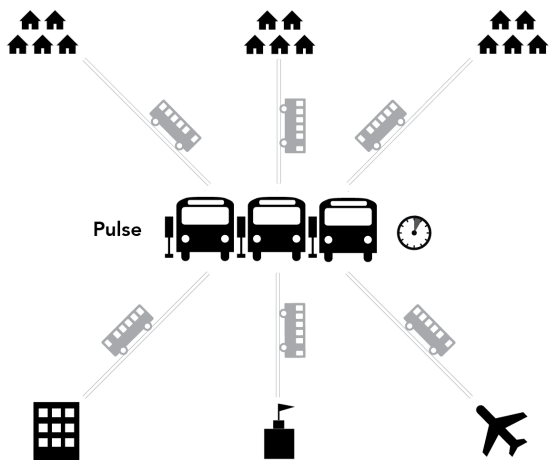


Figure 23: In a pulse, multiple low-frequency routes are scheduled to come together regularly, dwell for a few minutes so that passengers may transfer among them, and then depart again

These timed-connections, or pulses, occur when multiple buses dwell at the same location, allow a few minutes for transfers among them, and then continue on. The Recommended Network includes pulsing at the following transit centers: Hudson (Downtown), Southwest Memphis (3rd and Brooks), Airways, American Way, and Riverdale. The timed connections at Airways and American Way are critical to making easy connections between low frequency routes to major job centers in south Memphis and routes coming from central and north Memphis.

Downtown Circulation

A major assumption of the Short-Term Recommended Network is a simplification of downtown circulation. Currently all routes come to the Hudson Transit Center, which means that many routes from the north do not reach the core of downtown. Also, some routes through downtown use Front Street and others use the 2nd Street and BB King Boulevard. The Short-Term Recommended Network brings all routes through downtown on the this couplet and assumes that the City and MATA will redesign those streets to provide a dedicated bus lane and superstop amenities (bulb-outs at stops, large shelters) like in the example below from the 2016 plans by MATA for changes to downtown circulation.

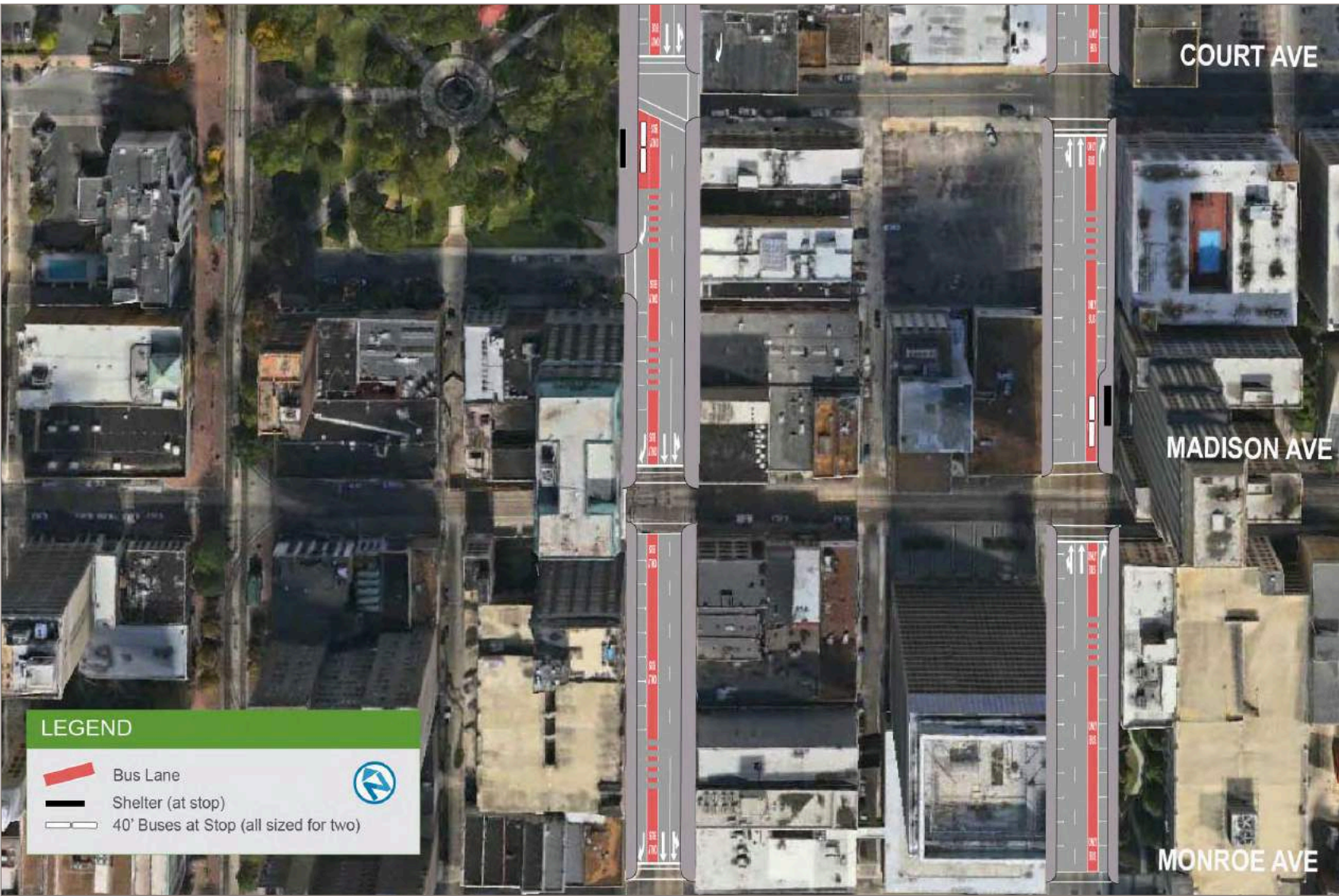


Figure 24: Example of 2nd/3rd couplet bus priority improvements

Short-Term Recommended Network

Figure 25 shows how routes would circulate through downtown. This routing and design would speed service through downtown and provide easier connections for people between routes without having to go to Hudson Transit Center. For example, someone wanting to transfer from the Florida route to the Union route could do so at BB King and Union, instead of riding to Hudson Transit Center as is necessary today.

In the Existing Network, routes that approach downtown from Martin Luther King, Jr Avenue, Vance Avenue, Fourth Street, BB King Boulevard and Florida Avenue use Front Street through downtown to reach the Hudson Transit Center. The main downside to shifting routes to 2nd and BB King Boulevard is that people who ride from routes that approach downtown from the south, like the those on Florida Street, and who want to reach destinations along Front Street would have a longer walk than they do today. This issue is most pronounced in the northbound direction where buses would travel on BB King Boulevard, which is farther from Front or Main.

There are a few alternatives to this design. One alternative is to consolidate bus service along Front Street and redesign the street to prioritize buses. This would bring all bus service through the middle of downtown, would bring routes from Union and Poplar across Main Street and minimize walking distances for accessing routes within downtown. Also, It would make it easier to connect between buses and trolleys. The primary downsides to this option include:

- Buses would take a longer route through downtown, costing more for the service.
- Front Street has less space than the 2nd Street and BB King Boulevard couplet and would require more difficult trade-offs in taking space from general traffic, parking, and loading zones.

Another alternative would be to convert 2nd Street and BB King Boulevard to two-way traffic and consolidate bus service onto 2nd Street. This would reduce the walking distance to and from destinations for northbound bus trips and it would keep all bus service on one street, instead of spreading it across two streets. The primary downside to this option is the cost of converting both streets to two-way operation, which includes significant traffic signal system redesign.

Trolley Service

The focus of the Short-Term Recommended Network is on the bus network. It was assumed in this process that the trolley network (Main Street, Riverside and Madison Avenue lines) would operate as it is planned to do once all rail service resumes.

This plan is not recommending changes to the trolley service plan at this time. Once rail service is restored on all three lines and the redesigned bus network is operational, more recent and accurate ridership data will be available. Then a study of the trolley network could be conducted to better guide the operations and design of trolley service for Memphis.

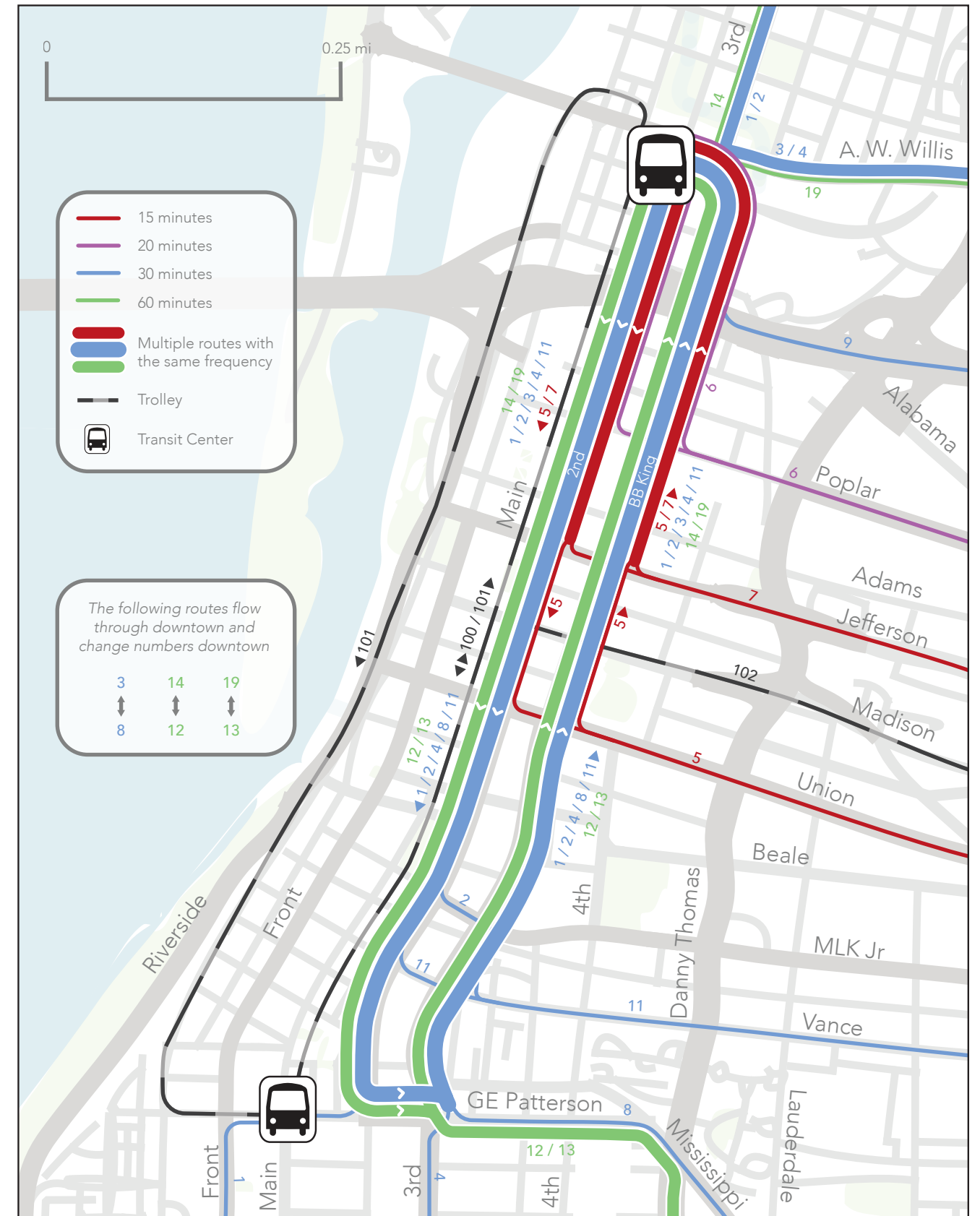


Figure 25: Downtown circulation in the Short-Term Recommended Network

Short-Term Recommended Network

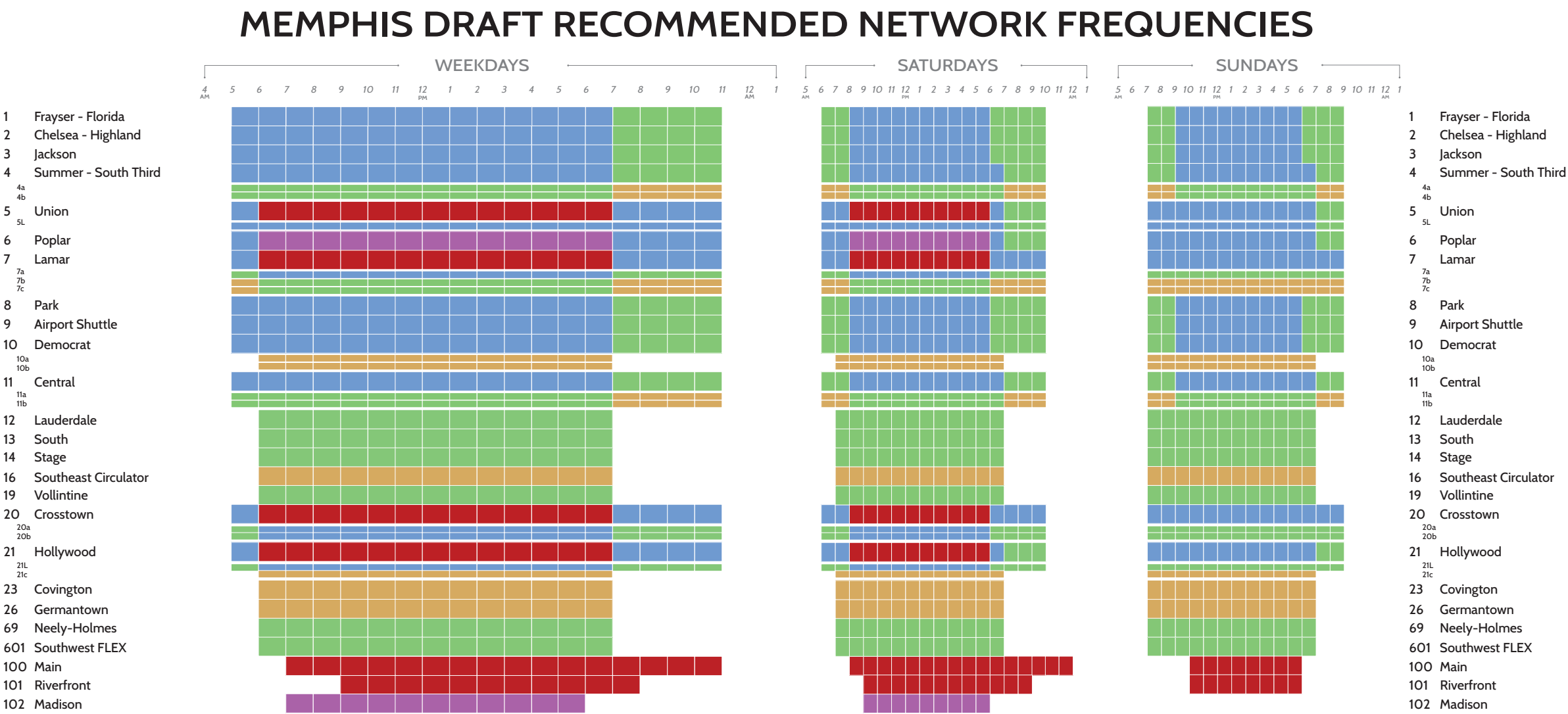
Span of Service

A key feature of the Short-Term Recommended Network is the consistency of when service is provided. The chart to the right shows the frequency of service by time of day and day of the week. Looking at this chart, one can see that the 6-Union route would have 15-minute service from 6 am to 7 pm on weekdays and 8 am to 6 pm on Saturdays.

The design of the Short-Term Recommended Network keeps all bus routes running seven days a week with 18 hours of service for most routes on weekdays, 16 hours on Saturdays and 15 on Sundays.

The Existing Network has less consistency in what time of day routes operate and far fewer routes run on Saturday and Sunday. The improvement in consistency of service across the day and days of the week would help more people find the system useful for more trips and find the system more reliable as a whole.

Figure 26: Short-Term Recommended Network Frequency and Span of Service



Takeaway

All bus routes in the Recommended Network would run on Saturday and Sunday.

JARRETT WALKER + ASSOCIATES

Data Source: GTFS feed, April 2017

Short-Term Recommended Network

Comparing Coverage

By simply comparing the maps on the previous pages, it is clear that the Recommended Network covers nearly the same area as today’s system. But that’s not the whole story of how the networks cover the city. How many residents and jobs does that geographic coverage represent and how many have access to frequent service?

The charts at right illustrate how many residents and jobs that have access to *any* service (no matter how frequent) and to *frequent* service within a half-mile under the Short-Term Recommended Network and the Existing Network.¹

The Existing Network provides any service within 1/2 mile of about 80 percent of residents. The Recommended Network expands this to nearly 85 percent. Only about 12,000 people (3 percent of the population) have access to frequent service in the Existing Network. The Recommended Network brings frequent service to 79,000 more people, so that 14 percent of residents are near frequent service.

Job accessibility shows a similar pattern. The Existing Network provides any service near 69 percent of jobs, while the Recommended Network reaches 71 percent of jobs. Only about 36,000 jobs (6 percent of all jobs) are near frequent service in the Existing Network. The Recommended Network provides frequent service near an additional 103,000 jobs, reaching a total of 24 percent of jobs in the city with frequent service.

Access to frequent service is a good estimate of potential ridership. While frequency alone is not enough to cause high ridership, frequency deployed along direct routes, in places that are dense, walkable and proximate to one other, does tend to lead to high ridership and lower operating costs, and thus to high productivity.

Takeaway

The Recommended Network brings an additional 79,000 people and 103,000 jobs within 1/2 mile of frequent transit.

¹ Data limitations requires that this analysis is done using the air distance (also called “as the crow flies” distance) to estimate the people and jobs near transit. We know this is imperfect and that it often corresponds to longer walks in areas with more disconnected street networks.

Figure 27: Chart of Residents with Access to Transit

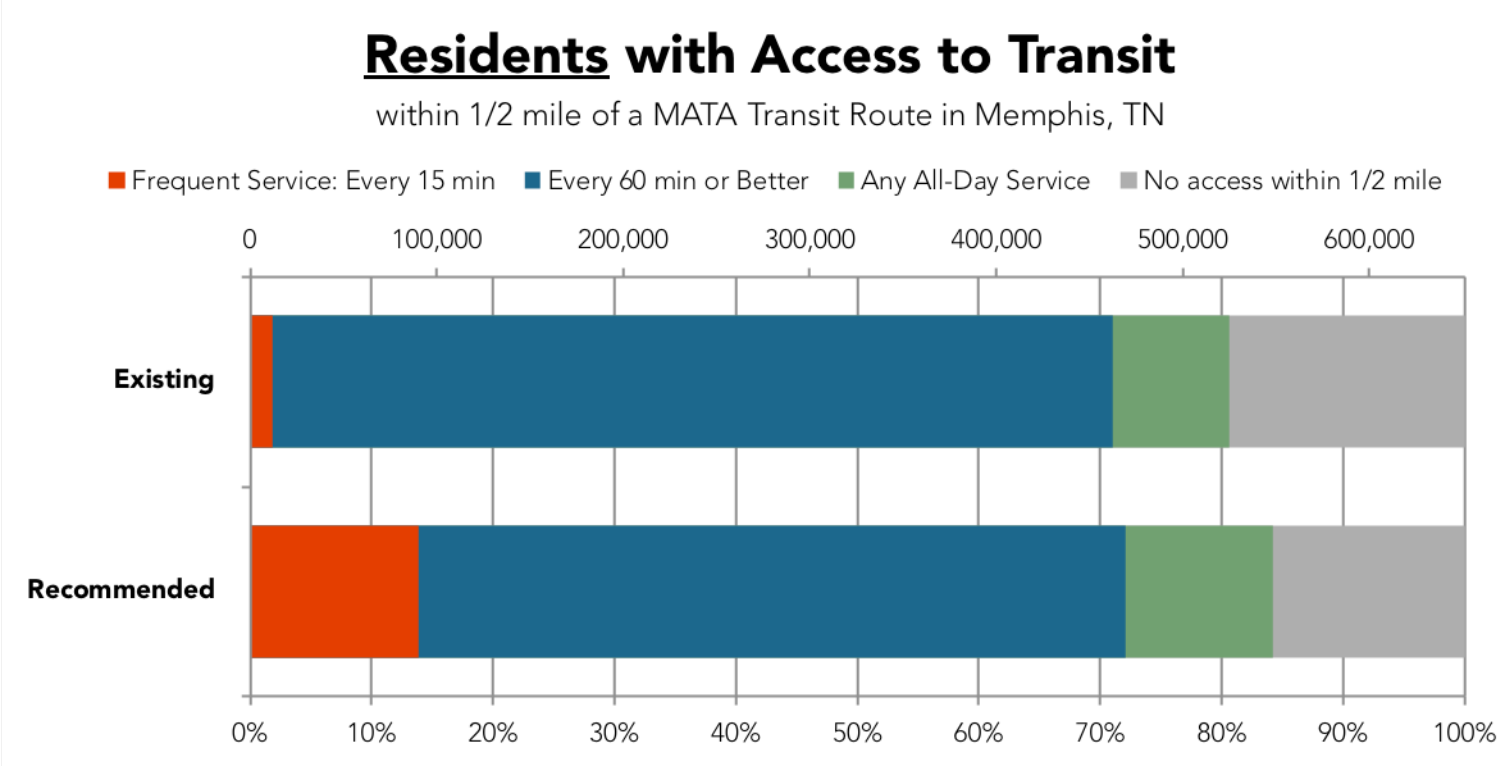
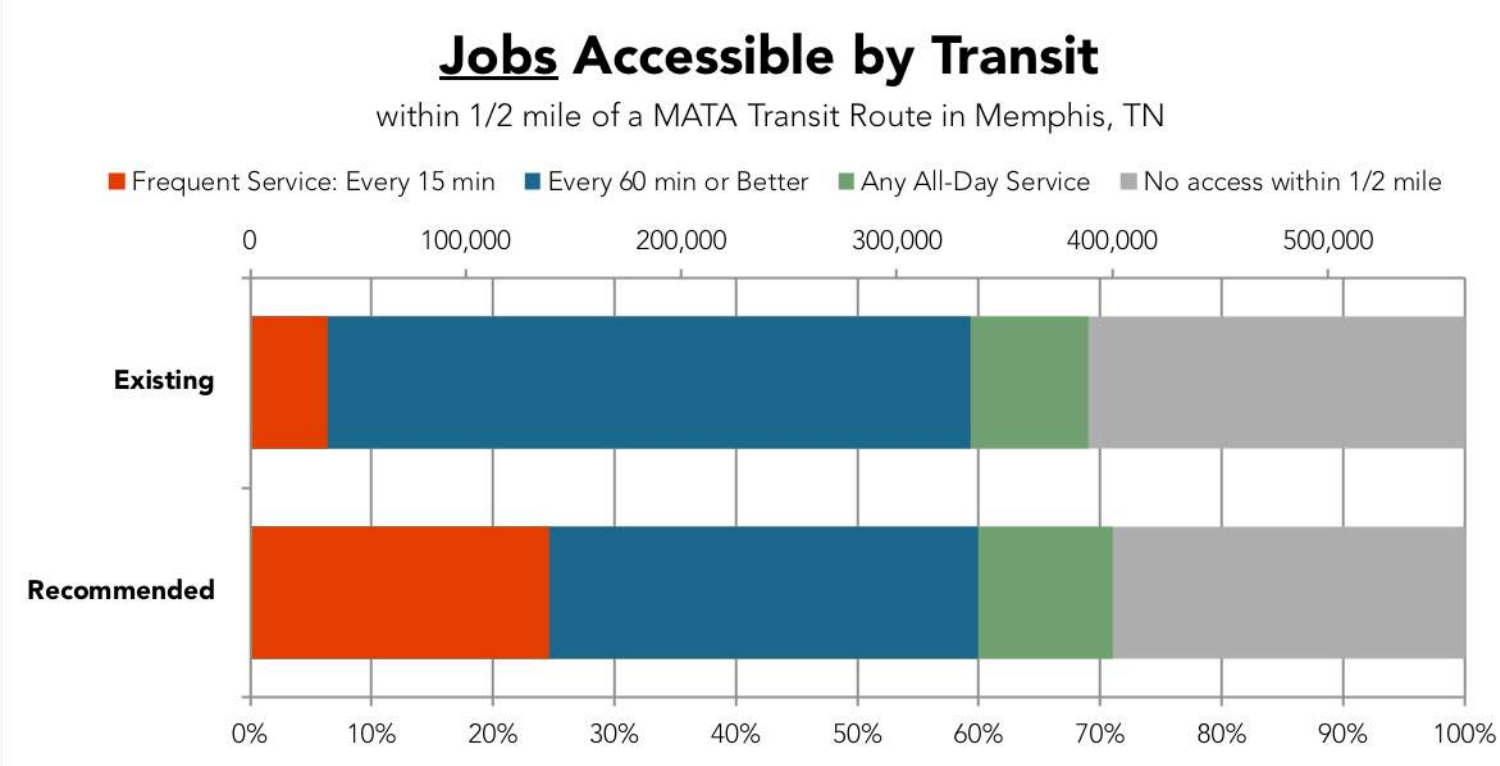


Figure 28: Chart of Jobs with Access to Transit



Short-Term Recommended Network

Coverage for Communities of Concern

For transit agencies, how a change in service affects racial and ethnic minorities and low-income people is of special concern, in part because of Federal Civil Rights statues like Title VI. The charts to the right show how minority and low-income residents are covered by the Existing and Short-Term Recommended Networks.

Similar to the effect on all residents, the Recommended Network increases access to transit service for both minority and low-income residents. And the Recommended Network significantly increases the percentage of minority and low-income residents who have access to frequent transit service.

Today, only about 8,000 minority residents are near frequent service with the Existing Network. The Recommended Network expands this by 50,000 people to bring frequent service to 12% of minority residents.

Similarly, only about 4,000 low-income residents are near frequent service with the Existing Network. The Recommended Network expands this by 34,000 people to bring frequent service to 15% of low-income residents.

Takeaway

The Recommended Network brings frequent service close to an additional 50,000 minority residents and 34,000 low-income residents.

Figure 29: Chart of Minority Residents with Access to Transit

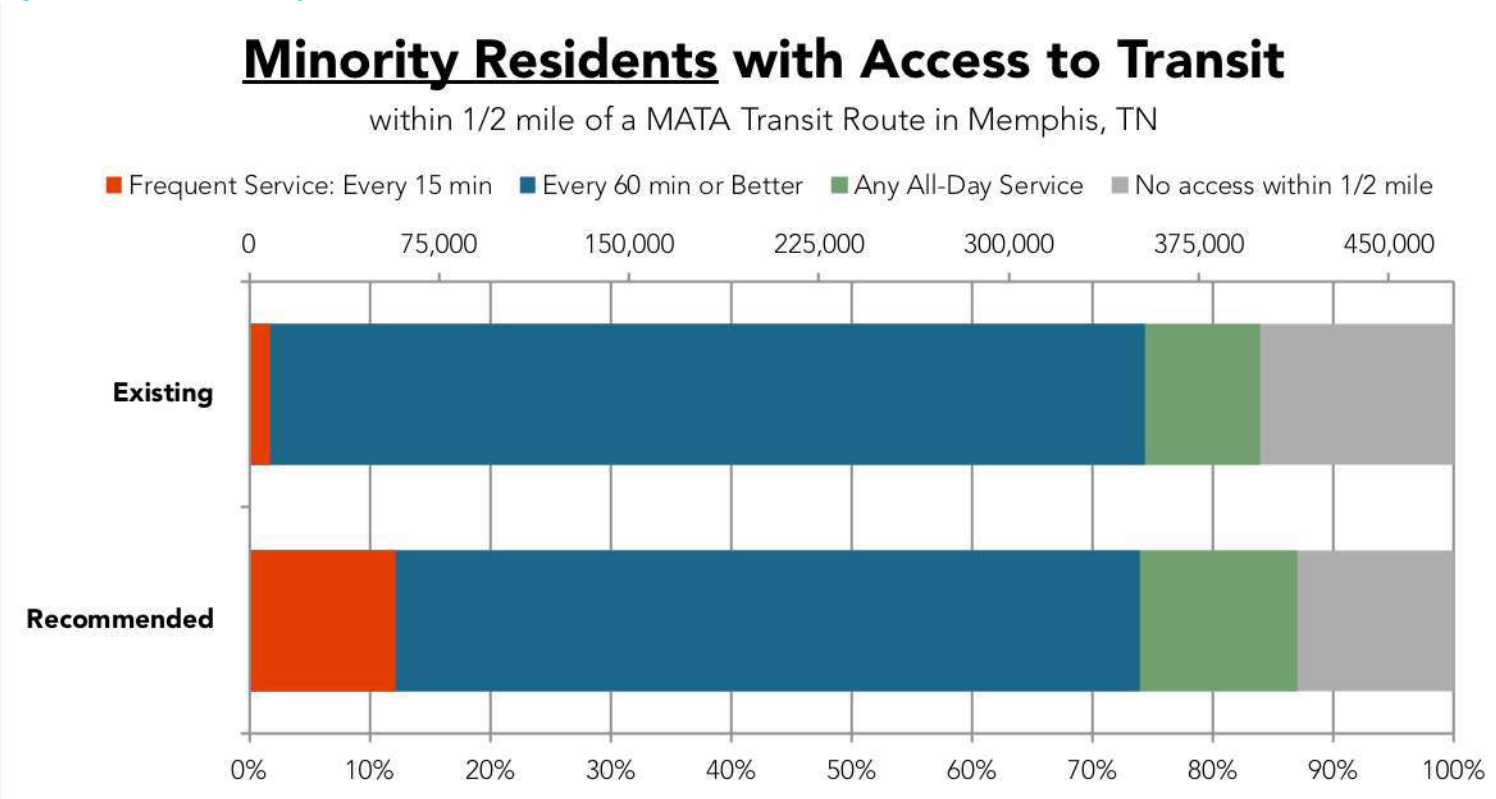
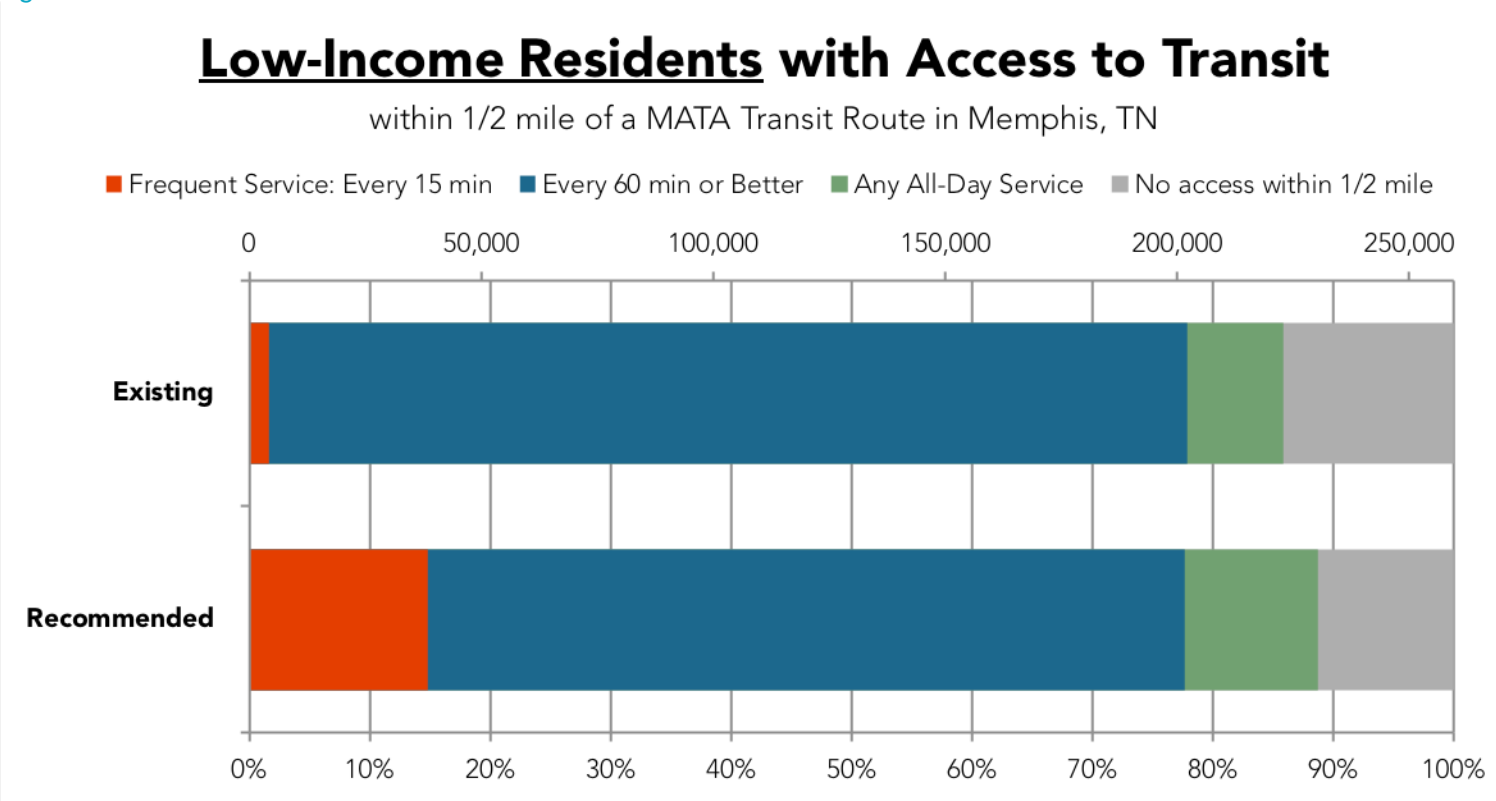


Figure 30: Chart of Low-Income Residents with Access to Transit



Short-Term Recommended Network

Liberty and Opportunity

The Short-Term Recommended Network increases the number of people and jobs that have access to high frequency service, meaning that people near these routes or connecting to these routes have much shorter waits for service.

