

Draft Recommended Network

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INTERNATIONAL

RICHMOND TRANSIT
NETWORK PLAN



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1 Introduction

Where are we now?

At the beginning of 2016, the City of Richmond began a conversation with stakeholders, riders, community members and elected officials about whether and how to change the city's transit network.

The goal of this process has been to create a blueprint for changes to the transit network that can be put into place soon. This blueprint was developed assuming that funding for transit would remain constant over the next two years, neither increasing nor decreasing significantly.

Richmond's transit network has not been thoroughly re-thought for decades, and many of its features are out-of-date. In addition, the Pulse BRT line will open in 2017. There is an opportunity to redesign local transit services to create an integrated network with BRT.

Who designed this network?

This network was designed through collaboration among City of Richmond planning and transportation staff, GRTC staff, and consulting transit experts (with national firms Jarrett Walker + Associates and Michael Baker International).

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

What happens next?

The Draft Recommended Network is presented, in this report, for the consideration of the general public, transit riders, community organizations, workers, businesses, and all other transit stakeholders in Richmond.

In January, the City is soliciting public input and comments on this Draft Recommended Network. Those comments will be considered before the preparation of the Final Recommended Network.

The Final Recommended Network will be delivered to the City and GRTC in March 2017, for potential implementation in late 2017 or 2018.

Learn more

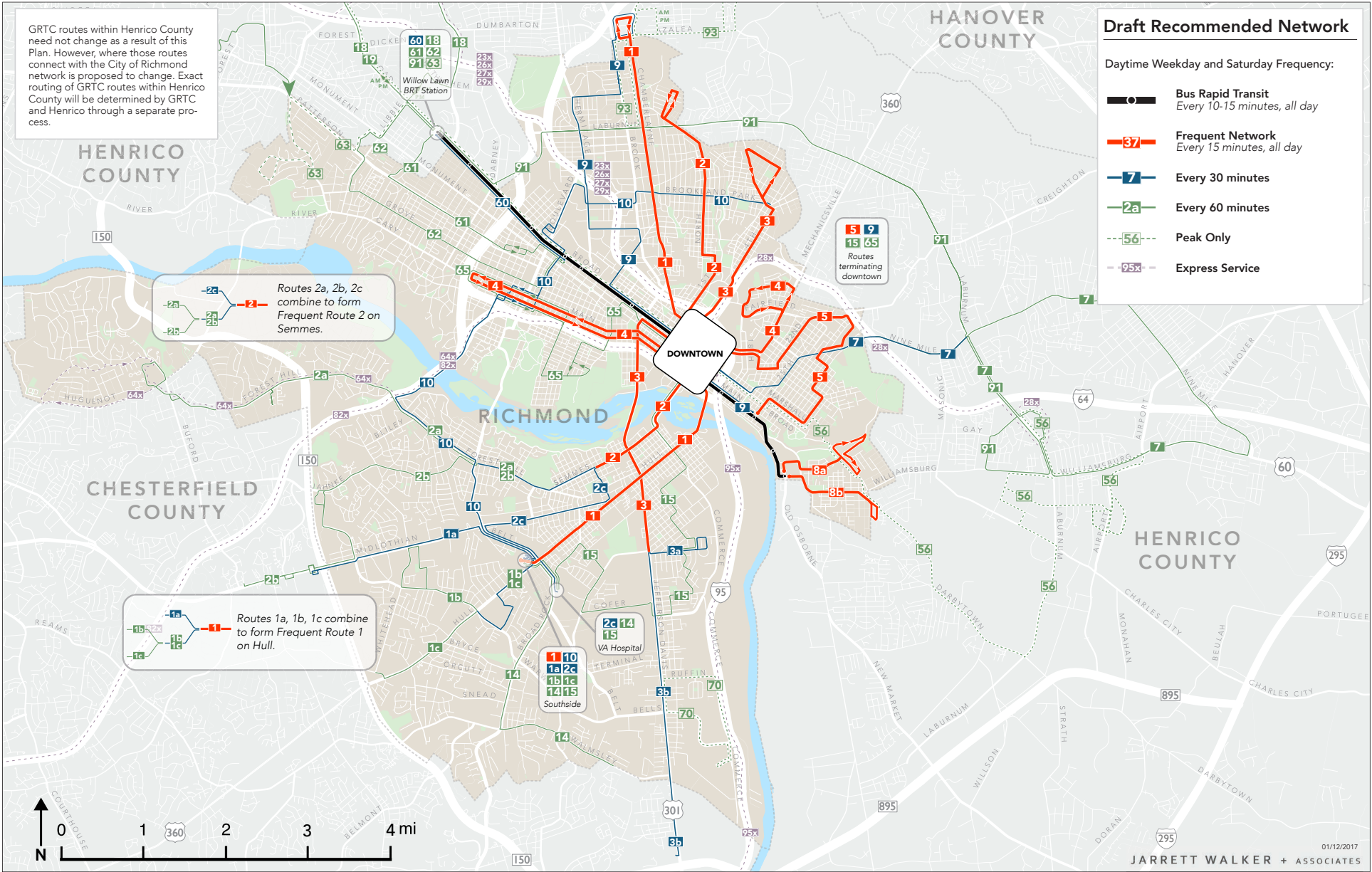
For the full story of this process, we encourage the reader to start with two earlier reports:

- The Choices Report, released in Spring 2016, available for download from the project home page: www.richmondtransitnetwork.com or directly from [this link](#).
- An interactive report on the Network Concepts, released in Summer 2016, available at: www.richmondtransitnetwork.com/Pages/Concepts.aspx

An interactive online tool allowing the reader to compare their own travel time, to or from any point in the City of Richmond, on this Draft Recommended Network, is available at:

<http://www.richmondtransitnetwork.com/Pages/Webmap.aspx>






Members of the public are encouraged to attend public meetings and submit comments online, in response to this Draft Recommended Network. To find public meetings and other opportunities for input, visit: www.richmondtransitnetwork.com/RTNP_Updates