High frequency services, especially in a grid pattern where many connections are possible, maximize the range of useful destinations that can be reached quickly, for the maximum possible number of people.

For a person to choose transit over other modes, transit must provide a reasonable travel time to reach their destination. It stands to reason that when transit offers access to more destinations within a shorter travel time, to more people, it will attract higher ridership.

We can visualize this change in travel times and access, and compare concepts to one another using this measure. We have analyzed, for several locations around Memphis, what places can be reached in a fixed amount of time. Maps of this information are called “isochrones.”

In the example isochrone in Figure 31, you will see a figure (we call her Jane) placed at a key location in Memphis, and a series of maps. Those maps show where you could travel, in a fixed amount of time, by walking and riding transit. The example in Figure 32 shows how far Jane could travel from downtown in the Existing and Recommended Networks in 30, 45, 60 minutes. More importantly, it tells you how many more people and jobs she could reach with the Recommended Network. In total, there are 15 isochrone examples in Chapter 5, showing how the Recommended Network changes access for many different parts of the city.

We sometimes refer to these as maps of liberty and opportunity because that’s what they are. If someone chooses to rely on transit, they will be constrained by where transit can readily take them, and will experience the blobs in these images as walls around where they can go and what they can do. For someone to choose to rely on transit, and especially for them to decide to not own a car or to share a car among others, these blobs have to contain enough of the places that make people’s lives complete: jobs, education, shopping, services, social opportunities, and so on.

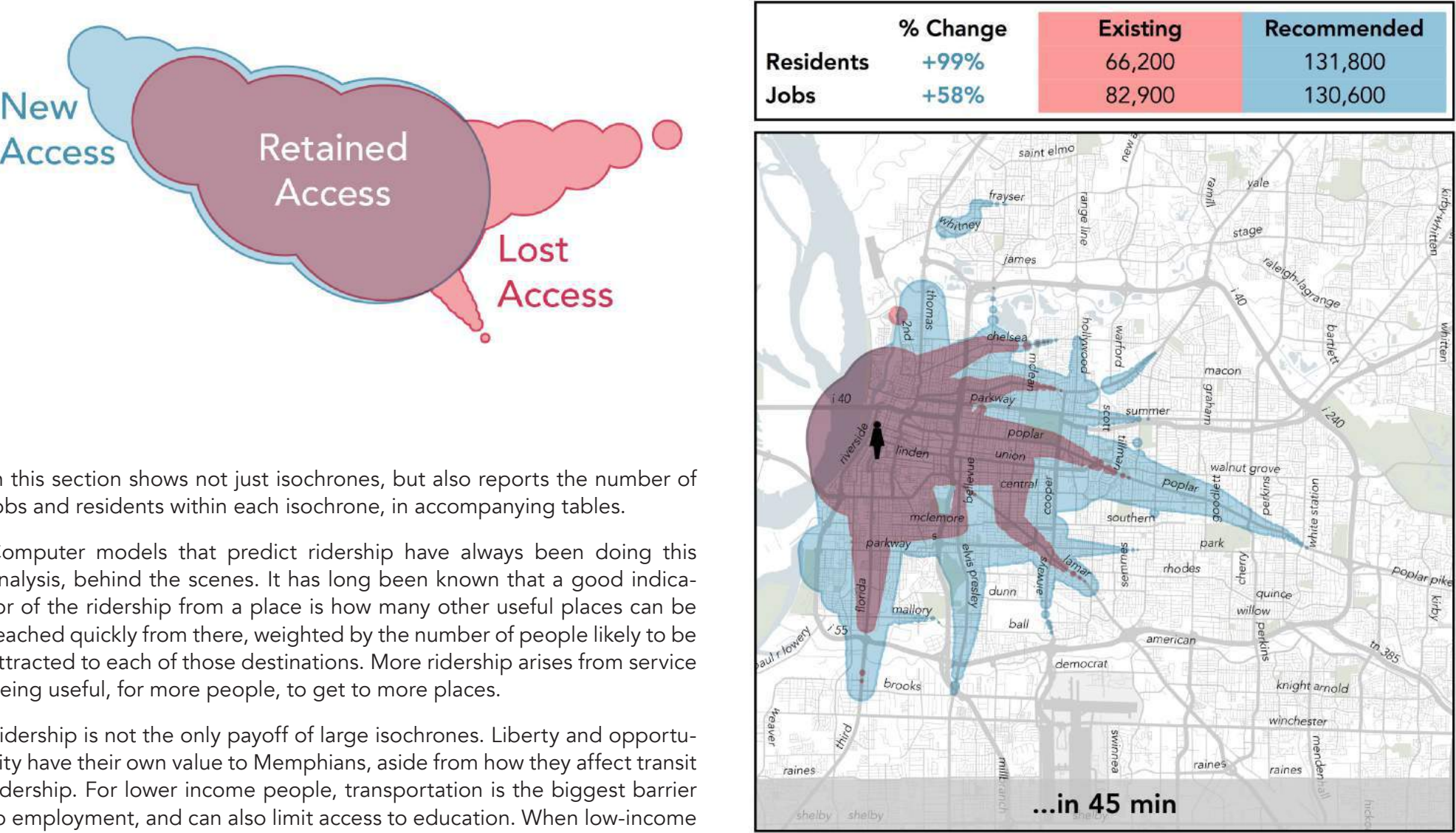
You can use this tool to think about access in the reverse, as well. For a work site or store at the selected point, the blobs show who could readily get there, the employees it can attract, and the customers who might visit.

Of course, the real measure of usefulness is not just how much geographic area we can reach, but how many useful destinations we can access within that space. All geographically accurate maps tend to emphasize land area, when what really matters is population and activity. That’s why each page

Figure 31: Example of Isochrone Maps and Diagram

How far can I travel from Downtown?

Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



in this section shows not just isochrones, but also reports the number of jobs and residents within each isochrone, in accompanying tables.

Computer models that predict ridership have always been doing this analysis, behind the scenes. It has long been known that a good indicator of the ridership from a place is how many other useful places can be reached quickly from there, weighted by the number of people likely to be attracted to each of those destinations. More ridership arises from service being useful, for more people, to get to more places.

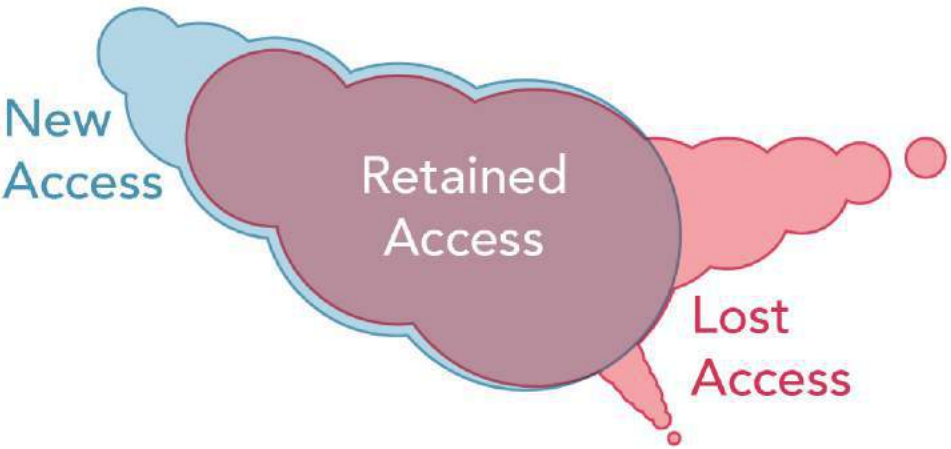
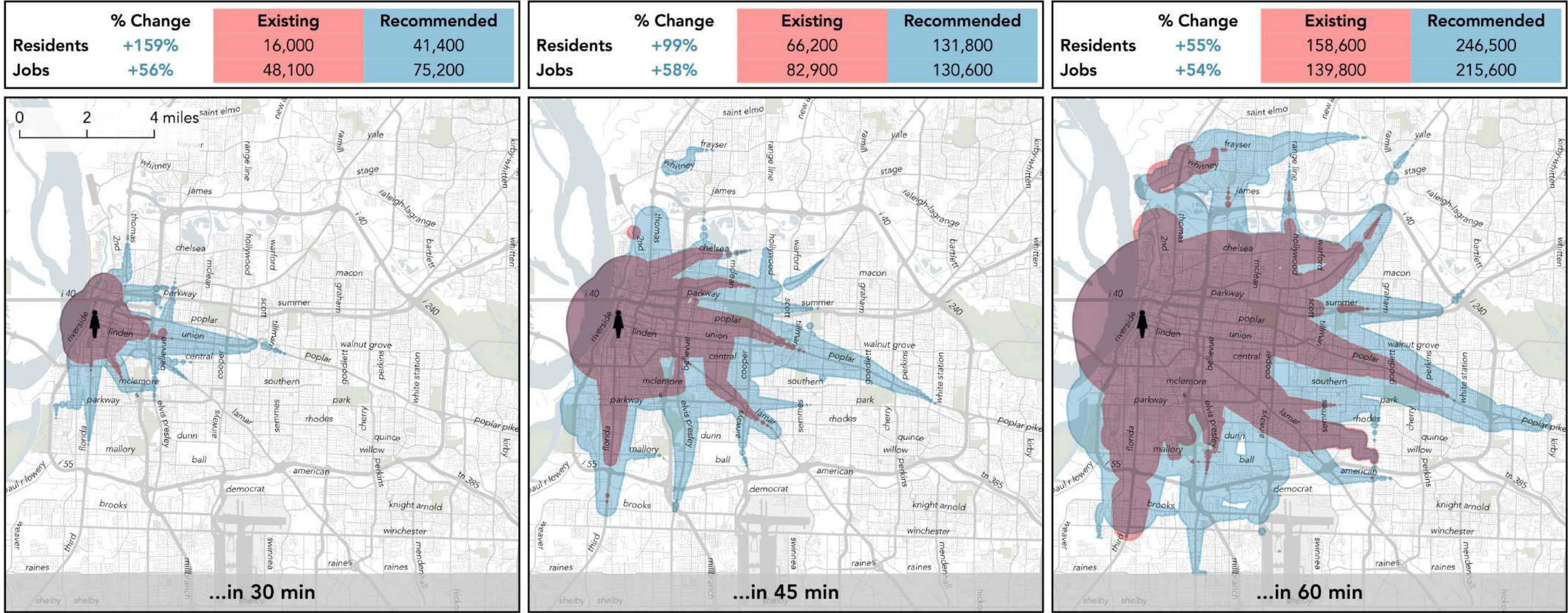
Ridership is not the only payoff of large isochrones. Liberty and opportunity have their own value to Memphians, aside from how they affect transit ridership. For lower income people, transportation is the biggest barrier to employment, and can also limit access to education. When low-income people are able to get to more places in less time, it means they have more choices in their lives, and in that sense, more freedom.

Short-Term Recommended Network

Figure 32: Job and Resident Access to and from downtown increases significantly with the Recommended Network

How far can I travel from Downtown?

Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



Short-Term Recommended Network

Access to Jobs

A key measure of the usefulness of transit is how it connects people to employment. Job access is an indicator of both the work opportunities that can be reached by transit, and the businesses and services customers or clients could choose to travel to.

The chart below shows how much the Recommended Network improves job access for all residents, for low-income residents, and for minority residents. The average Memphian would see their access to jobs increase by 39% with the Recommended Network, increasing from about 38,000 to about 56,000 the number of jobs they could reach in 60 minutes. Low-income residents see their access to jobs increase by 49% and minority residents see their access increase by 45%.

The map to the right shows the change in the number of jobs someone can reach by walking and transit in 60 minutes when comparing the Existing and Short-Term Recommended Networks. Each hexagon on the map is shaded by the percentage increase or decrease in jobs reached by walking and transit in 60 minutes from its center point. Most areas of Memphis see enormous increases in job access. A few areas see decreases in job access, such as around Airways and Holmes. The areas that see decreases in access to jobs are generally low density, and thus relatively few people would experience a decrease in job access.

Figure 34: Change in jobs accessible for all residents, low-income residents, and minority residents

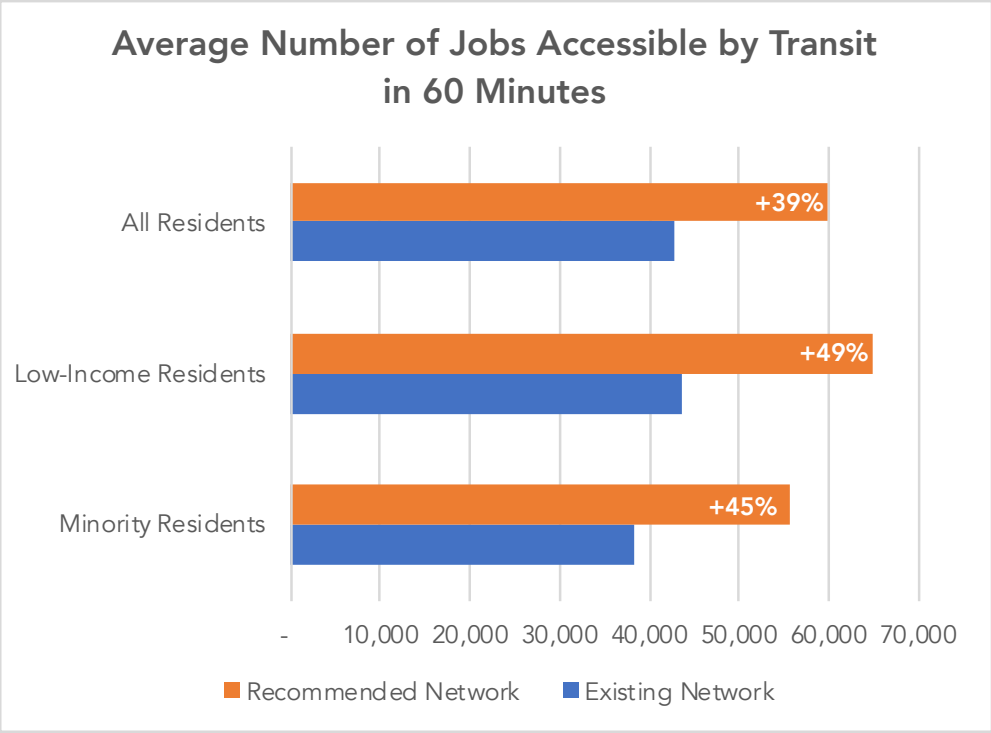
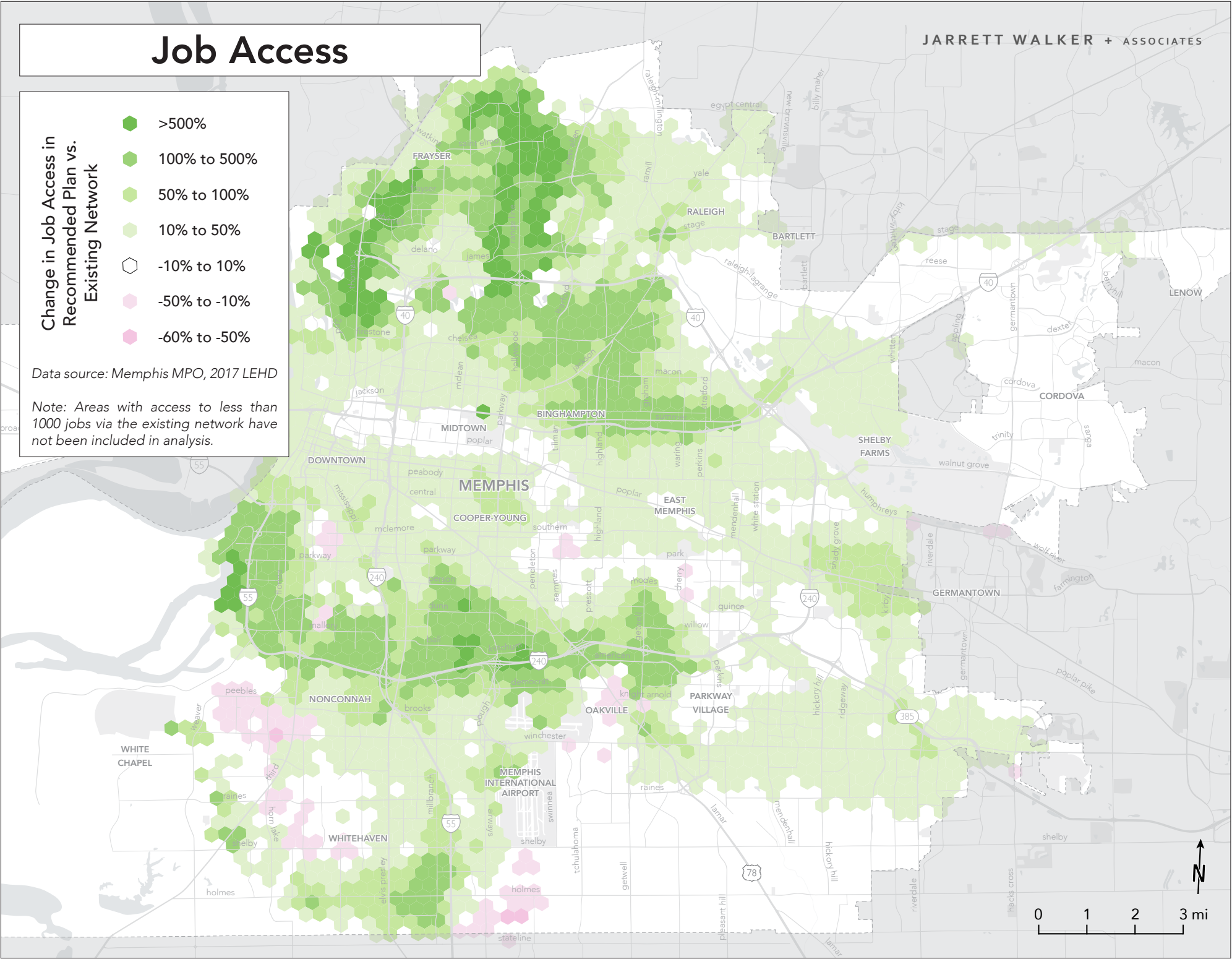


Figure 33: The Short-Term Network significantly increases jobs accessibility for most areas and most people in the city



Short-Term Recommended Network

Major Capital Improvements

Because the Short-Term Recommended Network is focused on improvements in bus service, the major capital improvements needed to support it are limited. Nevertheless, the needed improvements are essential to ensure the network operates efficiently and gets people where they are going in a timely manner.

Airways Transit Center

Airways Transit Center becomes a much more important hub for low frequency routes in the Recommended Network and therefore requires improvements to make space for routes to meet at the same time. The current facility only has four bus bays for local bus routes. To adequately meet the need for the Recommended Network, four additional bays will

be needed, likely fit into the grassy median area to the north of the existing bus bays.

In addition, the current egress from the site forces an unnecessarily long travel time for buses that need to go north out of Airways. Currently, any bus that wants to go north must turn right on Airways, right on Brooks, right on Directors Row and then left on Airways. This out of the way travel adds at least 0.5 miles to the distance traveled. To improve access, a signal should be added, the median of Airways rebuilt, and the transit center egress throat widened so that buses can turn left out of Airways Transit Center onto northbound Airways Boulevard.

Southwest Transit Center

A new on-street transit center will be needed on Brooks at 3rd Street in Southwest Memphis. This transit center will need space for four buses on the curb area along Brooks adjacent to the McDonald's. This will require reusing the current turn lane as a bus only lane for buses to dwell so passengers can transfer easily.

This area provides the most convenient transit access for all routes that converge in this area. The existing access driveway for the McDonald's from Brooks will likely need to be relocated to use the driveway for the adjacent gas station to make room for four buses.

Figure 35: Airways Transit Center Improvements

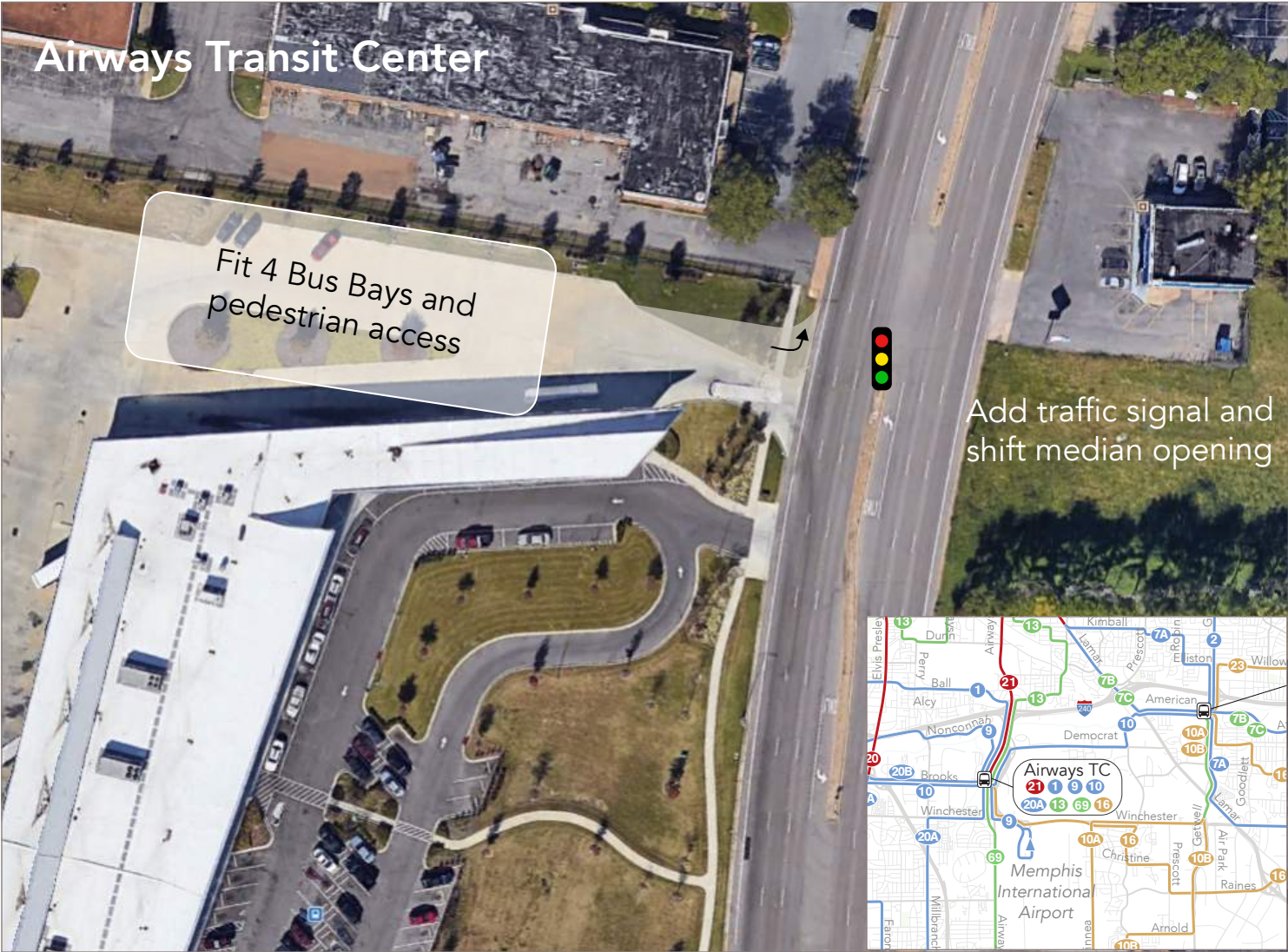


Figure 36: Southwest Transit Center

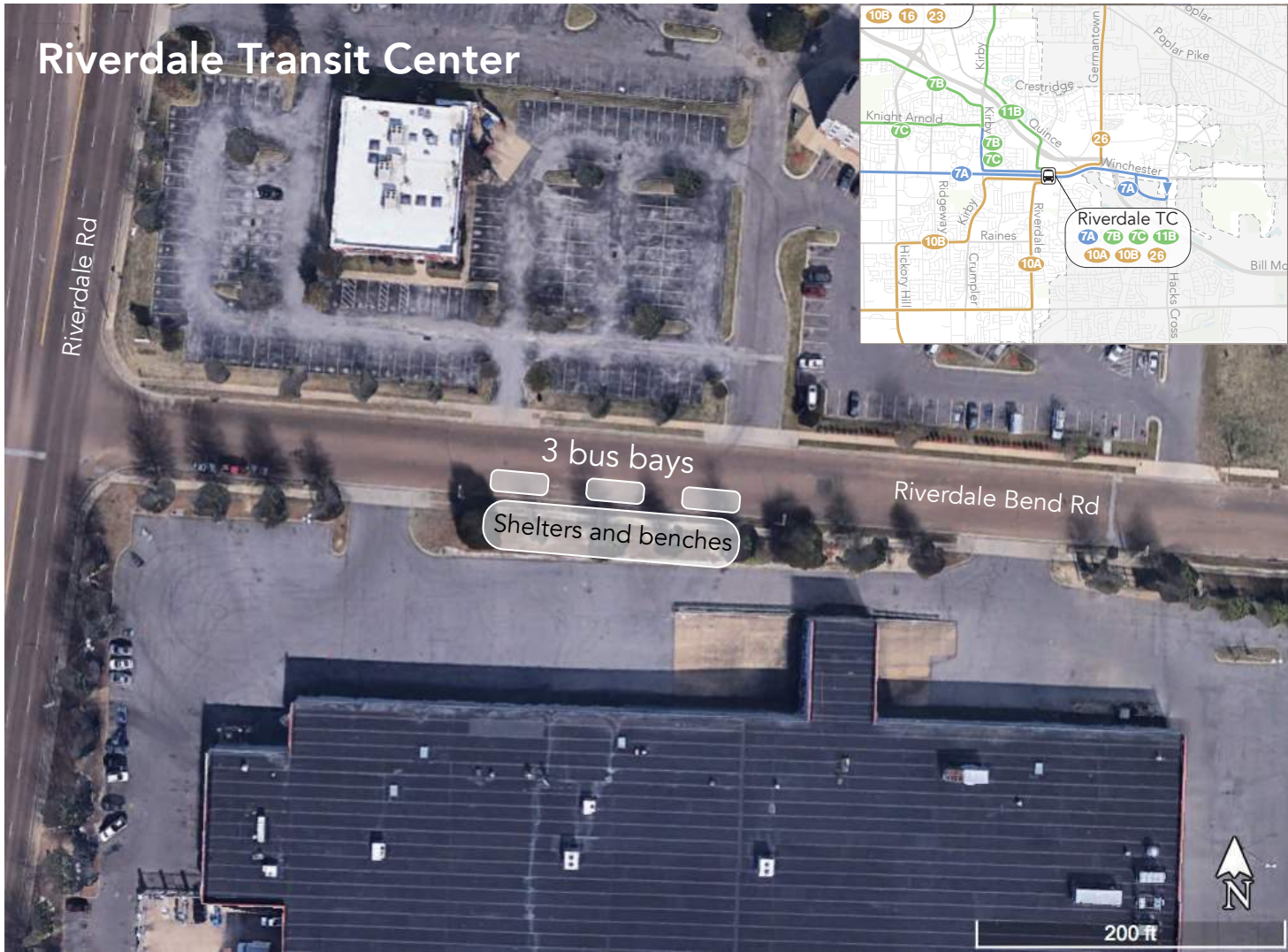


Short-Term Recommended Network

Riverdale Transit Center

The Riverdale Transit Center will be another important connection point in the transit system in southeast Memphis. At this location routes 7B, 7C, 10A, 10B, 11B, and 26 will all terminate. Because some of these routes run a very low frequency, only three bus bays will be needed to allow for the necessary pulsing of routes at this location. In addition to the on-street space for buses, shelters and other amenities will be needed to provide at least shade and a place to sit for passengers. In the long-term a more permanent transit facility with restrooms and a climate-controlled waiting area would be a valuable investment at this location.

Figure 37: Riverdale Transit Center



4

2040 Vision Network

2040 Vision Network

What about the long term?

The focus of this report has been on the Short-Term Recommended Network, which could be implemented starting in 2022 after additional funding is secured. By defining high frequency transit corridors for the short term, and identifying possible future high frequency transit corridors, this process has already helped guide discussions about where major new developments, and especially affordable housing and job centers, should be encouraged.

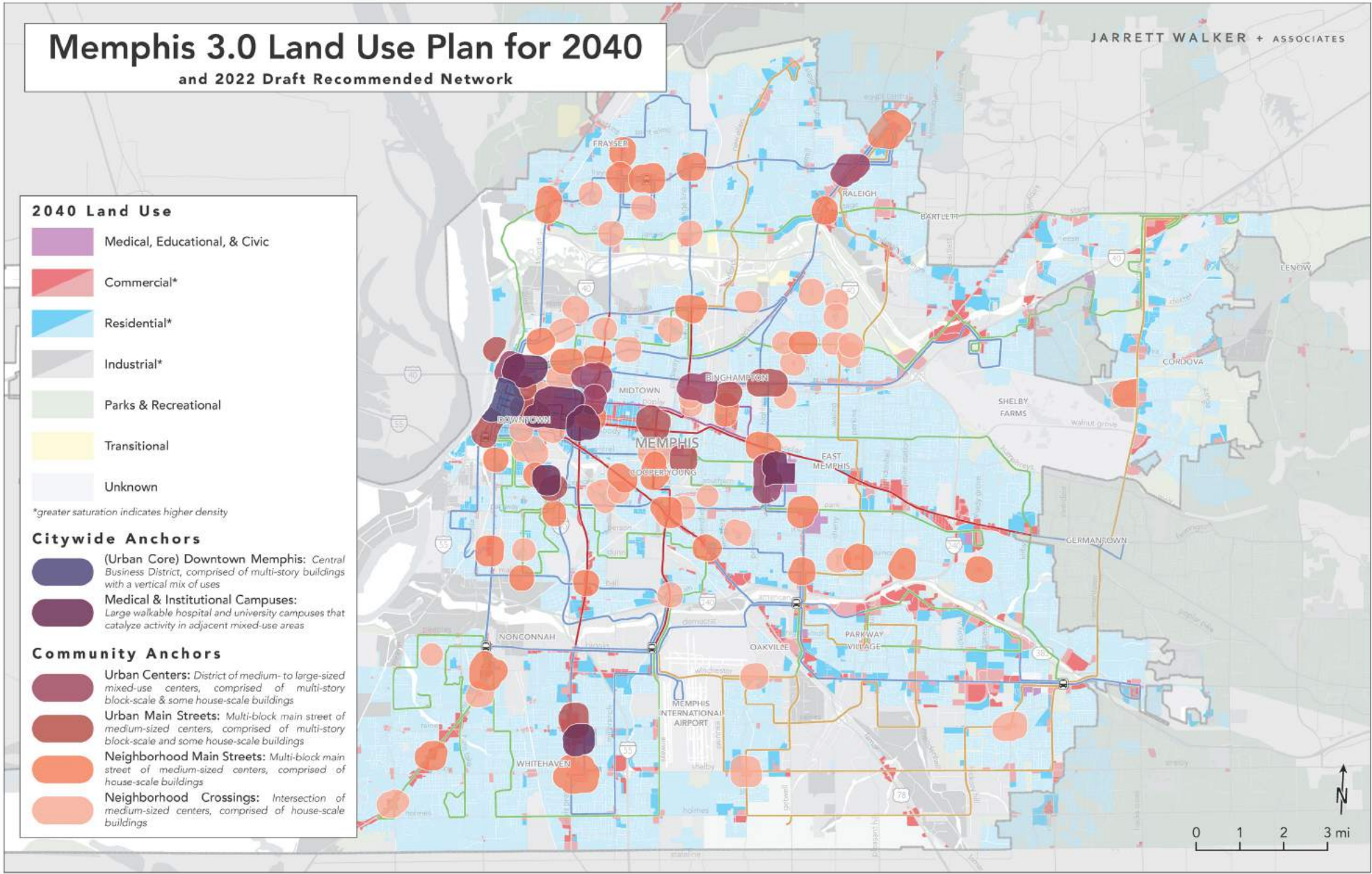
The City has been engaged in that larger and long-term discussion about land use and transportation through the Memphis 3.0 Comprehensive Plan process. That process resulted in a refined land use vision for the city in the fall of 2018. That land use vision is summarized in the map to the right. The Memphis 3.0 Vision Statement clearly states:

In our third century Memphis will build up, not out. Memphis will be a city that anchors growth on strengths of the core and neighborhoods; a city of greater connectivity and access; a city of opportunity for all.

That emphasis on building up, not out is reinforced in the land use vision that emphasizes key anchors of more intense development, particularly in the downtown core, around the Medical District and Midtown areas. Other key outlying anchors are planned in Raleigh, Whitehaven, and at the University of Memphis.

The other part of the vision statement clearly calls for a better connected city that provides opportunity for all. While the Short-Term Recommended Network does much to expand access by improving frequency of service for many, it only provides frequent service to about 15% of residents and 25% of jobs. To better meet the vision of a city that has greater connectivity and opportunity, the 2040 Vision invests in frequent service across a much larger swath of the city and along many more corridors.

Figure 38: Memphis 3.0 Land Use Plan for 2040



2040 Vision Network

Long-Term Network for 2040

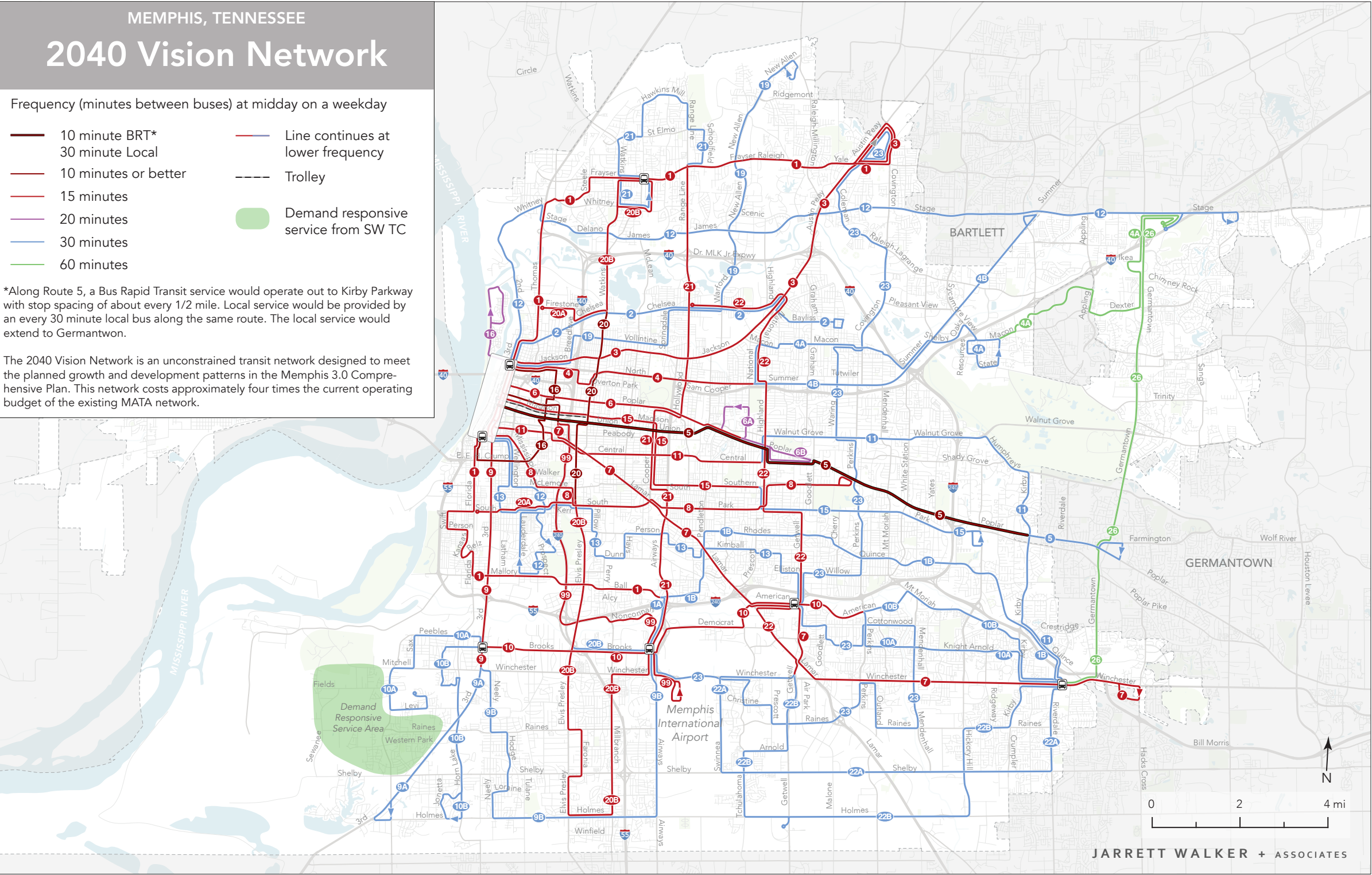
The 2040 Long-Term Network is designed to respond to the city's growth and land use plans, in order to improve transit in the areas most suited to cost-effective and high-rider-ship service and to improve service across areas most of the city.

This network will require about 4 times as much service as the existing MATA network, using 1,200,000 hours of service per year (rather than the 320,000 service hours required to operate the existing network). It will also require an expanded fleet of vehicles, additional staff, improved bus stops, and other infrastructure.

One of the key features of this network is its frequent grid (shown in red and maroon in the map at right). It allows someone to go from anywhere to anywhere on the grid, with a single fast transfer. In the 2040 Vision the frequent grid has been expanded across much more of the city. Additional frequent routes are added on numerous east-west corridors such as Frayser/Raleigh, Jackson Avenue, Summer Avenue, and Central Avenue. In addition a new north-south frequent crosstown route along the National/Highland/Getwell corridor from Airways Transit Center north to the Jackson Avenue corridor is added to improve access across the city.

With an expanded frequent grid, MATA can offer freedom and mobility to large numbers of people without needing to provide everyone with a one-seat-ride to the places they care about.

Figure 39: 2040 Transit Vision



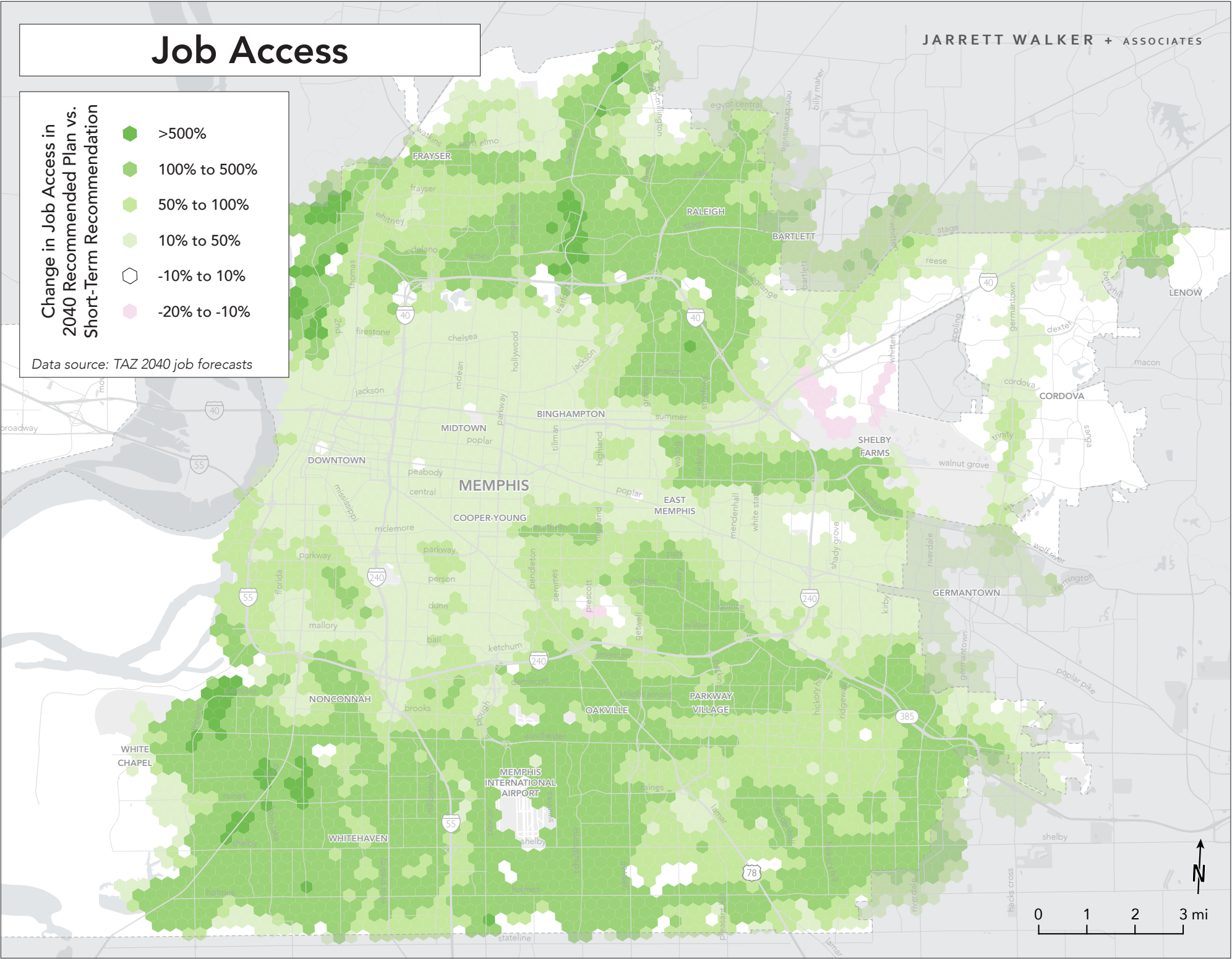
2040 Vision Network

Access to Jobs

A key measure of the usefulness of transit is how it connects people to employment. Job access is an indicator of both the work opportunities that can be reached by transit, and the businesses and services customers or clients could choose to travel to. The 2040 Vision Network vastly expands the number of jobs accessible to most people in Memphis and across most of the city compared to the Short-Term Recommended Network.

The map to the right shows the change in job access across the city. Large areas of the city see job access increases of over 100%, particularly Southwest Memphis, Whitehaven, Frayser, Raleigh, and East Memphis. The percentage increase in job access for the inner portions of the city are not as dramatically better, in large part because the Short-Term Recommended Network already serves this areas with relatively high frequency service, so the number of jobs reachable in 60 minutes does not increase as dramatically within the core as it does for outer parts of the city.

Figure 40: The 2040 Vision Network significantly increases jobs accessibility for nearly every part of Memphis.



2040 Vision Network

Priorities for Frequent Service

The 2040 land use vision imagines a number of higher intensity anchors in the Core City, particularly around downtown and the Medical District, and along Watkins. In addition, in the University and Midtown areas a number of anchors are planned along North Parkway and along Highland near Central and Poplar Avenues.

To better connect these planned intense areas of growth and development, the 2040 Vision imagines higher frequency service along **high priority east-west corridors**:

- North Parkway/Summer
- Central Avenue
- Jackson Ave
- Mississippi/South/Park

In addition, the 2040 Vision imagines a new crosstown corridor through the Medical District in an orbital pattern from the southern edge of downtown, across Crump, north through the Medical District, then west to the Pinch District and on to Mud Island. Through the core of the Medical District this route would run every 10 minutes, providing easy connection from connecting routes from the south, like the Florida, Mississippi, and Central Avenue corridors to destinations across the Medical District.

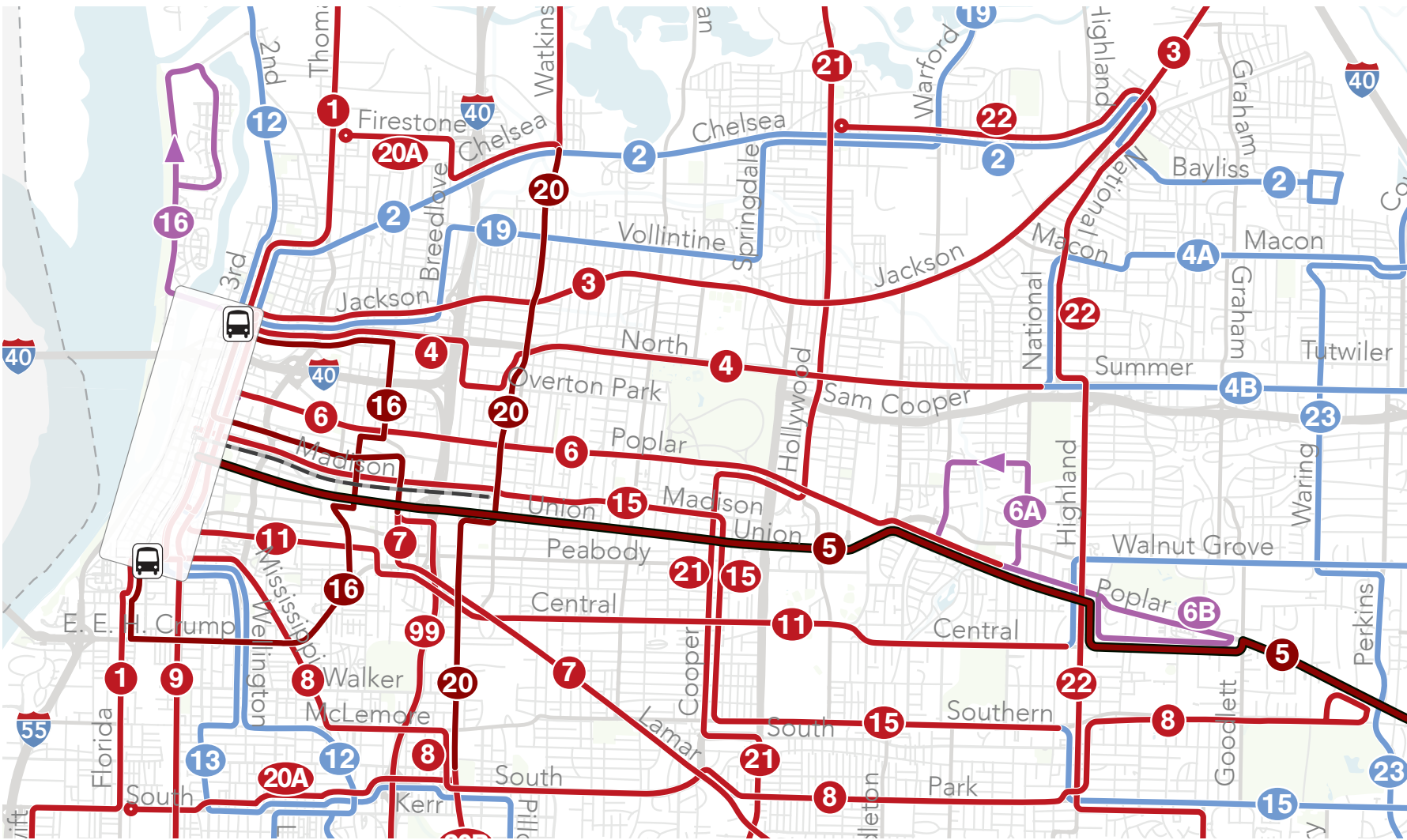
The 2040 Vision also recommends another north-south frequent corridor (Route 22) along National/Highland/Getwell. Combined with frequent routes on Watkins/Presley and Hollywood/Cooper/Airways, the new 2040 Vision network would have four north-south frequent crosstown routes intersecting with 10 primarily east-west frequent routes.

The other major addition to the network is the BRT route on Union/Poplar from downtown to Kirby. This route would operate with approximately 1/2 mile stop spacing and at a frequency of every 10 minutes all day. A local route would operate every 20 minutes making local stops in between the BRT stops. This route would serve the long, dense, and active corridor and provide faster trips between destinations along this key corridor.

In summary, the high priority frequent corridors are Routes 3, 4, 8, 11, 16, 22. These corridors already have relatively high density and are targeted for the most intense development in the land use plan.

Secondary priorities for frequent service include Routes 1, 6, 9, 15, 20A/B. Routes 1 and 9 have less density today, and while there are planned anchors along these routes, some of those anchors are much farther from the core (such as the anchor in Raleigh) and therefore are much more expensive to

Figure 41: 2040 Transit Vision in the Core City and University Areas



service with frequent transit. Similarly, Routes 20A/B are secondary priorities for higher frequency service as these routes are serving more distant anchors at higher costs. Routes 6 and 15 are a lower priority because there are nearby frequent routes in the Short-Term Recommended Network that would serve overlapping markets for these corridors, and therefore the inner Poplar and Madison corridors would be secondary priorities for frequent service.

The third tier of high frequency corridors includes outer Winchester (Route 7), the Airport Route 99, Brooks corridor (Route 10). These corridors do not serve key anchors like the other recommended frequent corridors, but they do serve as key connectors between other frequent routes, helping to build a stronger overall grid. And in the case of the outer Winchester corridor, the frequent service would serve an area of relatively high density.

Guidelines for Transit-Supportive Land Use Policies

In many cities, the ability of transit to run quickly and reliably is most often the result of things outside the transit agency’s control. High transit rider-ship results from a four legged stool:

- Transit Service: a well-connected network with high frequency, long spans, reasonable speeds, high reliability and sufficient capacity.
- Land Use: the density, walkability, linearity and proximity of residents, jobs, and other land uses.
- Street design: the ability of transit to use certain streets, to make turns, and whether transit has priority that protects it from congestion.
- Pricing: the cost of transit fares relative to competing modes.

The transit agency only has complete control of the first element (service). It has partial control over the fourth (price) but only in terms of the transit fare. In general, local or state governments have complete or partial control over the other three elements.

Cities and state governments control the density of land by determin-ing the zoning and approving or not approving development. They set parking policies, which dramatically affect both the density of land use and the cost of competing modes. They control walkability through land use decisions and the management of streetscapes, signal timing, and crossing locations. They manage curbs and determine parking locations, parking enforcement, loading zone locations, and traffic enforcement. They manage street priority by allocating lanes among competing uses. Overall, cities have as much control, if not more, over the success of transit than transit agencies.

The Memphis 3.0 Comprehensive Plan is making strides to increase density, walkability, linearity, and proximity of development through a focus on growing up instead of out. Other key policies that the City can focus on in improving the ability of transit to carry many riders include

- Reducing or eliminating parking requirements near frequent transit corridors;
- Increasing the density of development along frequent transit corridors;
- Prioritizing pedestrians and safe crossings along frequent transit corridors;
- Prioritize connected streets and connected pedestrian paths near frequent transit corridors to maximize the walkable area around bus

stops with frequent service;

- Prioritize transit movement on frequent corridors so that buses full of people are not delayed by lower occupancy vehicles;
- Reducing or eliminating direct city subsidies for parking, particularly in and around downtown.

Action item: City staff should adopt policies that reduce parking requirements, allow higher densities, prioritize pedestrian infrastruc-ture improvements, and prioritize movement of transit on and around frequent transit corridors.

Development-Linked Funding of Service and Infrastructure

Cities are already well aware of the ways that physical improvements can be funded as part of development projects. Signals, sidewalks, trails, sewers or roadways are sometimes required when a private party wants to develop land adjacent to a road that is below standards.

Funding capital improvements is relatively easy

Developers are sometimes required to make investments in transit infra-structure at the same time. The simplest case is that of the bus pad and stop: a developer builds out a wider sidewalk and a sheltered bus stop as part of a “half-street” improvement. This is a wonderful contribution, but it can sometimes happen in the wrong place – on a route that is soon to be cut, or at a bus stop that is too close to adjacent bus stops and should be eliminated anyway.

The City and MATA should advocate for transportation infrastructure improvements to be funded as part of development projects on the Frequent Transit Network as identified in the 2040 Vision. The Frequent Network is made up of corridors that are most likely to have high ridership and useful service over the long run, and so where it is appropriate to ask private parties to invest in long-term infrastructure.

Funding service operation is more challenging

Raising funds for capital improvements through new development is rel-atively straightforward. Raising funds to operate service is difficult, and dangerous. If a new development makes a one-time contribution towards transit operations, and receives a service in return, the transit agency is

now accountable to riders and neighbors for that service in perpetuity. If the route generates little ridership or is expensive to operate, the agency may be faced with cutting it in the future, to the great disappointment of the new residents.

Two mechanisms are available for newly-developed areas to fund ongoing operations in a sustainable way:

- A residential or commercial area can form a non-profit Transportation Management Association, which also can collect dues to fund pro-grams and services.
- If a large residential or commercial development has reason to charge on-going parking fees, that revenue source could be used in part to support nearby transit service.

Action item: City staff should adopt a policy for where transit infrastruc-ture investments should be required of new developments.

Guidelines for Measuring Ridership Performance

This section includes general guidance for how MATA routes can be moni-tored in the future, in particular with regards to ridership relative to cost. This section refers to a few measures for which MATA may decide to set numerical standards in the future, such as:

- Productivity (riders per hour of service)
- Subsidy per passenger (operating cost per passenger less fares)
- Density required for new coverage (residents or jobs per square mile, within ½ mile of a potential new route)

General guidance for using transit ridership data

- Whenever possible, use one full year’s worth of data to calculate any measure related to ridership and operating cost.
- Collect transfer and linked-trips data to better understand how rider-ship responds to network design changes. This eliminates any suspicion or confusion about whether ridership is *really* growing as opposed to boardings growing because of a network change that requires a new transfer. Linked-trips data also helps measure the impact of routes being combined, or split. For example, combining a pair of routes , may improve travel time for people but actually reduce boardings by only

counting them once. If boardings are the only measure of ridership, that might look like a failure. This can distort an agency’s planning decisions.

For operations, transfer data can also help reveal the most common connections that may benefit from refinements in scheduling.

- Be very cautious when evaluating the productivity of a route by time of day or week. High ridership at some times may depend on the availability of service at other times, even if few people use the service at those other times. People choose to rely on a route because of its complete scheduled offering, and value the “insurance” provided by service at times when they don’t regularly travel. Cutting unproductive trips at certain times of day can cause ridership drops at other times of day.

Action item: Collect transfer and linked-trips data to better understand how ridership responds to network design changes.

Productivity standards for fixed routes

There is no objective standard for the productivity of a fixed route. Fixed routes are mostly evaluated relative to one another, and relative to what the transit agency believes is possible in their particular city. Any agency that wishes to increase ridership within its fixed budget is continually reevaluating its least-productive routes. Every service hour invested in the least-productive routes is attracting fewer rides than it would if it were re-allocated to improve a more-productive route.

A scatterplot is a useful tool for comparing productivities among routes, and observing relationships between productivity and frequency; or productivity and total annual service hours. MATA can continue to update this scatterplot with productivity and frequency data each year, to monitor route-by-route productivities and inform service changes.

Subsidy standards for flexible, demand response services

Demand response service (such as dial-a-ride or the app-enabled dial-a-ride that is called “microtransit”) can be evaluated using subsidy per ride rather than productivity.

Productivities for demand response service are rarely higher than 5 boardings per hour, typically much lower than the lowest-tolerable productivity on fixed routes. The Short-Term Recommended Network and the 2040 Vision both imagine demand responsive service in Southwest Memphis. MATA can set a floating ridership-related standard for demand-response

services, in which their operating subsidy per ride can be no bigger than the average subsidy per ride for the three least-productive fixed routes. This ensures that demand response riders are treated fairly with respect to fixed-route riders.

It is valuable, in calculating the operating subsidy per ride, to account for the extra vehicle costs associated with specialized services. For example, if a shuttle is in operation for only 4 hours of the day, its operating cost could be described as 4 daily service hours. Yet to provide that shuttle, the agency is purchasing, maintaining and storing a unique vehicle that only gets used at peak times, for 4 hours a day. In contrast, a vehicle on a fixed route is likely in use for 16 hours a day. Service hours alone will not capture the total operating costs of these routes. It will be important to account for the higher costs of the shuttle, in calculating subsidy per passenger, as well as the higher or lower fares paid by passengers on the shuttle.

Action item: Adopt a subsidy standard for any new demand-response service that relates to the subsidy provided on low-ridership fixed routes.

Remedial actions for low-productivity fixed routes

If a route or segment that staff believes is failing to meet its minimum standard for productivity, the following questions should be asked and possibilities explored:

- Does the failing route or segment also fall far below the system average on measures of speed or reliability? If so, those factors may be inhibiting its productivity.
 - Work with operations to determine whether factors within the agency’s control can be changed to improve speed or reliability.
 - Work with local traffic officials to improve speed or reliability using different signal or street treatments.
- Is there a reason to expect the route’s performance to improve soon, such as imminent dense development along the route? If so, the route can be maintained on a “watch list” to see if development and the built environment raise its productivity.
- Can the failing route be taken apart into fewer detachable segments (each of which could be operated as a standalone route, or added to a different route)?

- If so, then detach it into multiple standalone routes, and estimate the productivities of the detachable segments.
- If different segments of the route have very different productivities, that implies that service levels are not well-matched to demand over a large part of the route. It may be appropriate to consider ways to re-combine these segments with one another or with other route segments in the network, so that service levels are well matched to demand in the future.
- If frequency or span were reduced during lower-demand periods (such as on evenings, weekend mornings or Sundays) would that improve the productivity? If so, consider doing so.
 - Whenever possible avoid *eliminating all service* at a certain time of day, including eliminating the last trip of the day, and avoid eliminating midday service. Preserve the span of service for as long as possible, while reducing evening and weekend frequencies as a first resort.
- If, over time, a fixed route or segment continues to fail to meet a productivity standard, it should either be redefined as a Coverage route (having no productivity standard) or be ended.

Density guidelines for new coverage

Density guidelines may be useful for new coverage service, but since density is only one of a few factors behind the productivity of a route, density guidelines must be used in combination with some measure of walkability and linearity. These density guidelines can help MATA respond consistently to requests for service in advance of planned development.

This density guideline could be designed based on the number of people per 15 minutes of cycle time (driving + recovery) on a route who are within a 1/2 mile walk of a bus stop, on a low ridership route today. This density guideline can then be a minimum for future coverage, with the condition that poor linearity or long distances might overrule the measure.

While this standard used for determining the viability of new coverage services, it may also be applied throughout the existing network in the future. Density guidelines do not apply to ridership-focused routes since it is sometimes useful to invest in frequency to connect end-points, and to make a better network, not just because of adjacent land use patterns.

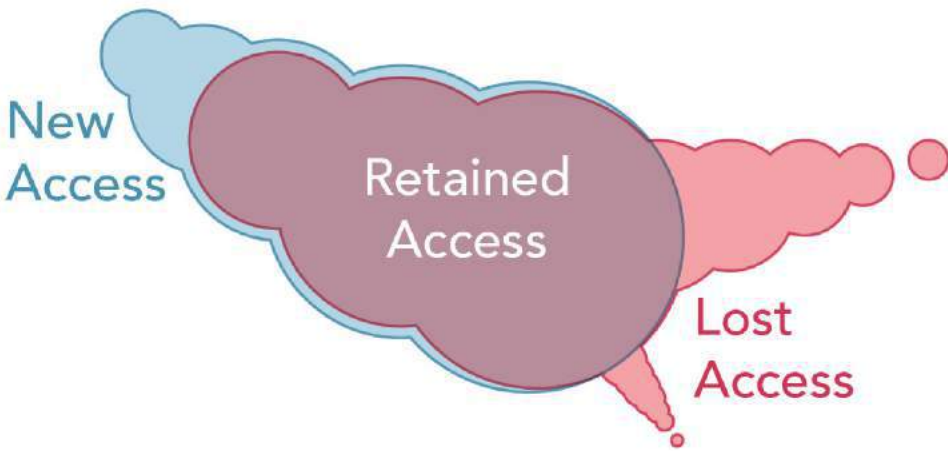
Action Item: Create combined density and walkability guidelines to be used as a minimum standard for new coverage service.

5

Access Maps

How far can I travel from Airways Transit Center?

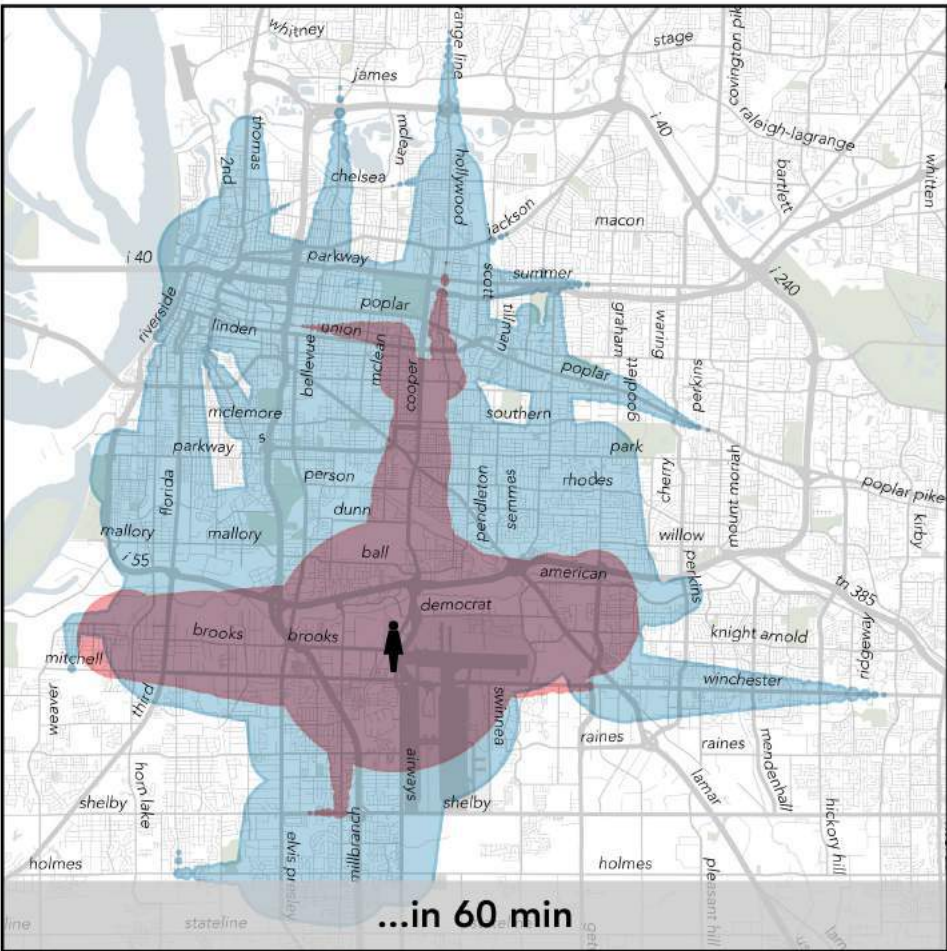
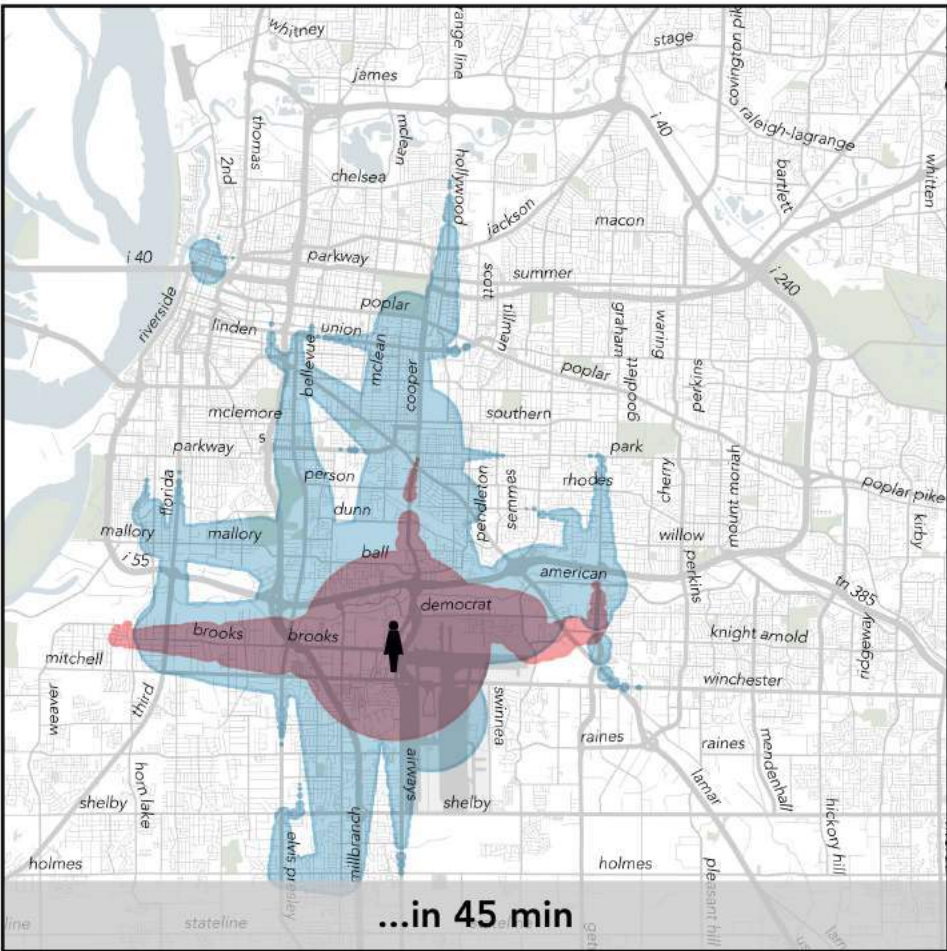
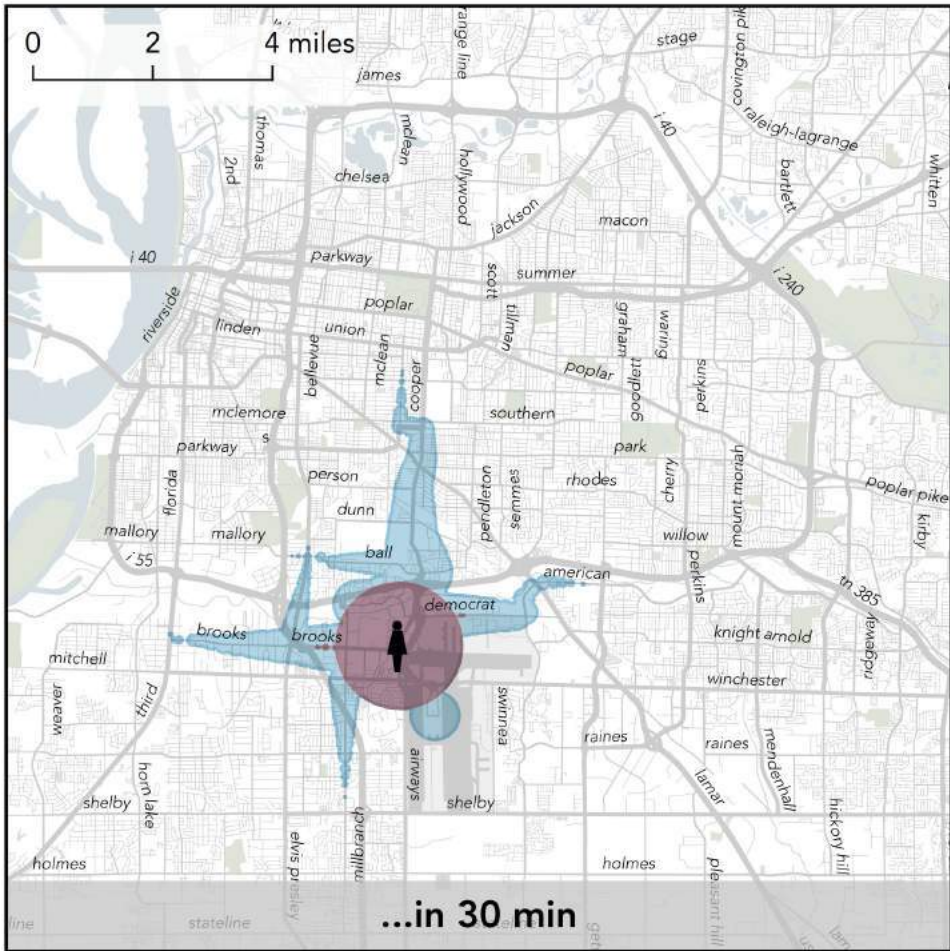
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+789%	1,600	14,300
Jobs	+117%	14,100	30,600

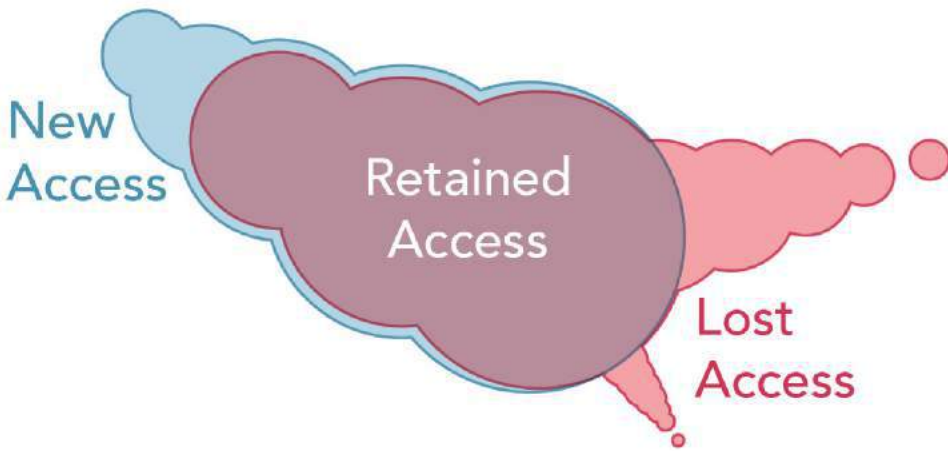
	% Change	Existing	Recommended
Residents	+529%	14,000	88,300
Jobs	+113%	39,500	84,200

	% Change	Existing	Recommended
Residents	+348%	54,600	245,100
Jobs	+193%	71,900	210,600



How far can I travel from American Way Transit Center?

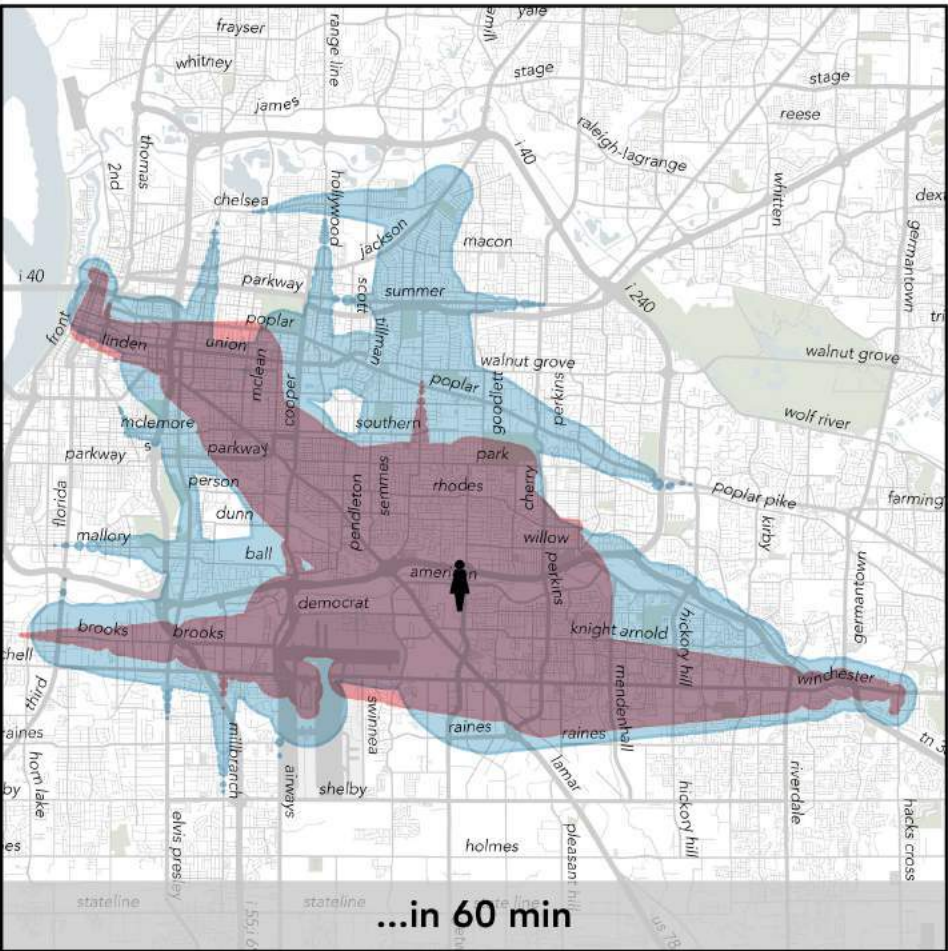
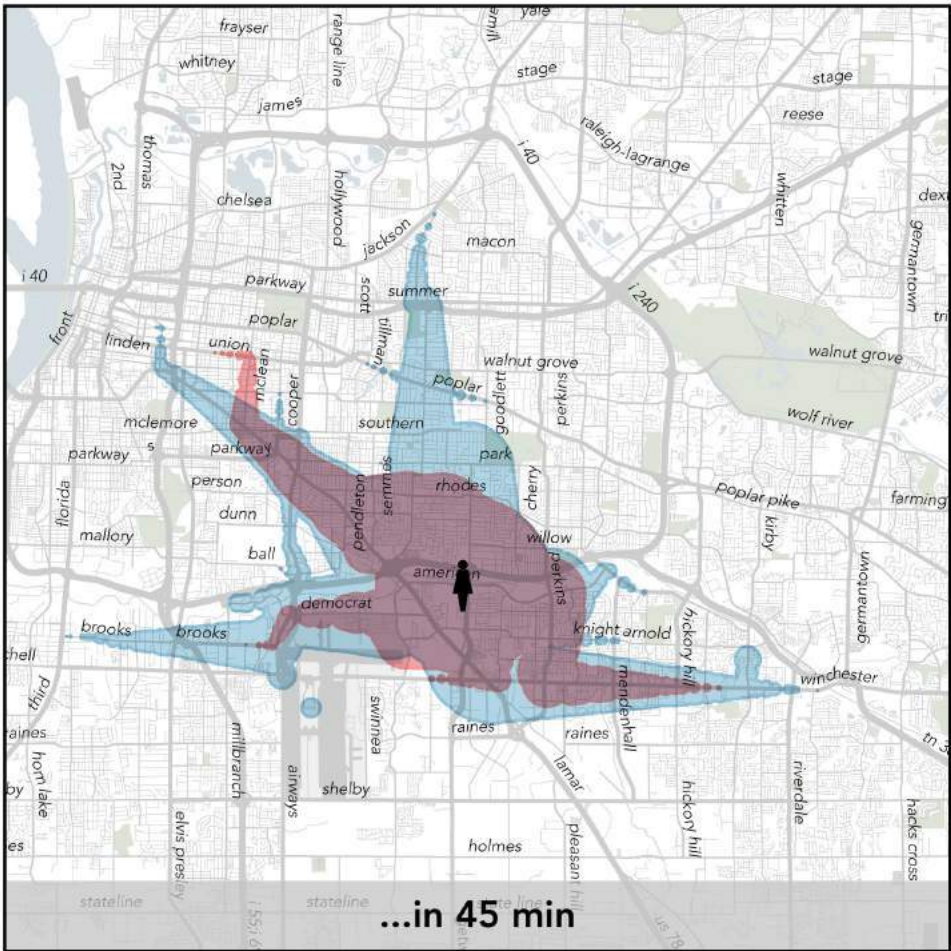
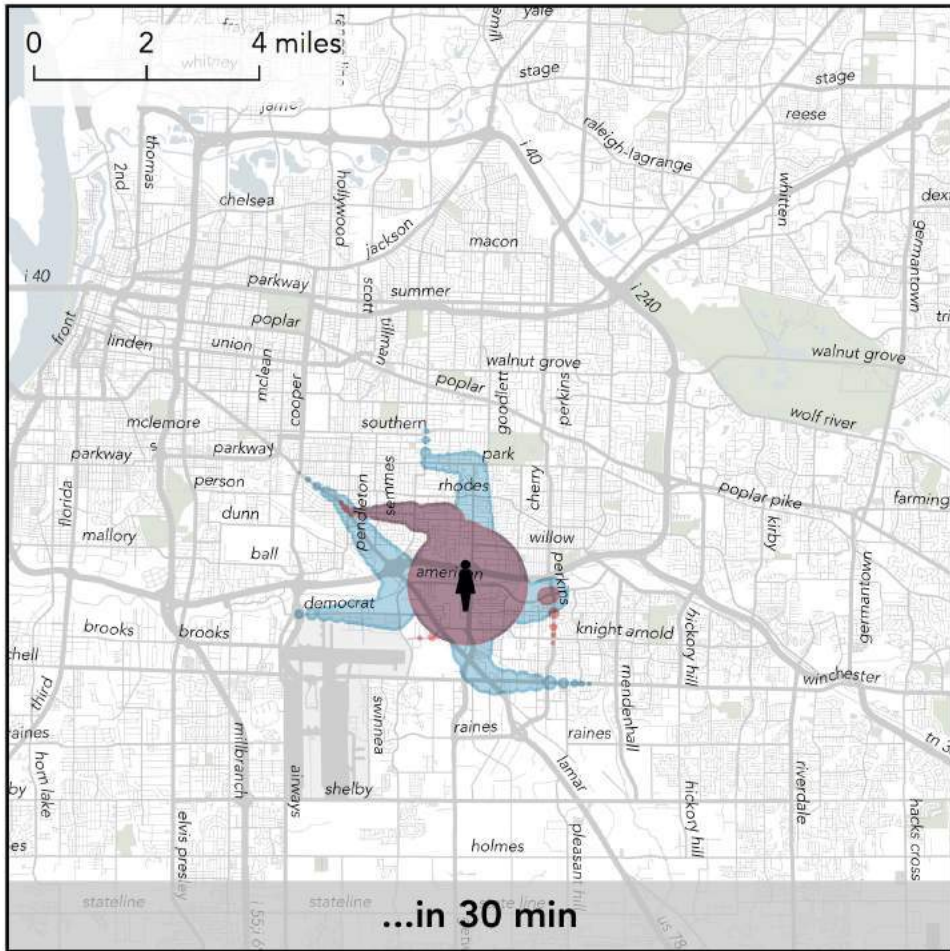
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+70%	16,600	28,200
Jobs	+179%	6,400	17,800

	% Change	Existing	Recommended
Residents	+58%	64,500	102,100
Jobs	+119%	35,400	77,400

	% Change	Existing	Recommended
Residents	+68%	141,500	237,200
Jobs	+62%	129,800	210,500



How far can I travel from Brooks and 3rd in SW Memphis?

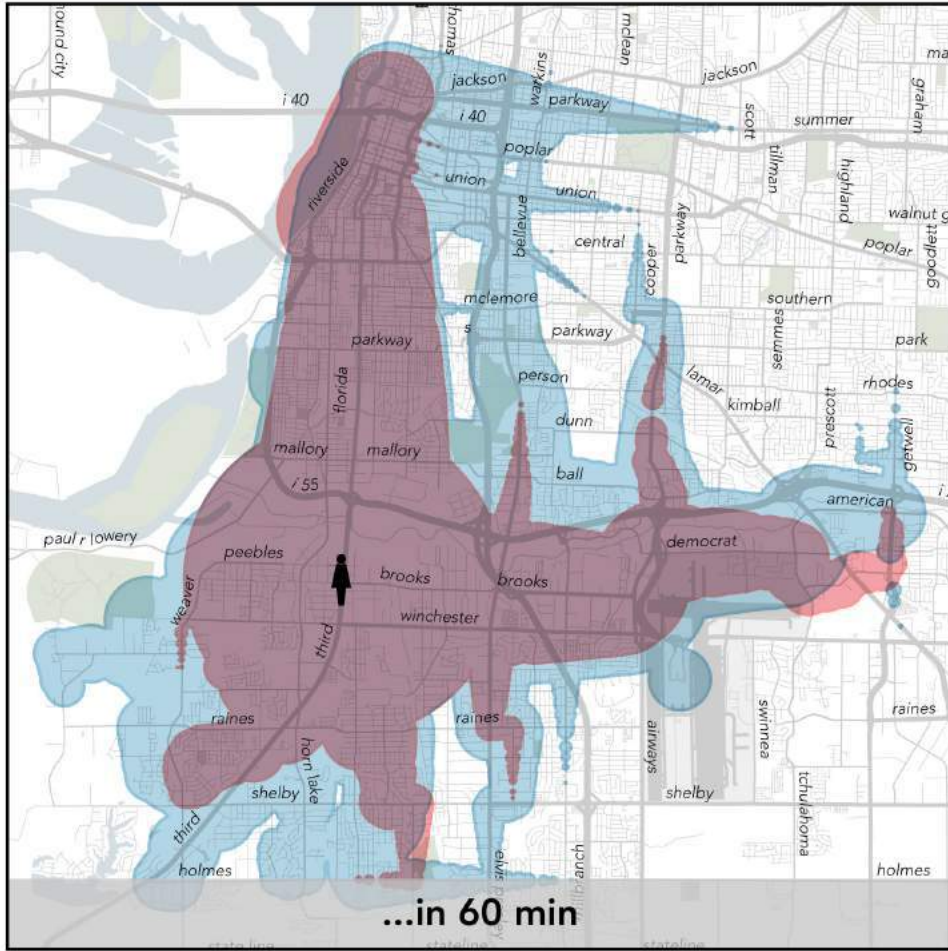
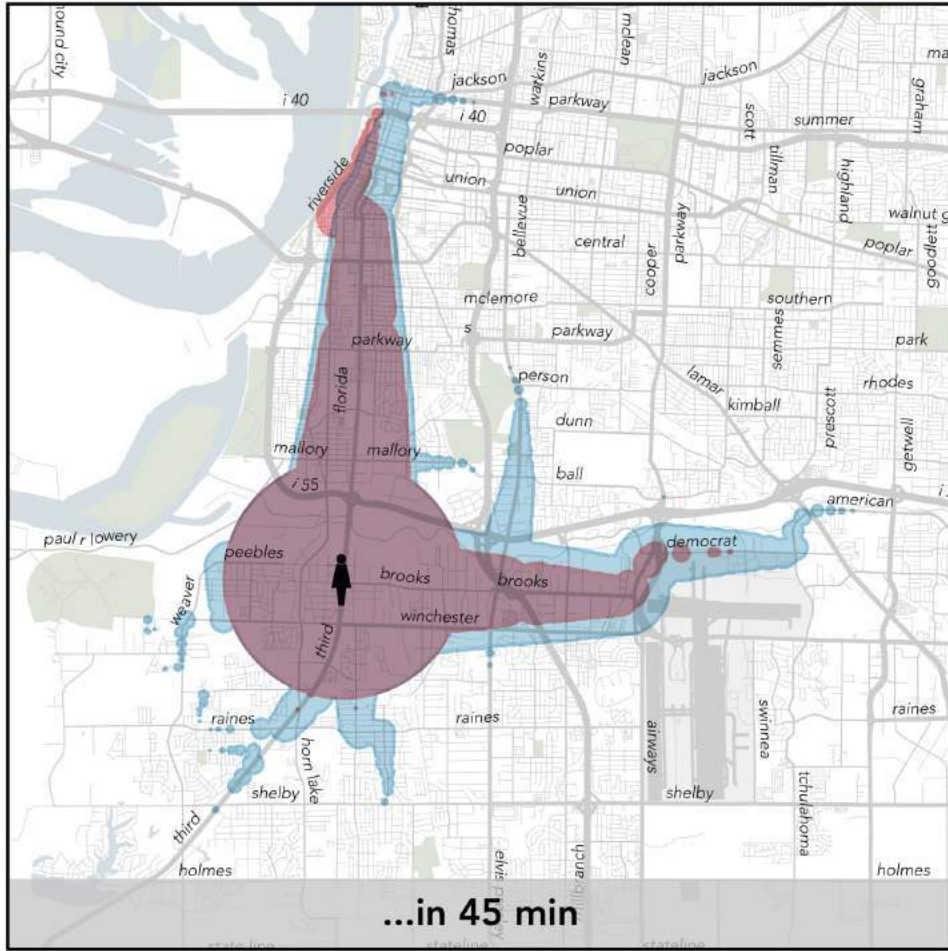
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+42%	5,000	7,100
Jobs	+69%	4,500	7,500

	% Change	Existing	Recommended
Residents	+59%	24,200	38,500
Jobs	+73%	37,500	64,900

	% Change	Existing	Recommended
Residents	+86%	74,400	138,400
Jobs	+46%	98,400	143,800



How far can I travel from Crosstown Concourse?

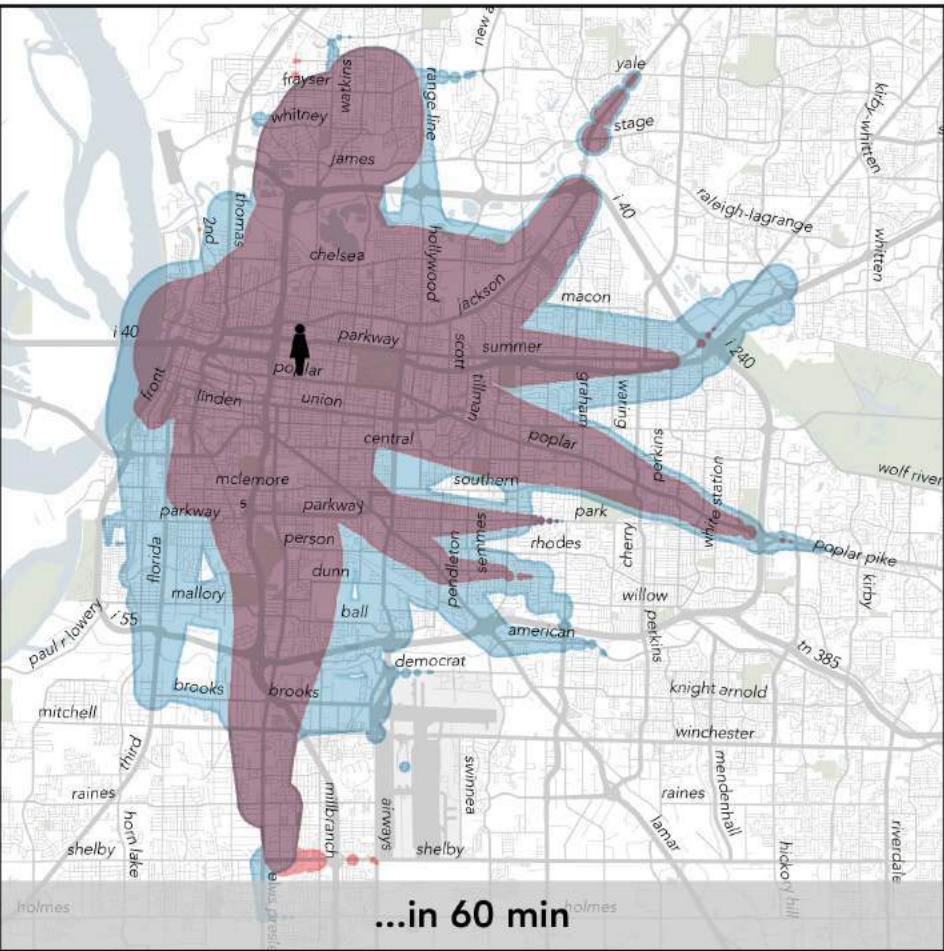
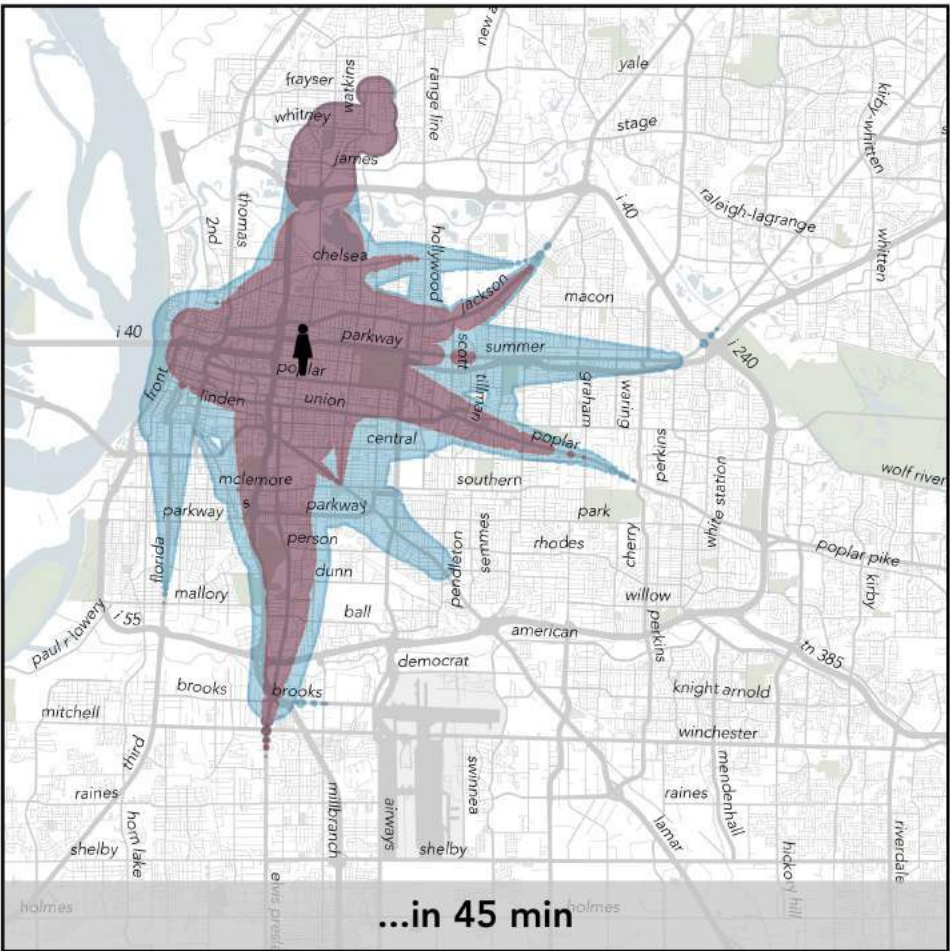
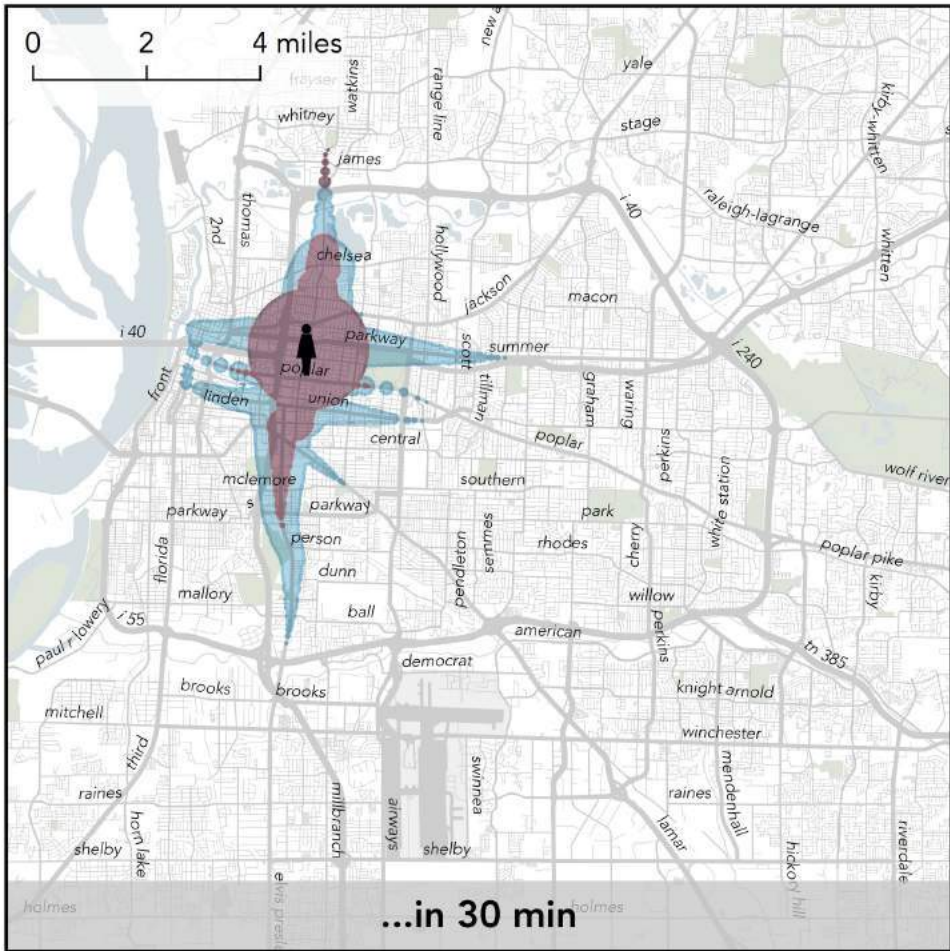
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+70%	22,400	38,200
Jobs	+140%	16,800	40,100

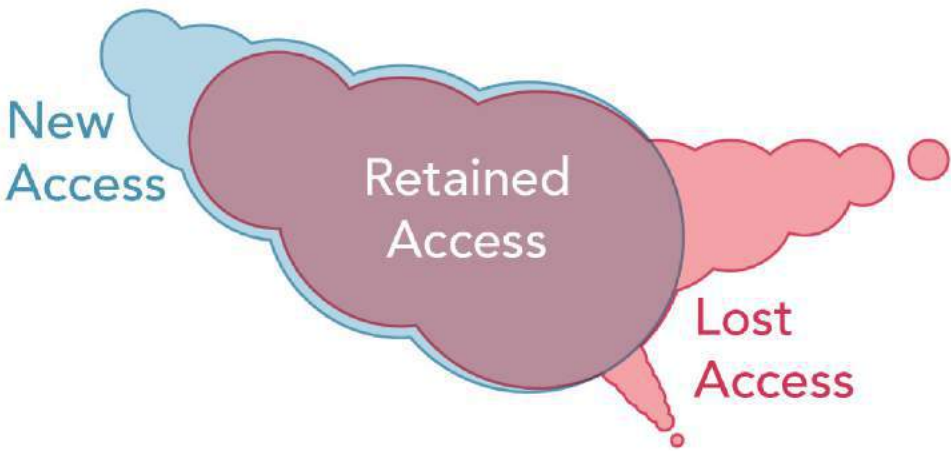
	% Change	Existing	Recommended
Residents	+71%	79,000	135,200
Jobs	+64%	76,200	124,900

	% Change	Existing	Recommended
Residents	+34%	188,400	251,700
Jobs	+35%	153,800	208,200



How far can I travel from Downtown?

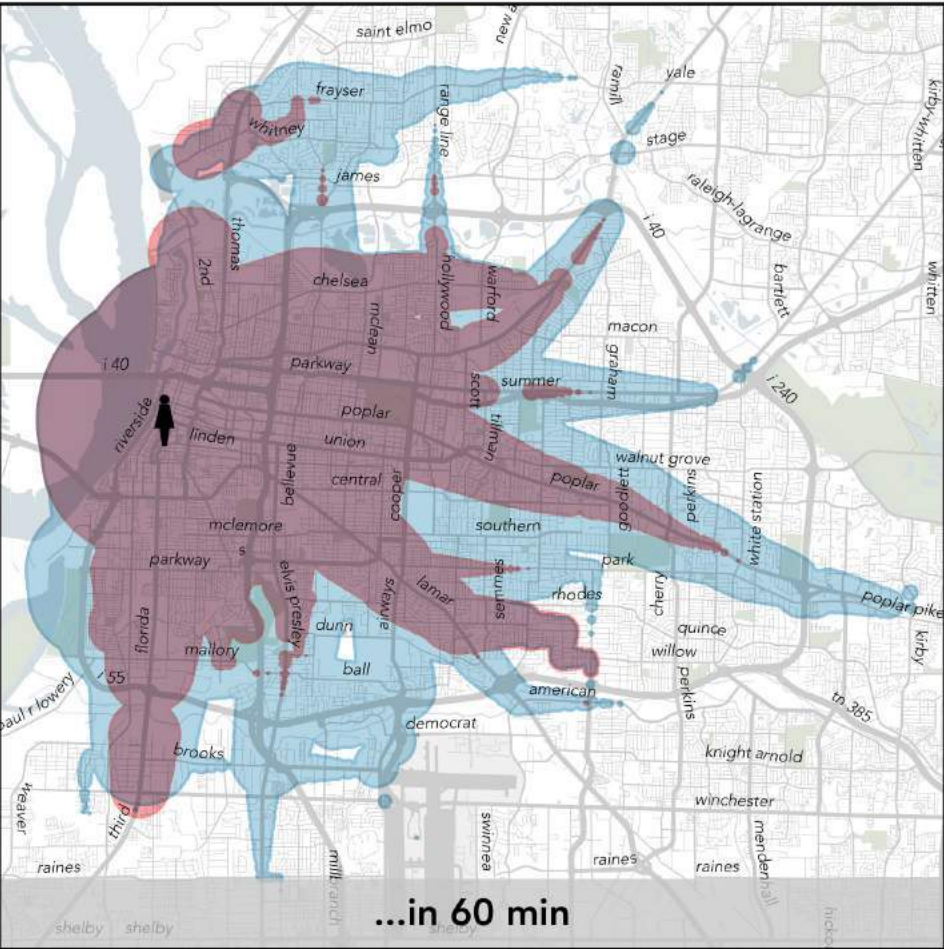
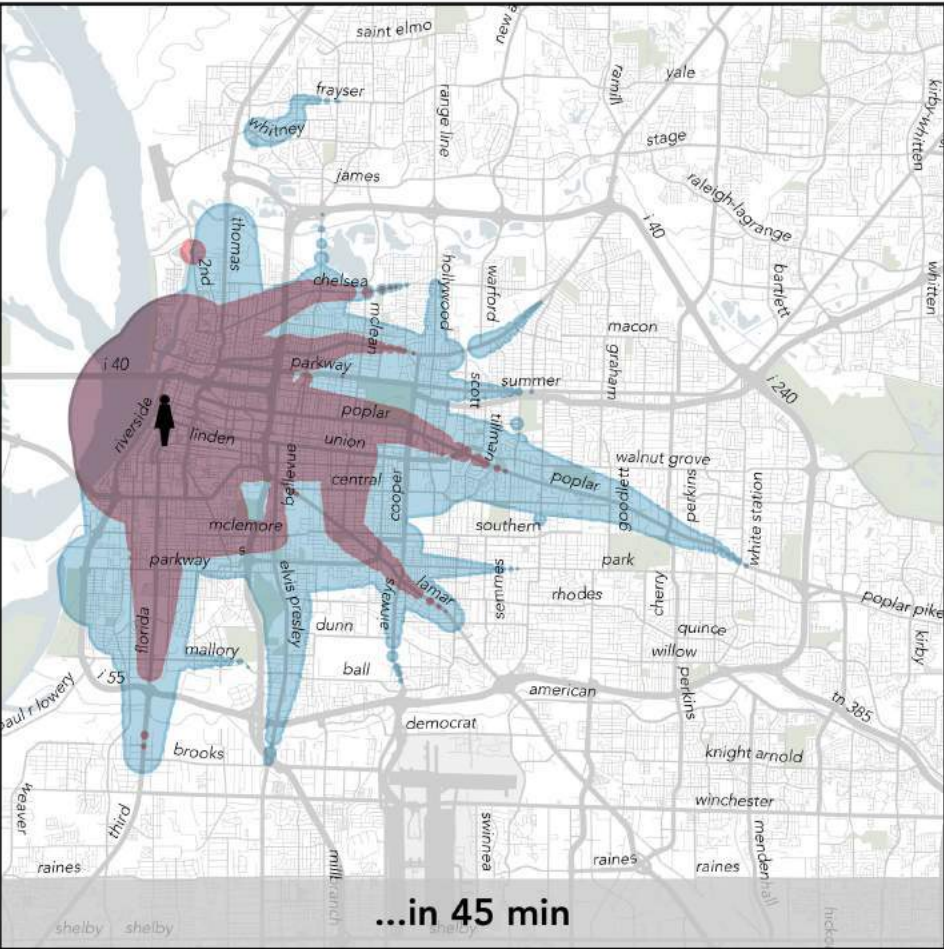
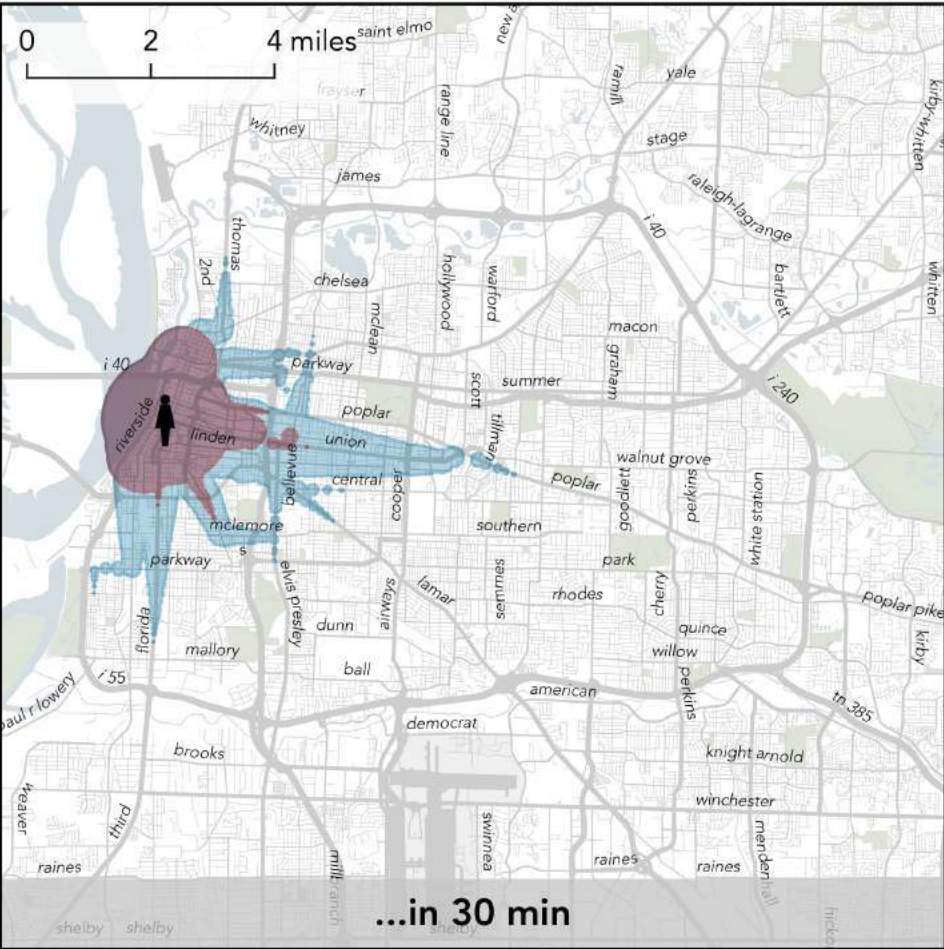
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+159%	16,000	41,400
Jobs	+56%	48,100	75,200

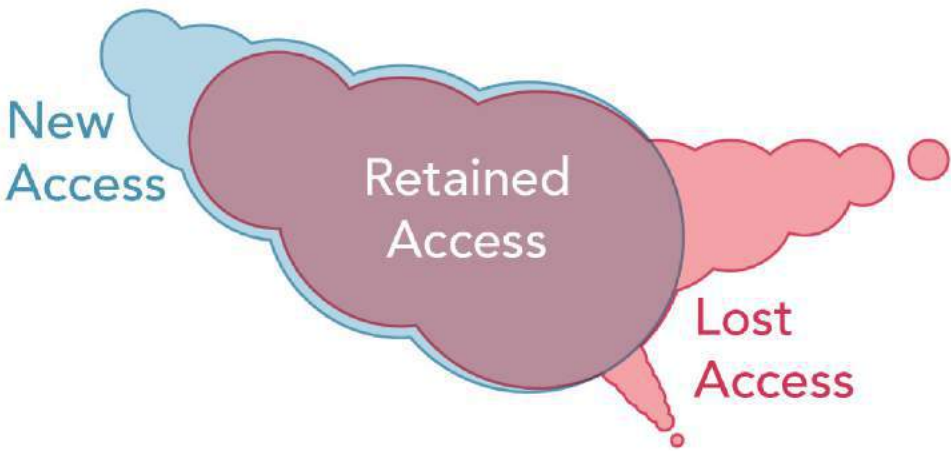
	% Change	Existing	Recommended
Residents	+99%	66,200	131,800
Jobs	+58%	82,900	130,600

	% Change	Existing	Recommended
Residents	+55%	158,600	246,500
Jobs	+54%	139,800	215,600



How far can I travel from FedEx Hub?

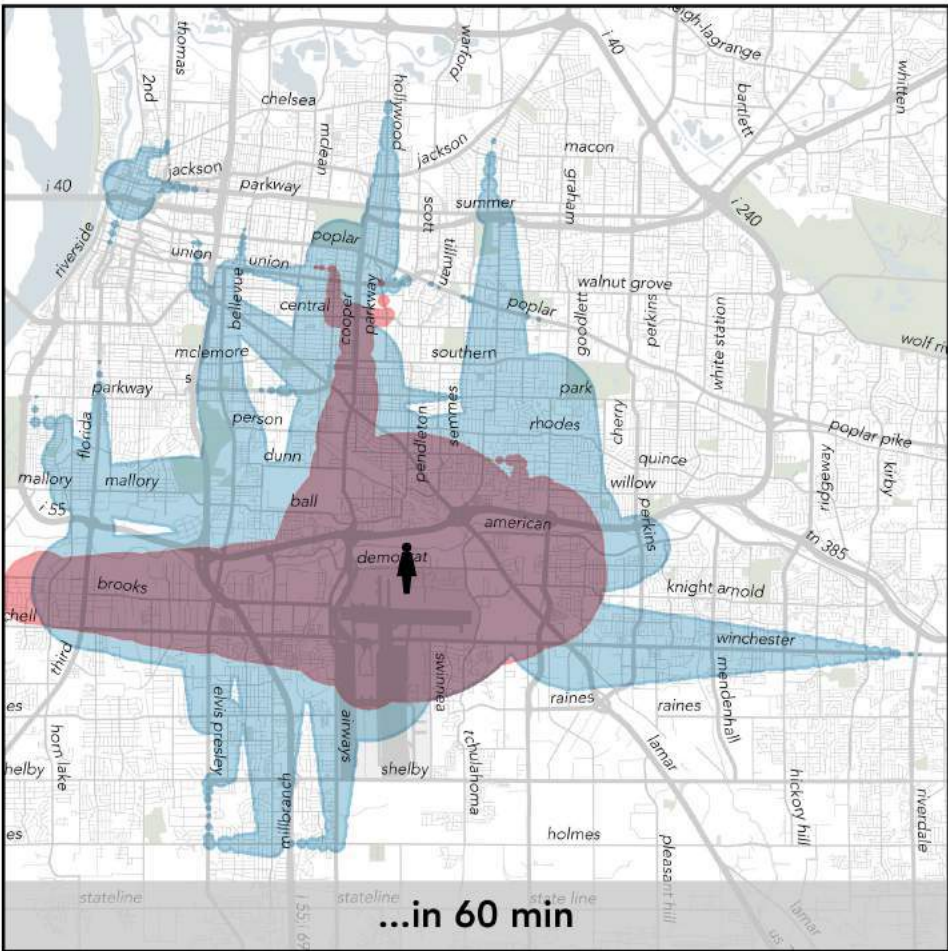
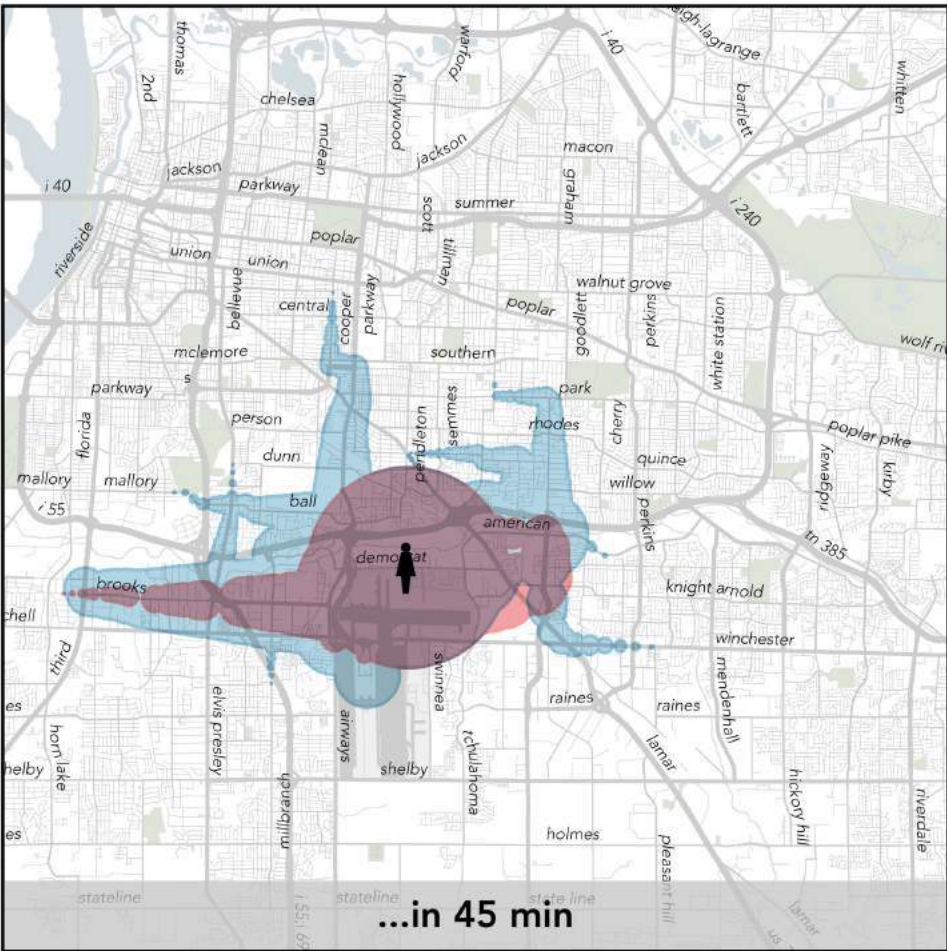
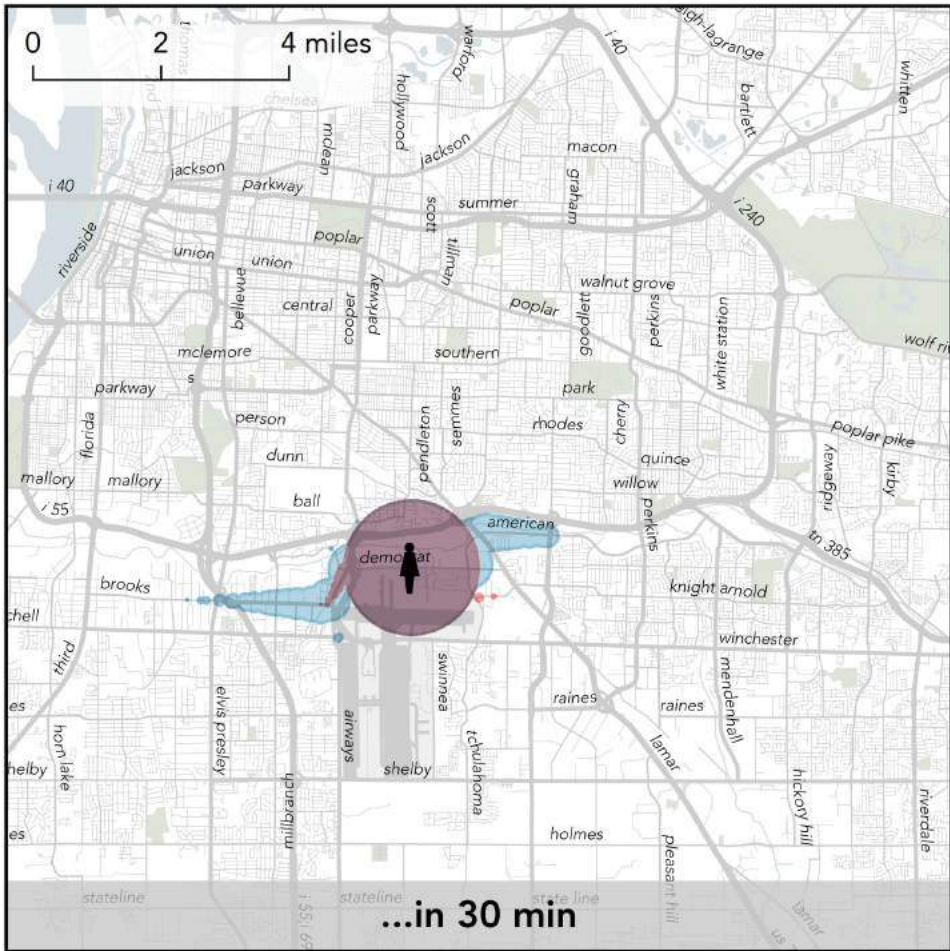
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+55%	2,000	3,100
Jobs	+33%	18,500	24,500

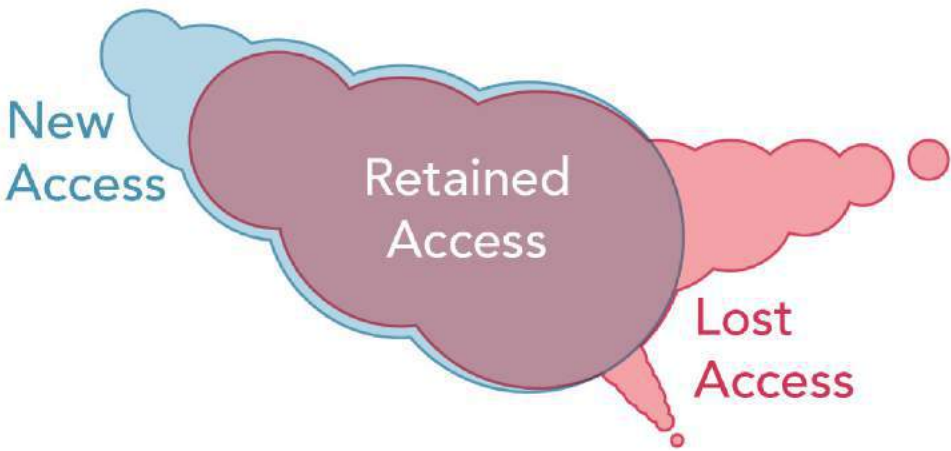
	% Change	Existing	Recommended
Residents	+171%	15,000	40,700
Jobs	+31%	41,700	54,600

	% Change	Existing	Recommended
Residents	+217%	50,500	160,100
Jobs	+99%	64,000	127,300



How far can I travel from Frayser and Overton Crossing?

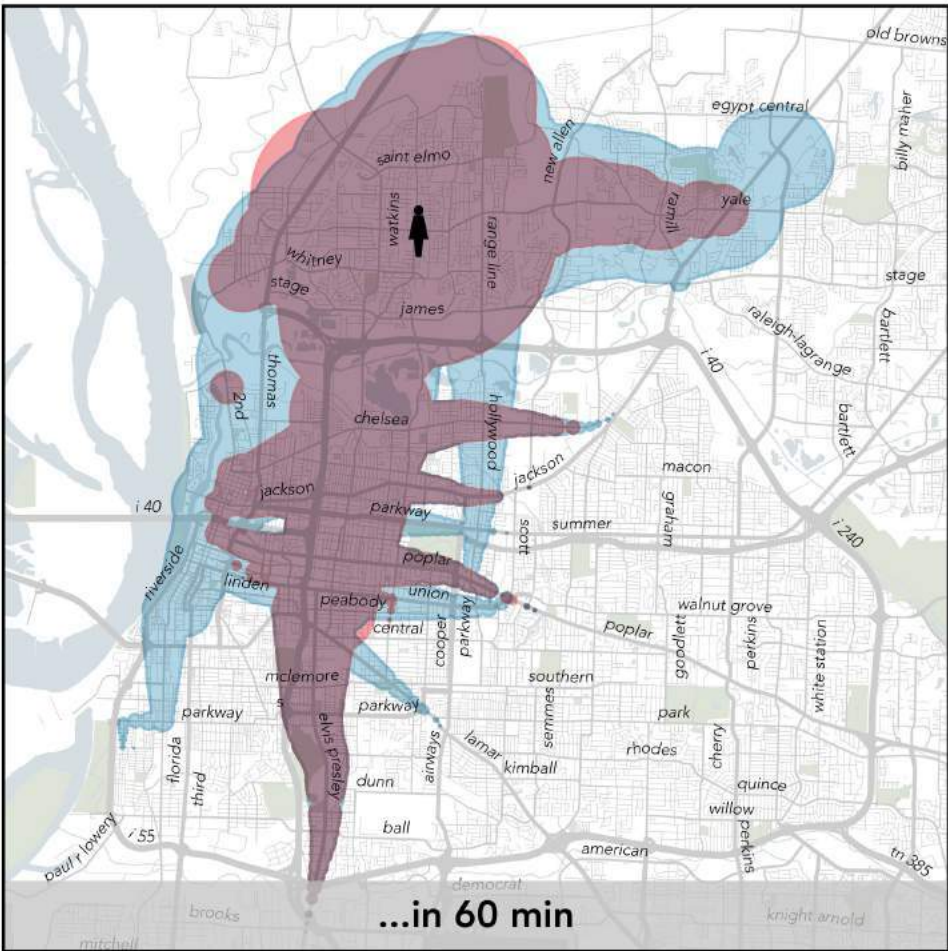
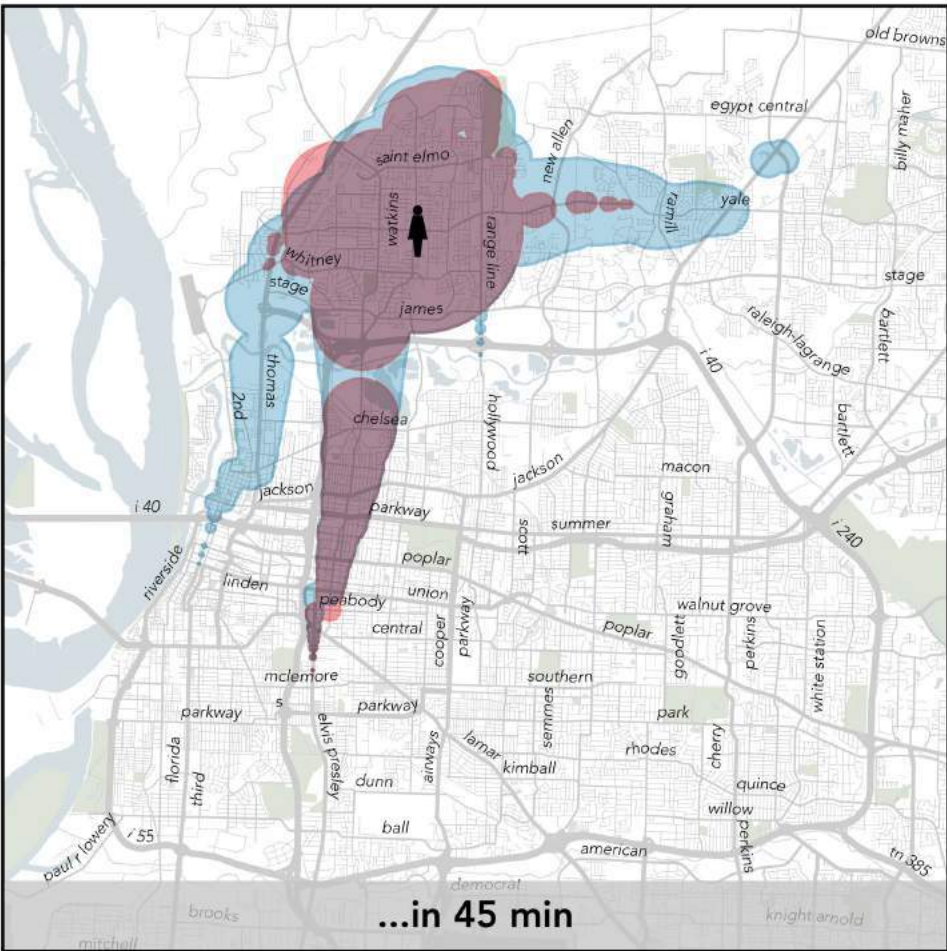
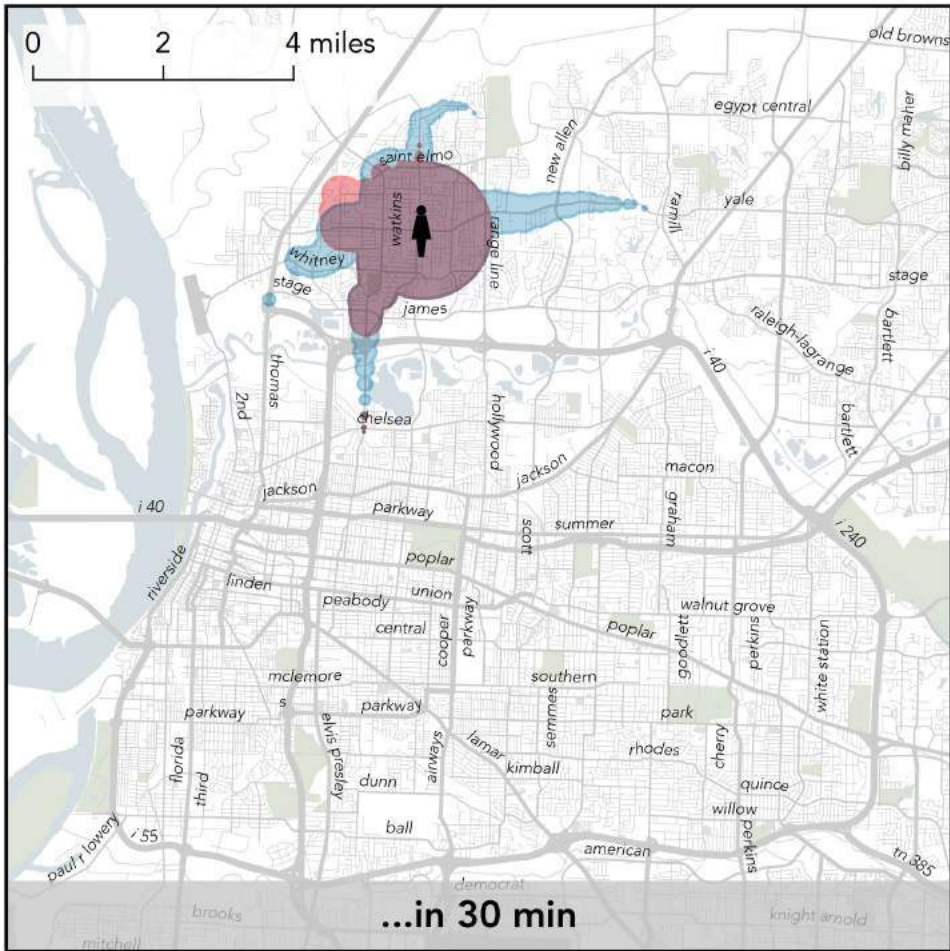
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+27%	17,300	21,900
Jobs	+32%	2,600	3,500

	% Change	Existing	Recommended
Residents	+33%	46,200	61,500
Jobs	+65%	12,700	21,000

	% Change	Existing	Recommended
Residents	+34%	107,100	143,200
Jobs	+92%	55,200	105,700



How far can I travel from Jackson and Bayliss?

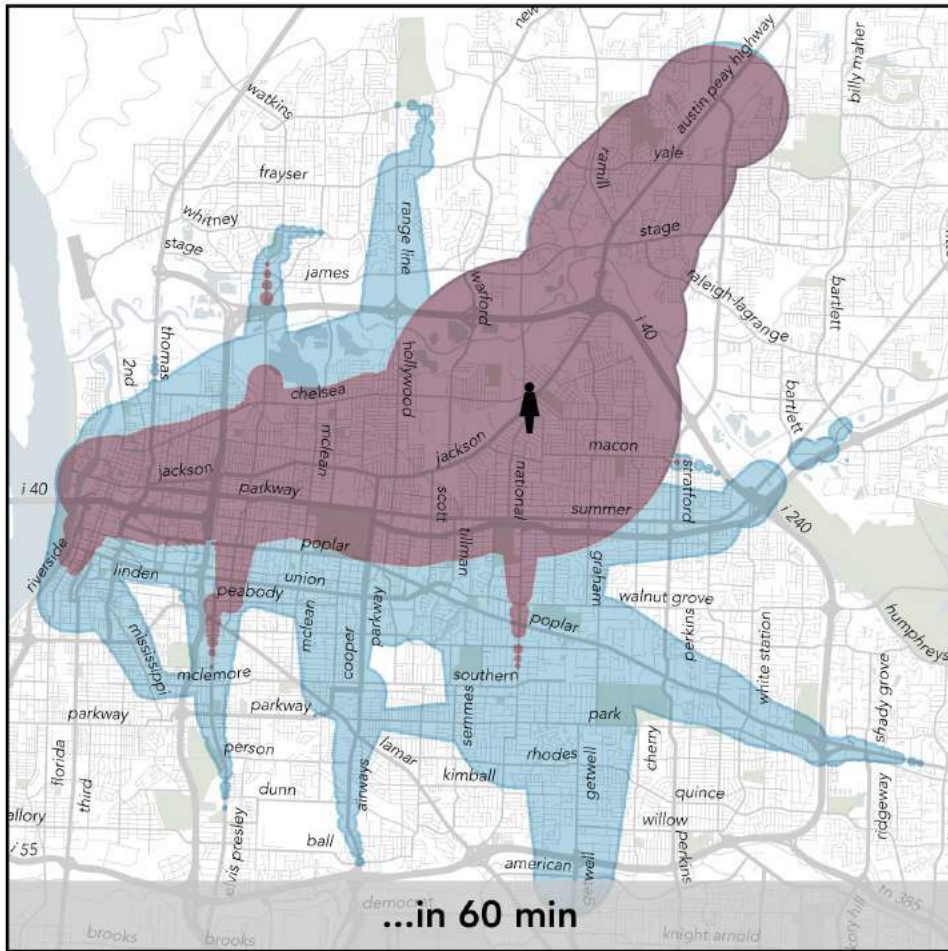
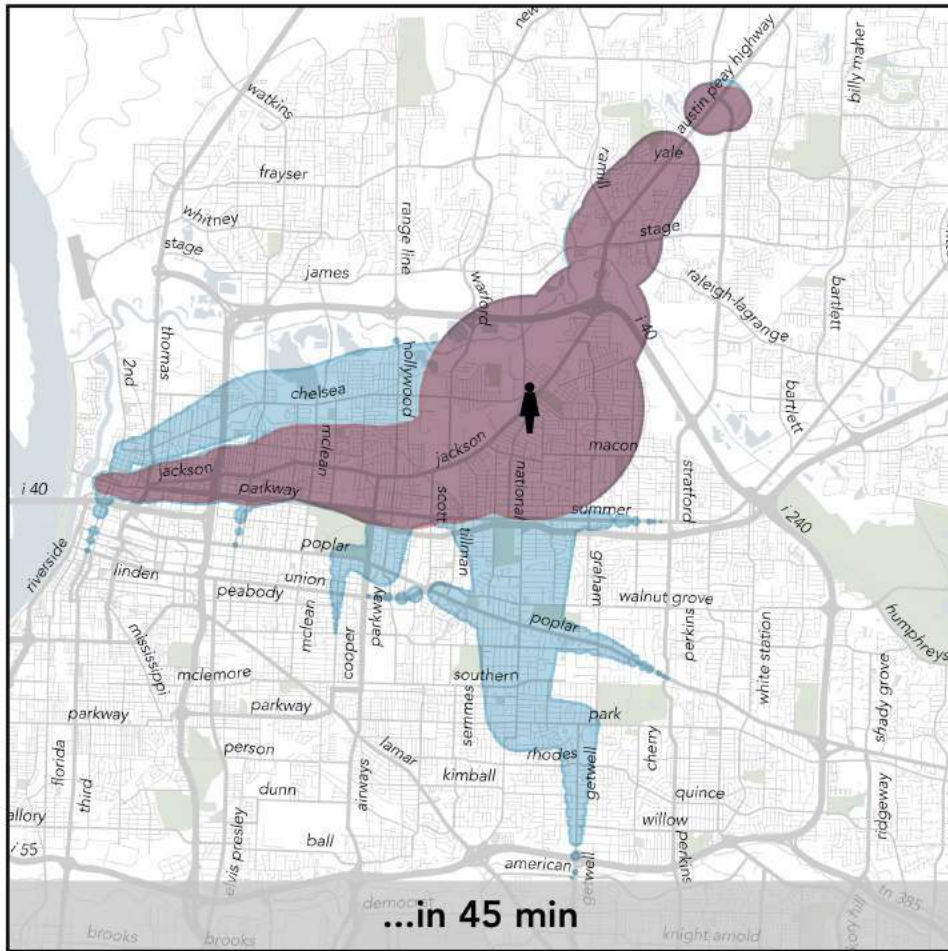
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+31%	16,100	21,100
Jobs	+31%	6,200	8,100

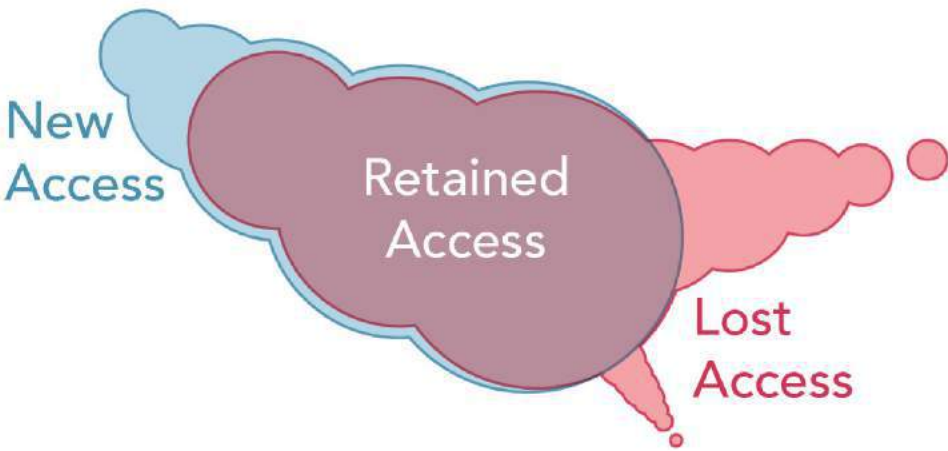
	% Change	Existing	Recommended
Residents	+68%	55,900	94,000
Jobs	+104%	21,500	43,900

	% Change	Existing	Recommended
Residents	+95%	107,000	208,600
Jobs	+141%	67,200	162,000



How far can I travel from Madison and Cooper?

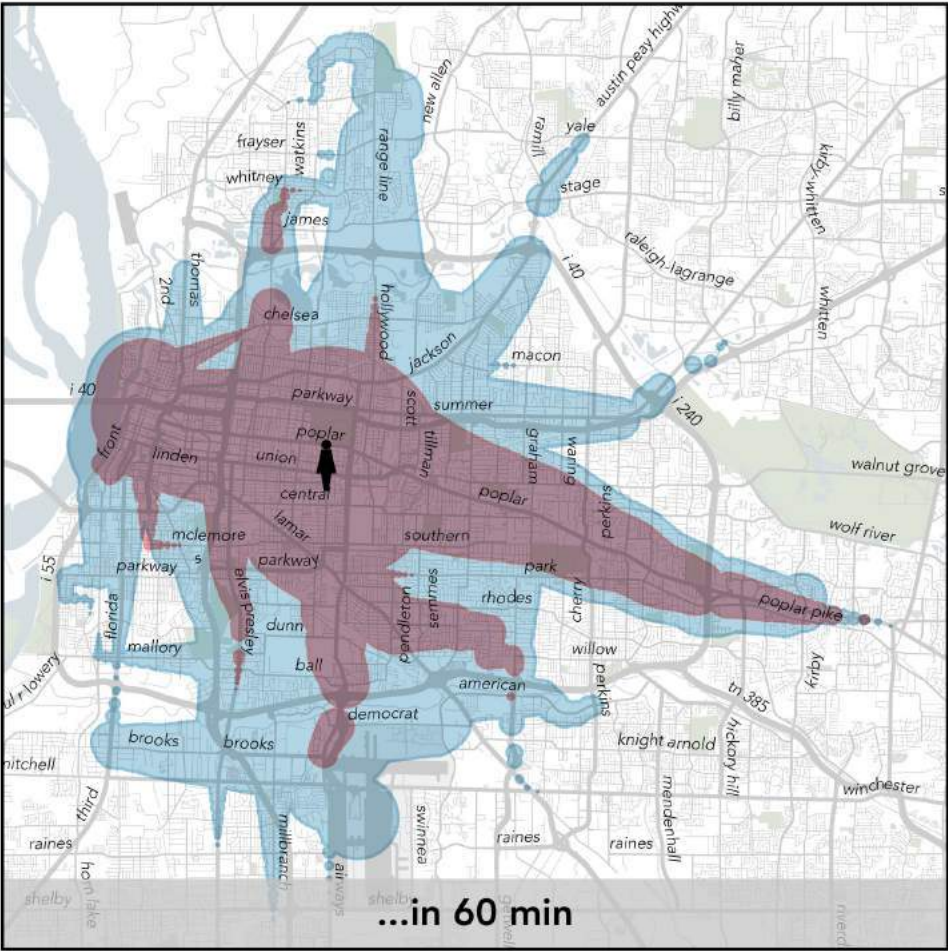
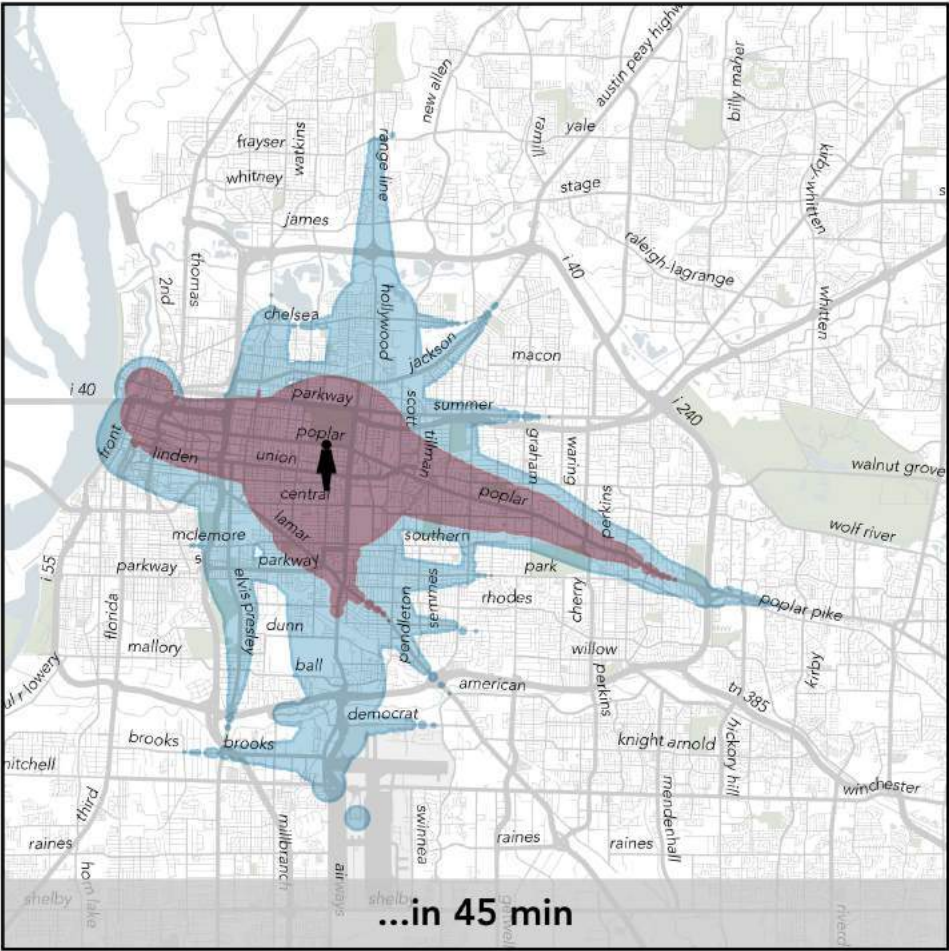
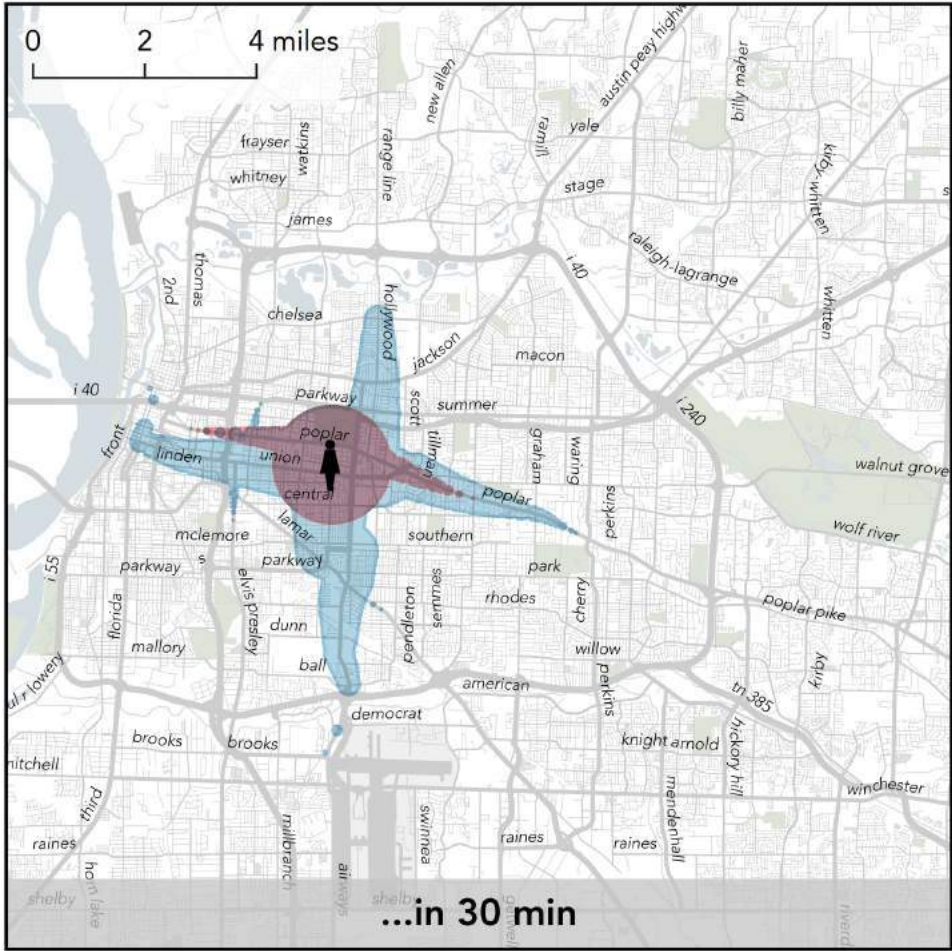
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+163%	17,200	45,300
Jobs	+199%	18,500	55,300

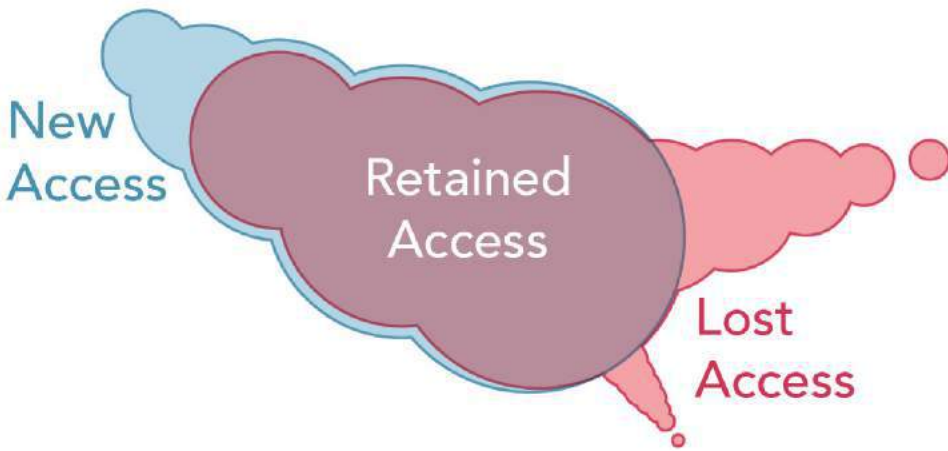
	% Change	Existing	Recommended
Residents	+120%	61,800	135,800
Jobs	+91%	78,600	150,100

	% Change	Existing	Recommended
Residents	+90%	139,700	265,500
Jobs	+60%	153,700	246,300



How far can I travel from Medical District?

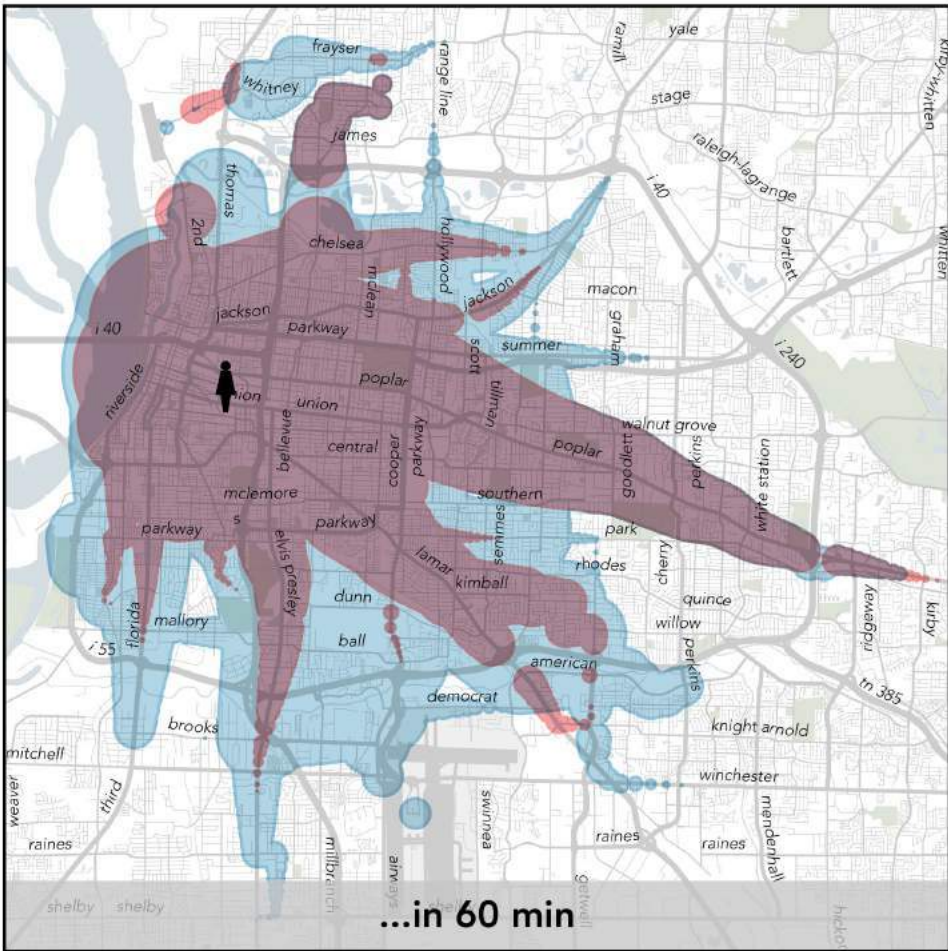
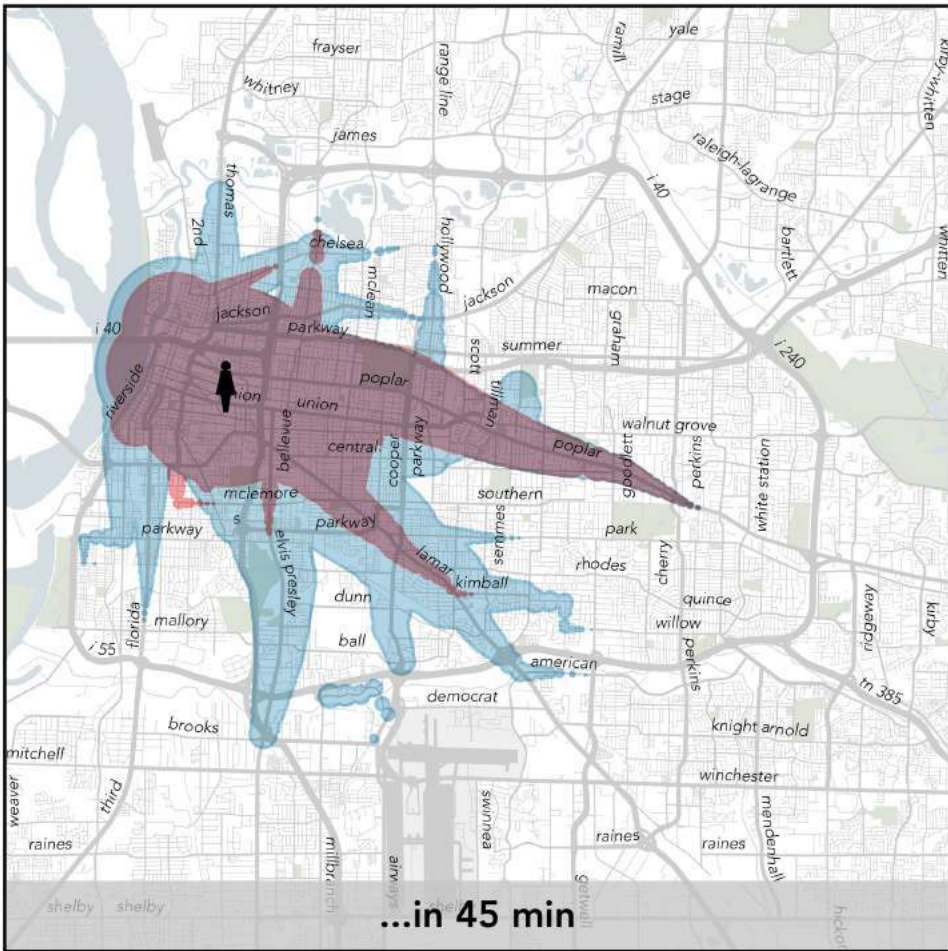
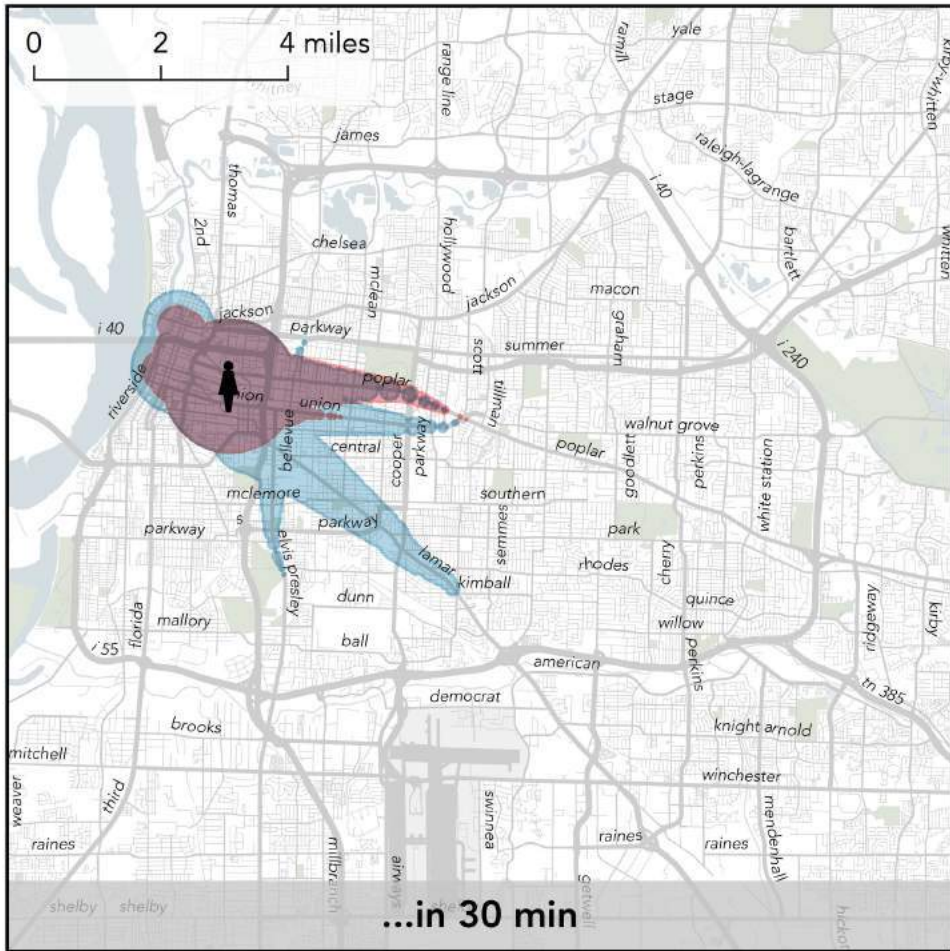
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+73%	24,100	41,800
Jobs	+30%	50,800	65,900

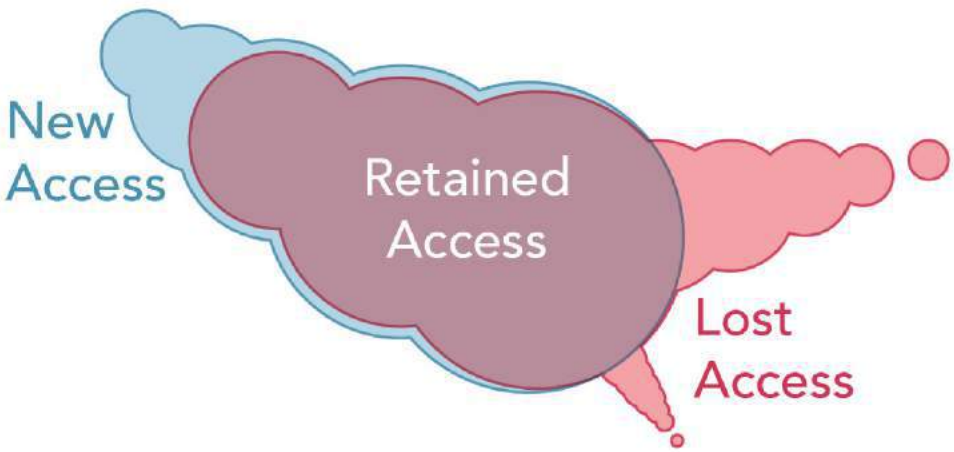
	% Change	Existing	Recommended
Residents	+71%	69,600	118,800
Jobs	+34%	90,400	120,800

	% Change	Existing	Recommended
Residents	+48%	159,900	236,500
Jobs	+39%	155,600	216,900



How far can I travel from New Chicago Neighborhood?

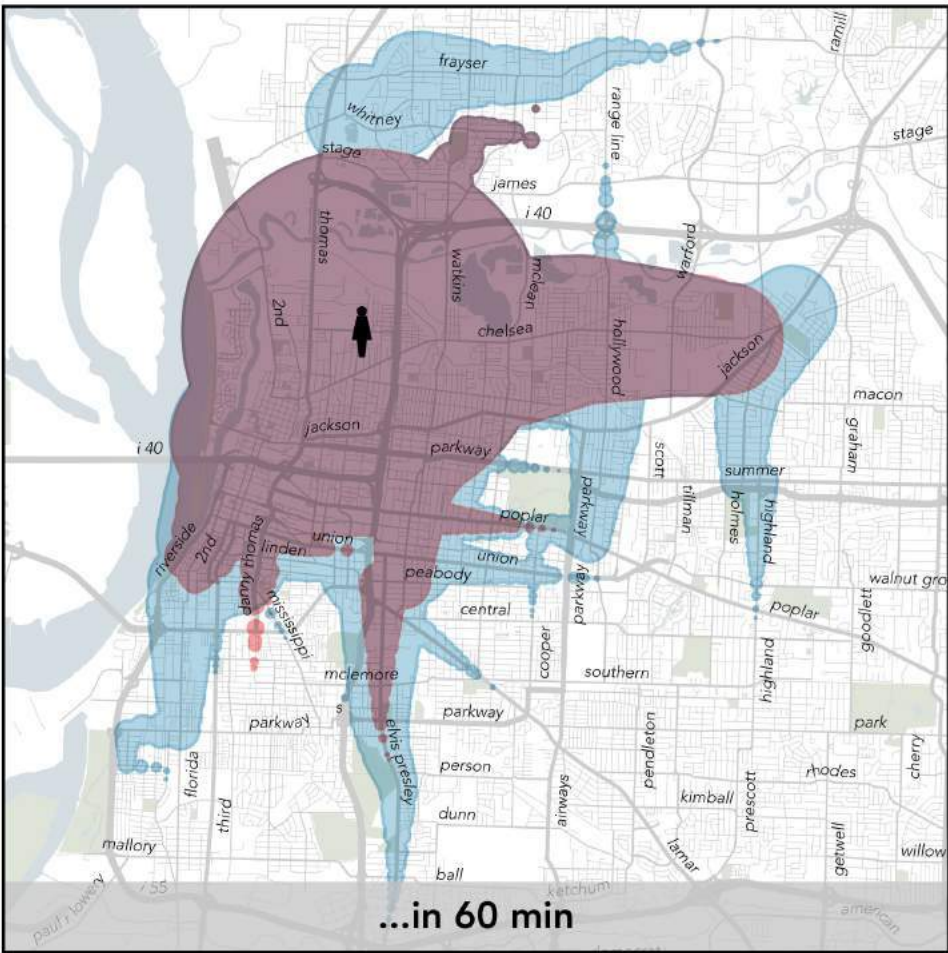
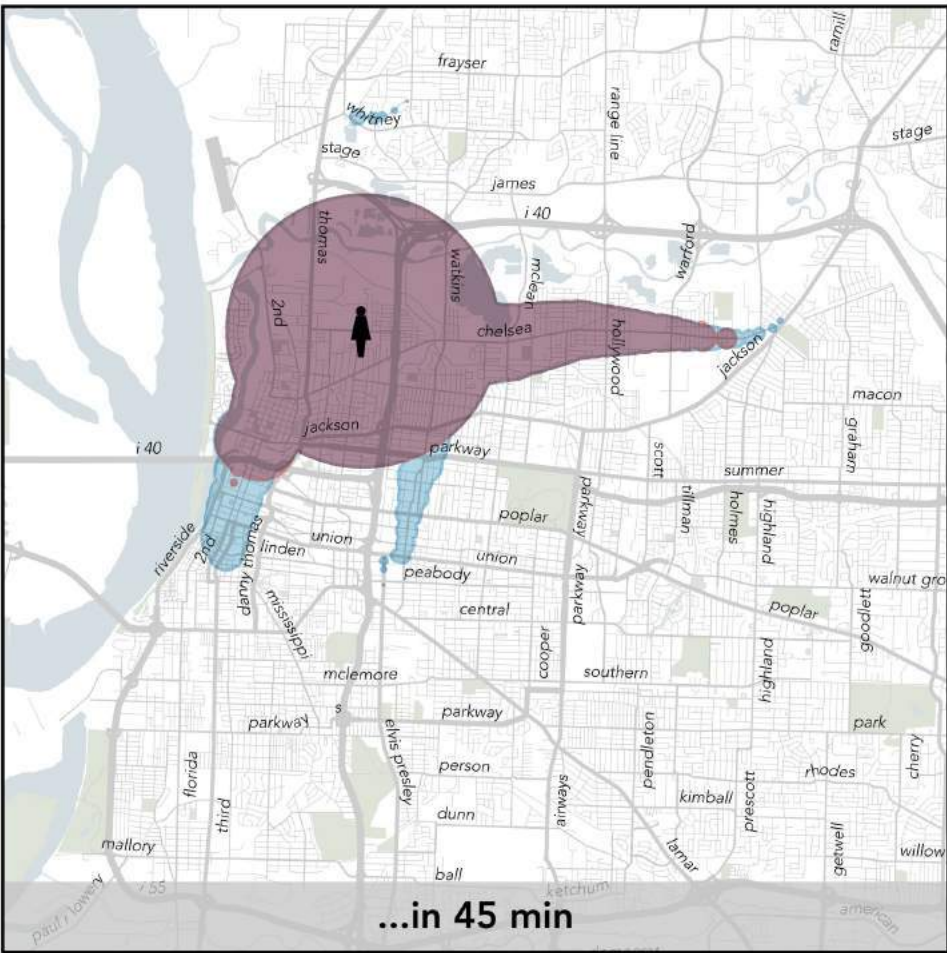
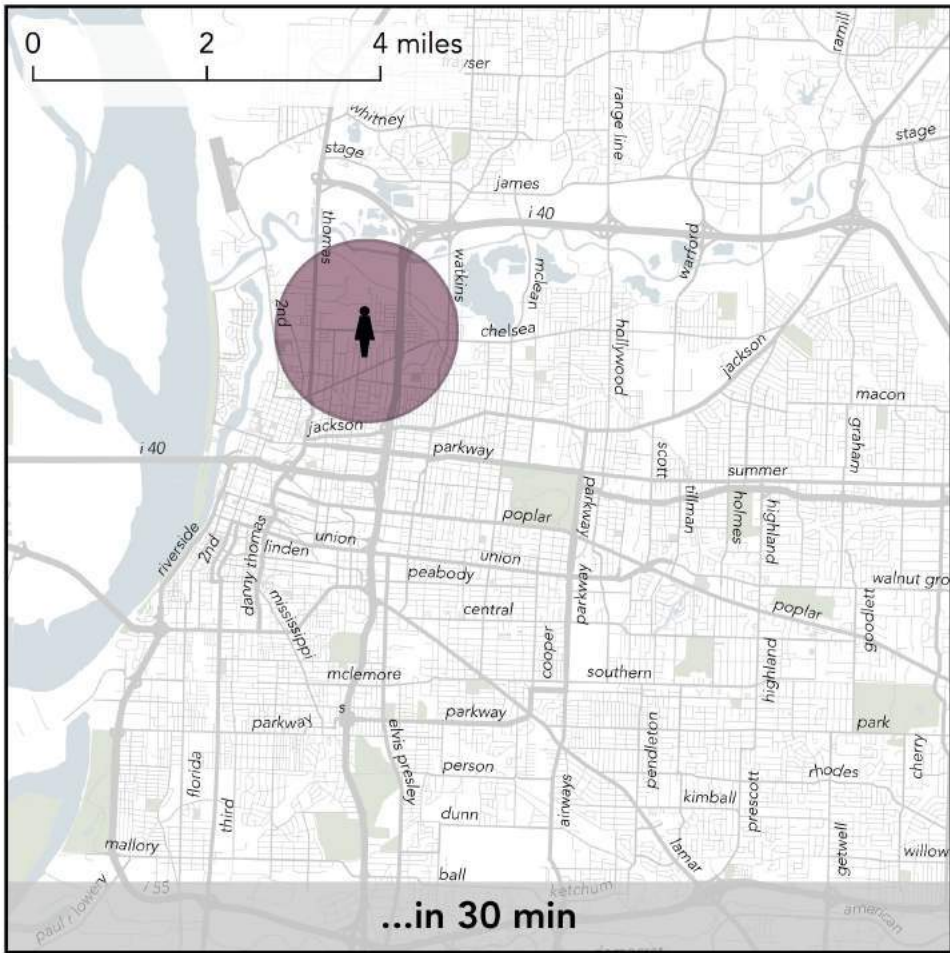
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	0%	7,100	7,100
Jobs	0%	5,400	5,400

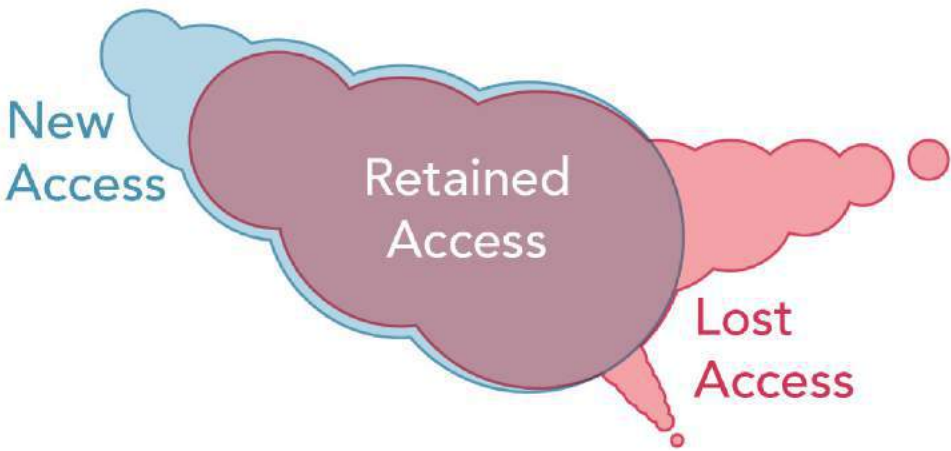
	% Change	Existing	Recommended
Residents	+30%	23,900	31,000
Jobs	+115%	19,300	41,600

	% Change	Existing	Recommended
Residents	+63%	63,600	104,000
Jobs	+31%	75,900	99,100



How far can I travel from Poplar and Ridgeway?

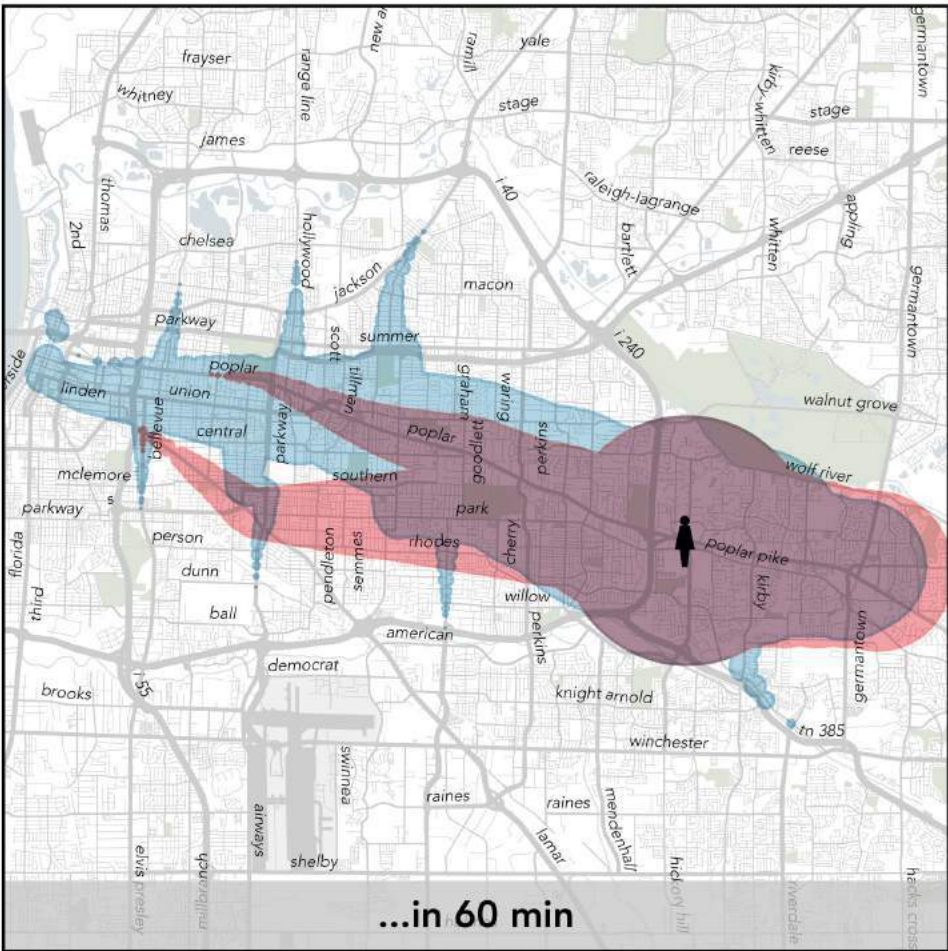
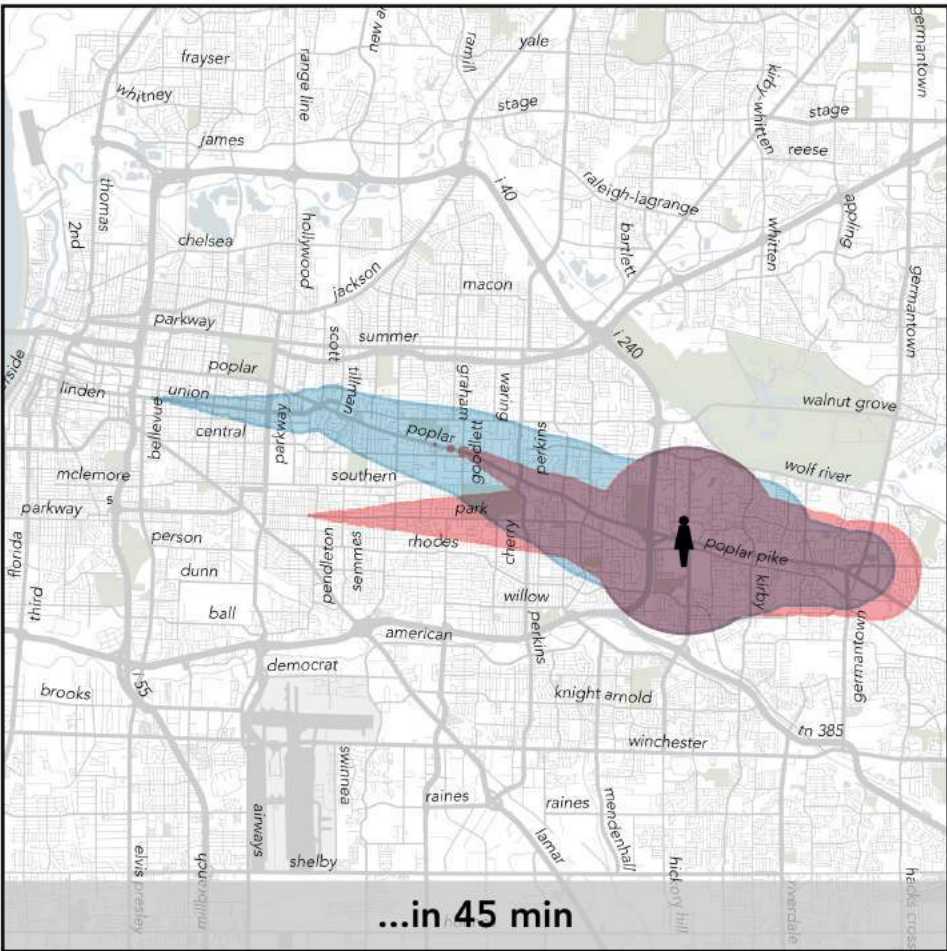
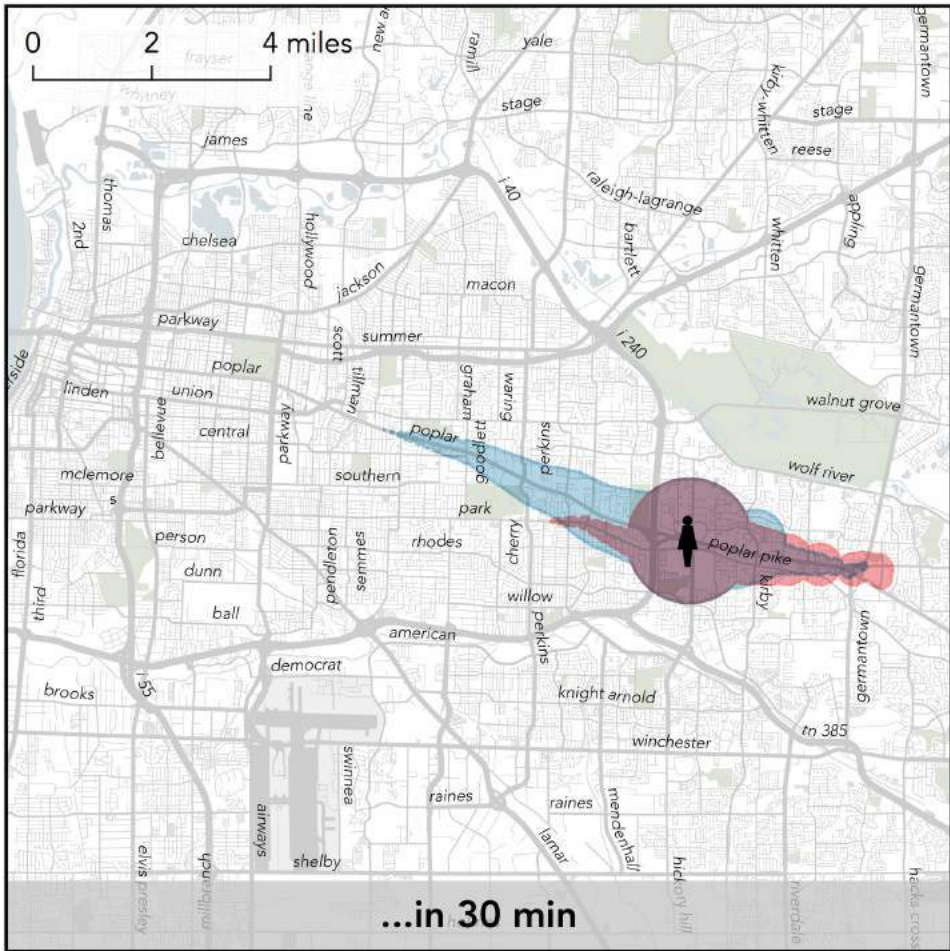
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+38%	13,200	18,200
Jobs	+29%	35,300	45,500

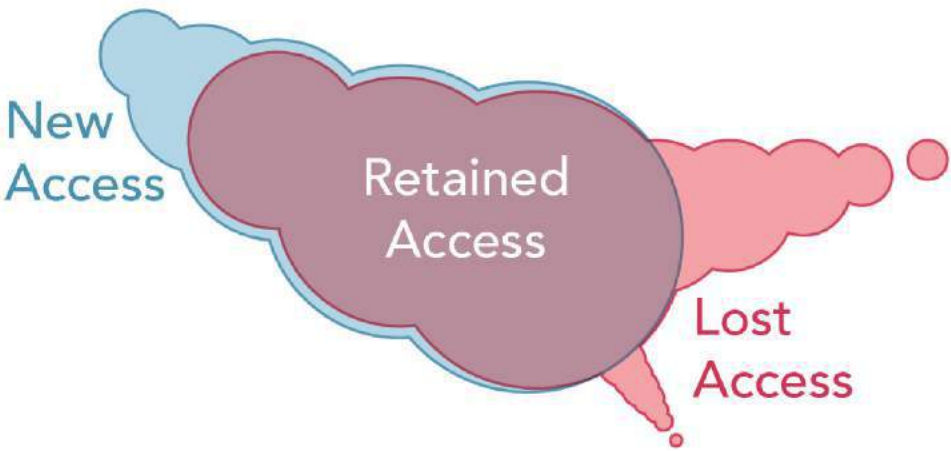
	% Change	Existing	Recommended
Residents	+26%	40,100	50,500
Jobs	+35%	60,200	81,500

	% Change	Existing	Recommended
Residents	+35%	94,100	126,600
Jobs	+60%	94,700	151,800



How far can I travel from Riverview Neighborhood?

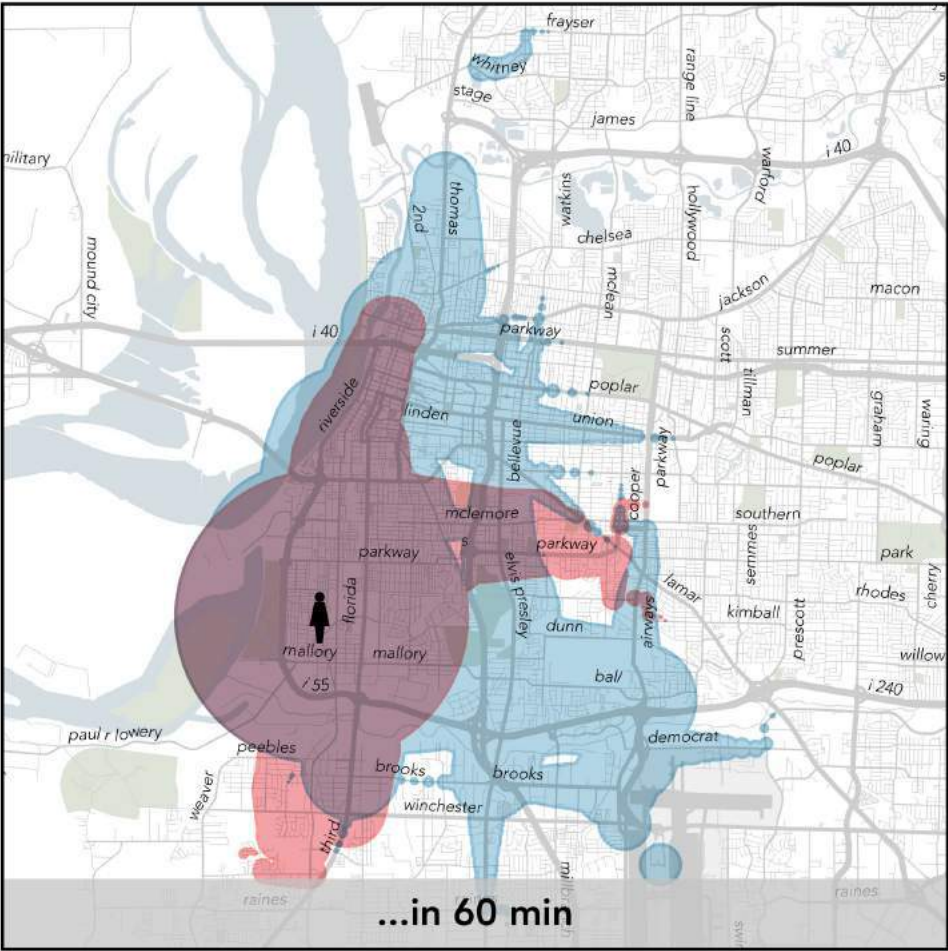
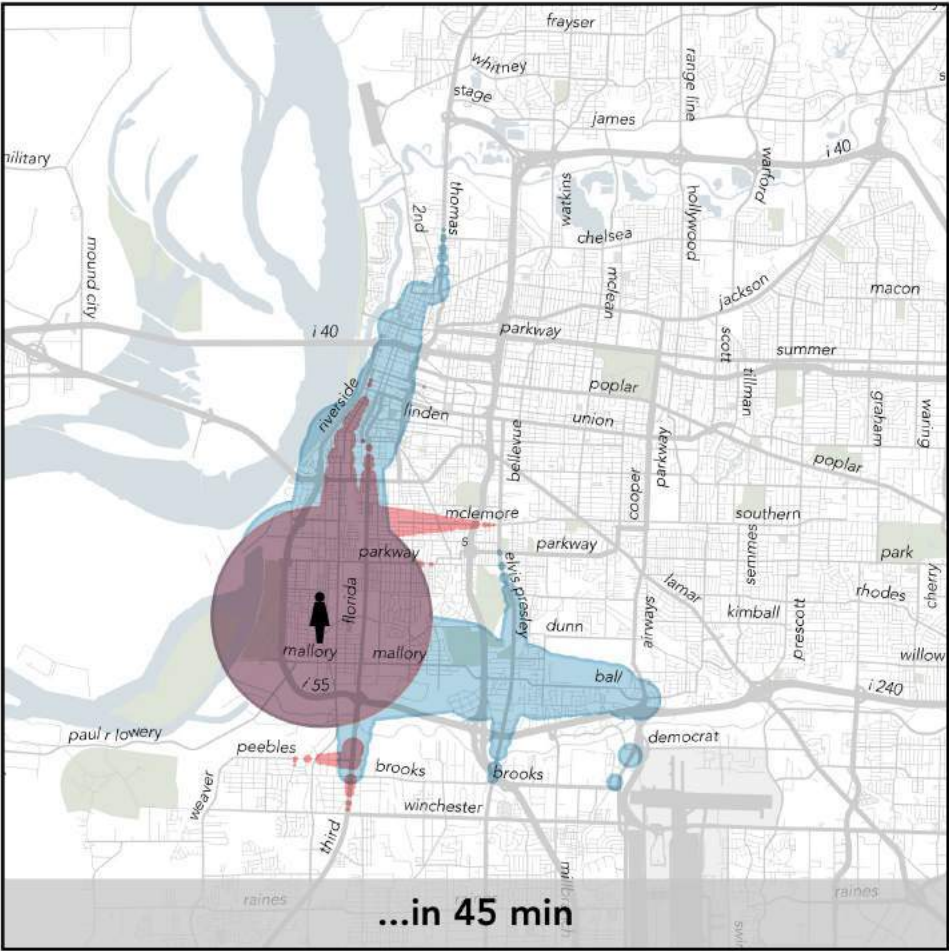
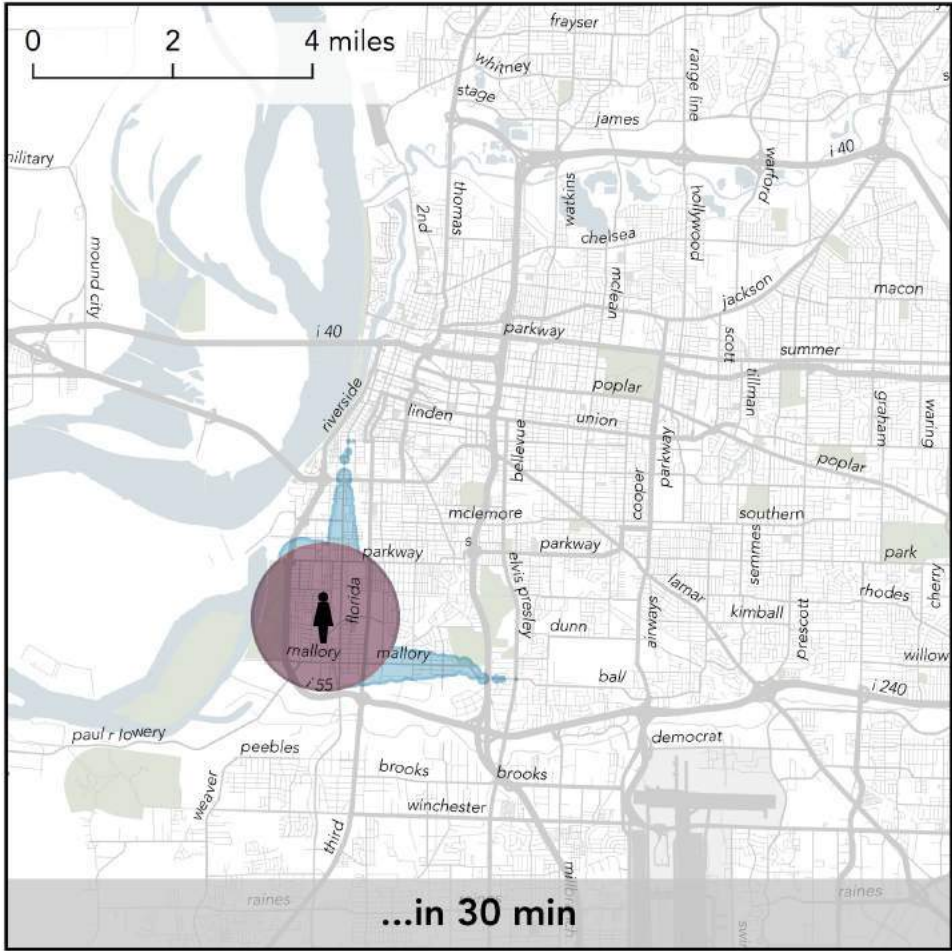
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+18%	8,400	10,000
Jobs	+33%	6,100	8,200

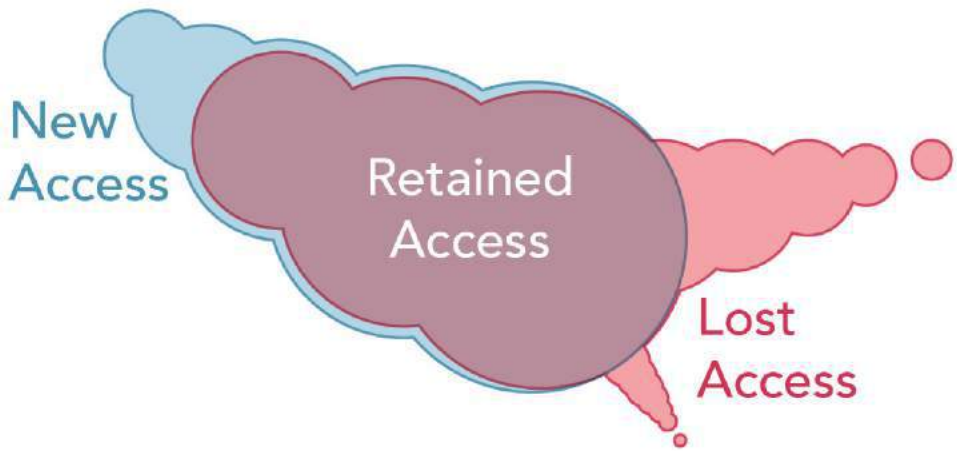
	% Change	Existing	Recommended
Residents	+103%	17,500	35,500
Jobs	+266%	14,400	52,900

	% Change	Existing	Recommended
Residents	+71%	52,100	89,200
Jobs	+107%	59,100	122,200



How far can I travel from Southwest Tennessee Community College?

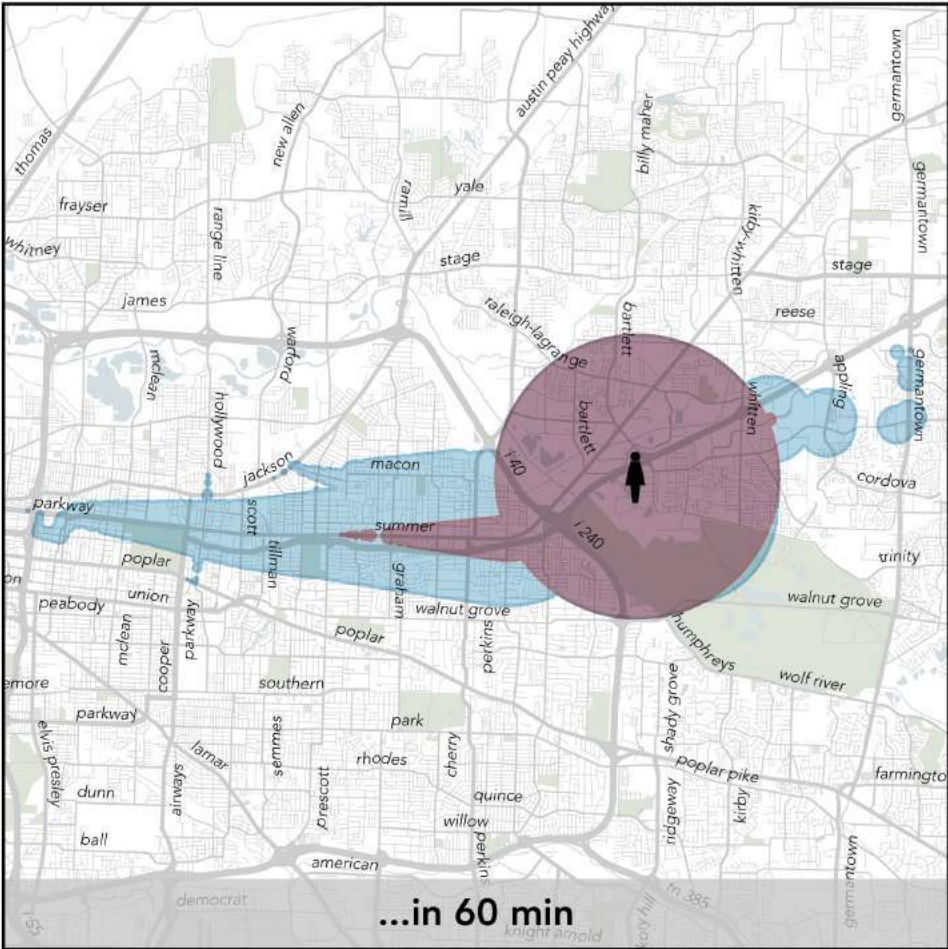
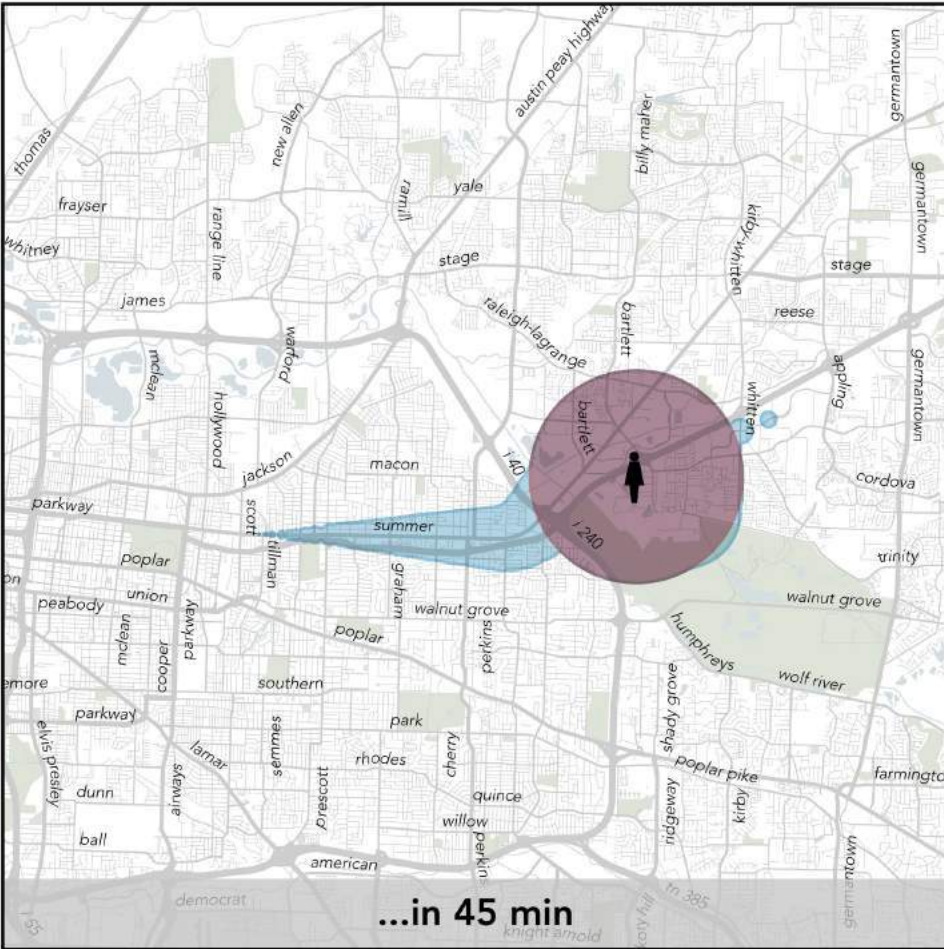
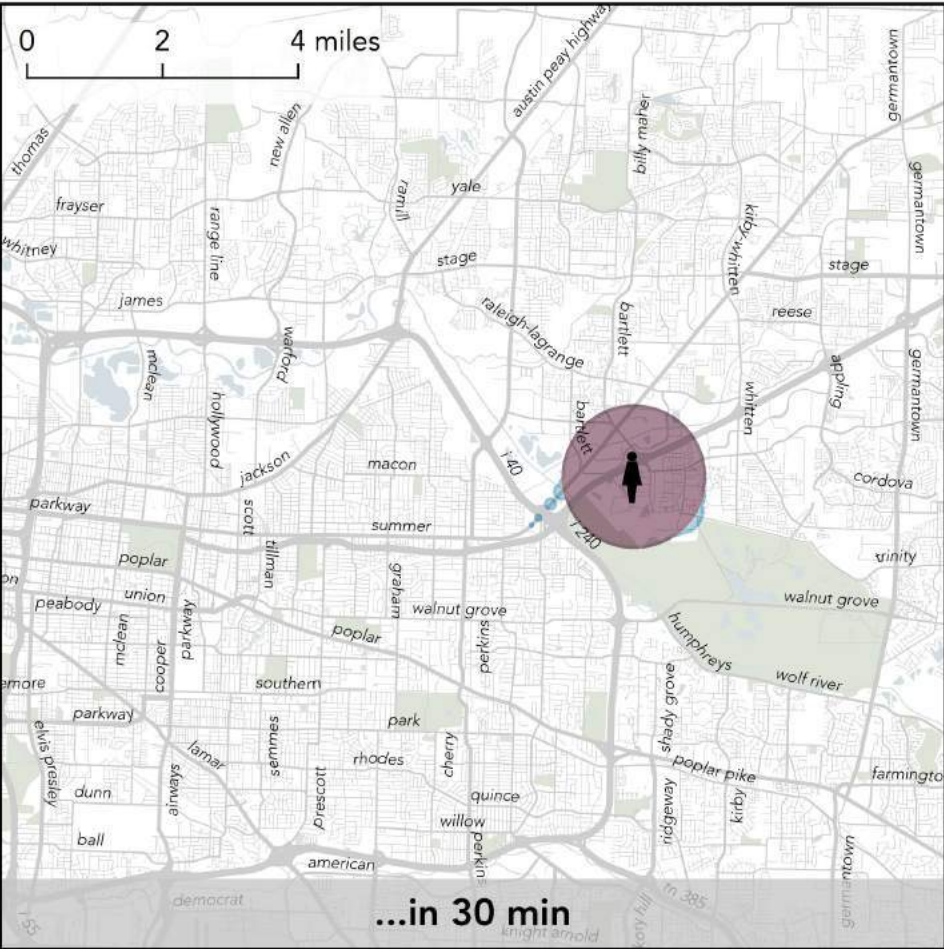
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+2%	8,700	8,900
Jobs	+1%	8,800	8,900

	% Change	Existing	Recommended
Residents	+55%	17,400	26,900
Jobs	+37%	15,100	20,700

	% Change	Existing	Recommended
Residents	+105%	35,300	72,100
Jobs	+55%	26,400	40,900



How far can I travel from University of Memphis?

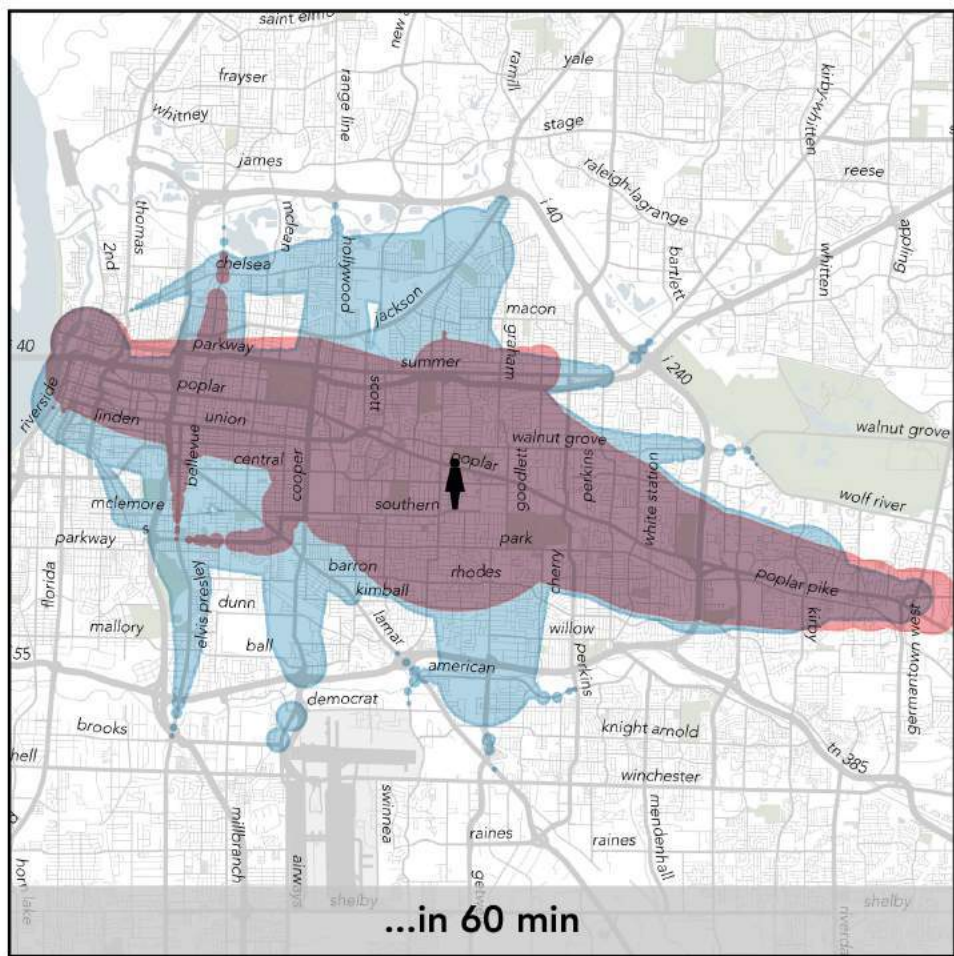
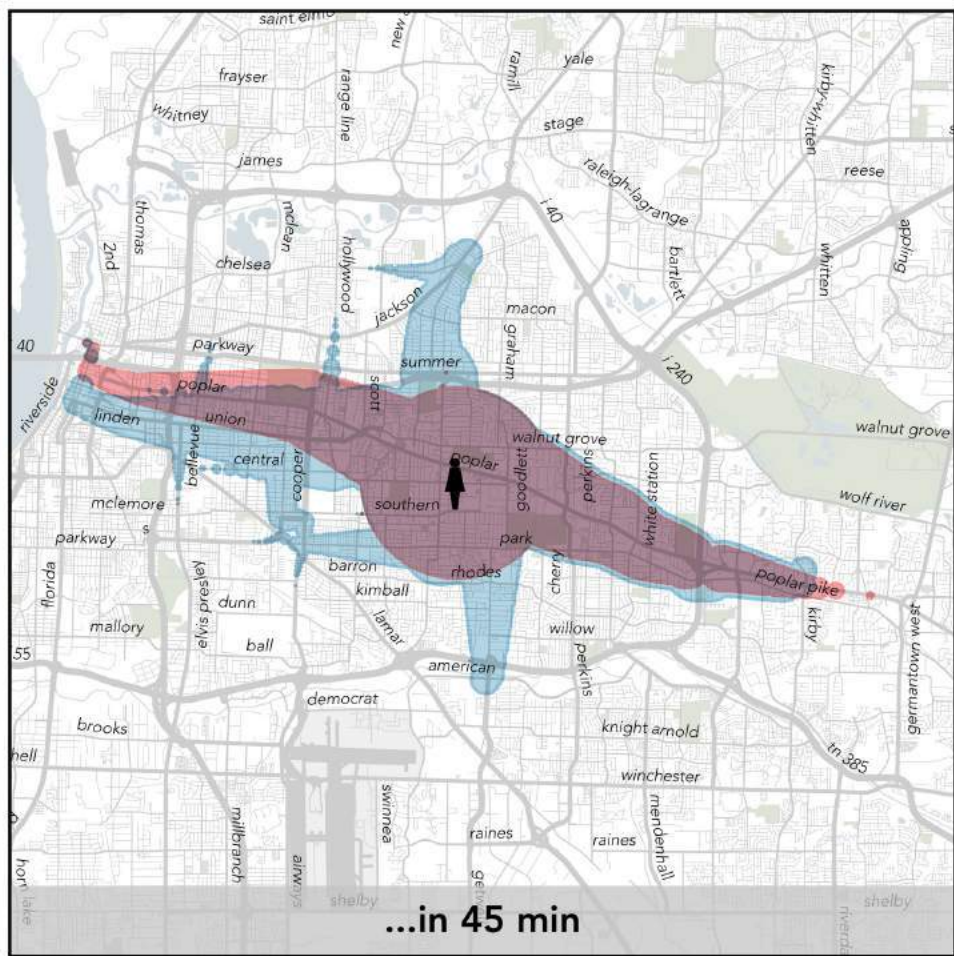
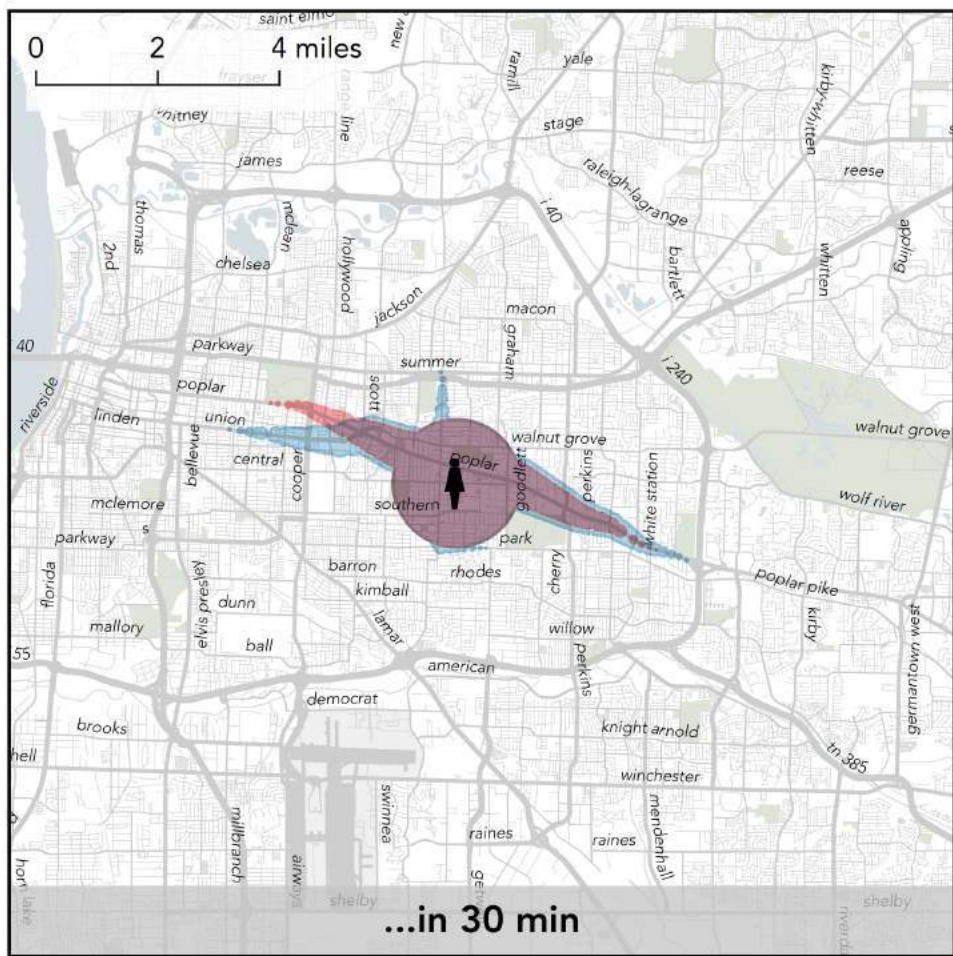
Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	+20%	17,600	21,100
Jobs	+47%	16,500	24,200

	% Change	Existing	Recommended
Residents	+53%	60,800	92,700
Jobs	+41%	75,200	105,800

	% Change	Existing	Recommended
Residents	+58%	131,800	207,700
Jobs	+25%	153,900	192,400



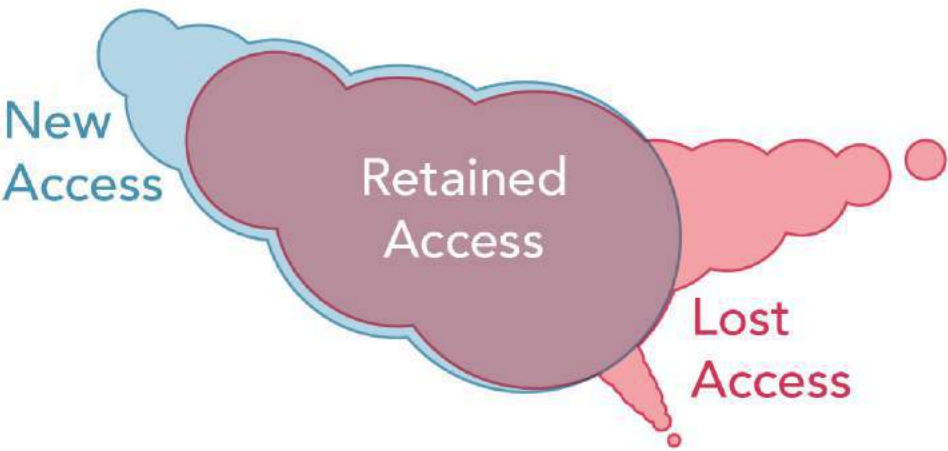
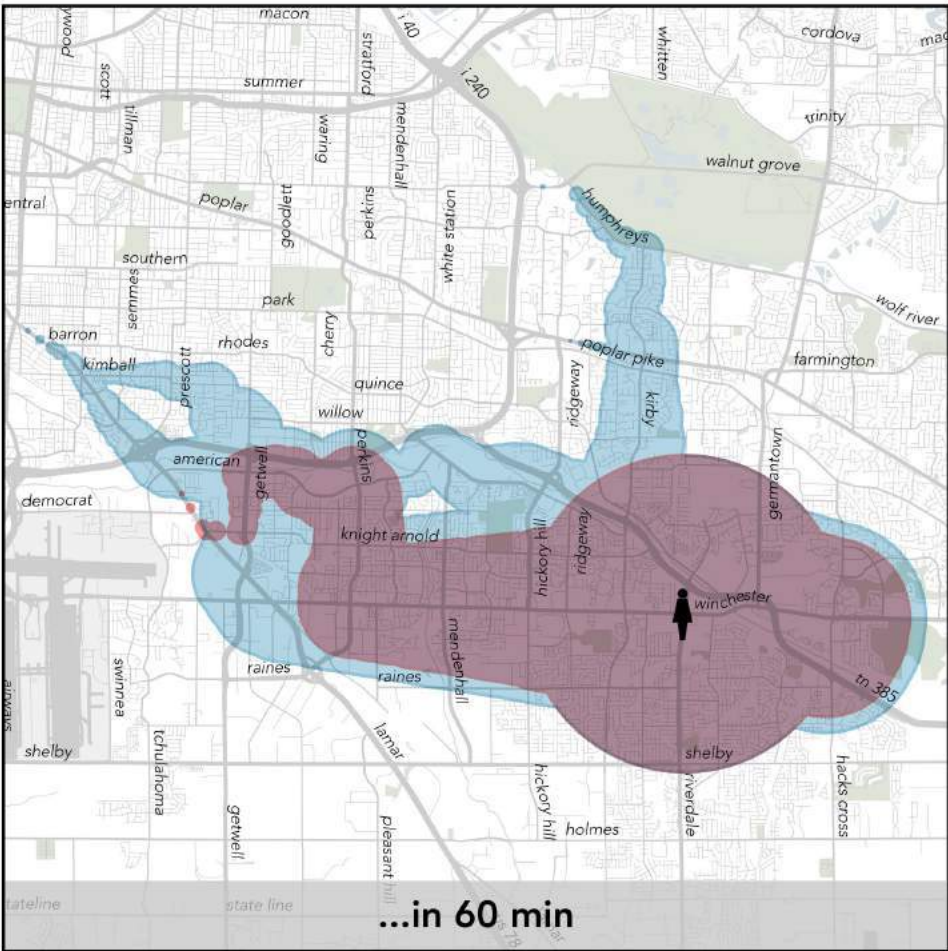
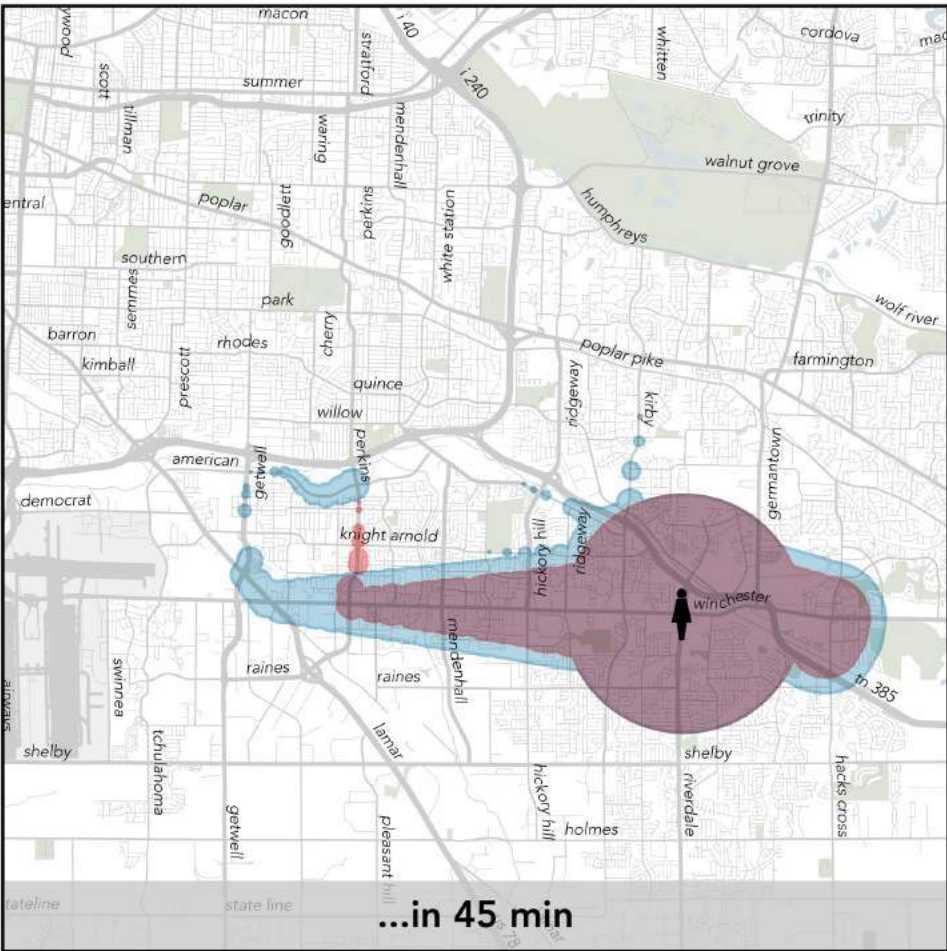
How far can I travel from Winchester and Riverdale?

Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).

	% Change	Existing	Recommended
Residents	+43%	13,100	18,700
Jobs	+63%	5,700	9,200

	% Change	Existing	Recommended
Residents	+31%	45,100	59,200
Jobs	+48%	17,400	25,800

	% Change	Existing	Recommended
Residents	+44%	90,200	129,500
Jobs	+87%	37,800	70,600



How far can I travel from Wolfchase Galleria?

Riders can reach more jobs and residents in the Recommended Plan than in the Existing Network (traveling by transit at noon on weekdays).



	% Change	Existing	Recommended
Residents	0%	3,600	3,600
Jobs	0%	13,100	13,100

	% Change	Existing	Recommended
Residents	+12%	11,400	12,800
Jobs	+2%	20,000	20,300

	% Change	Existing	Recommended
Residents	+27%	34,500	43,800
Jobs	+10%	28,000	30,800

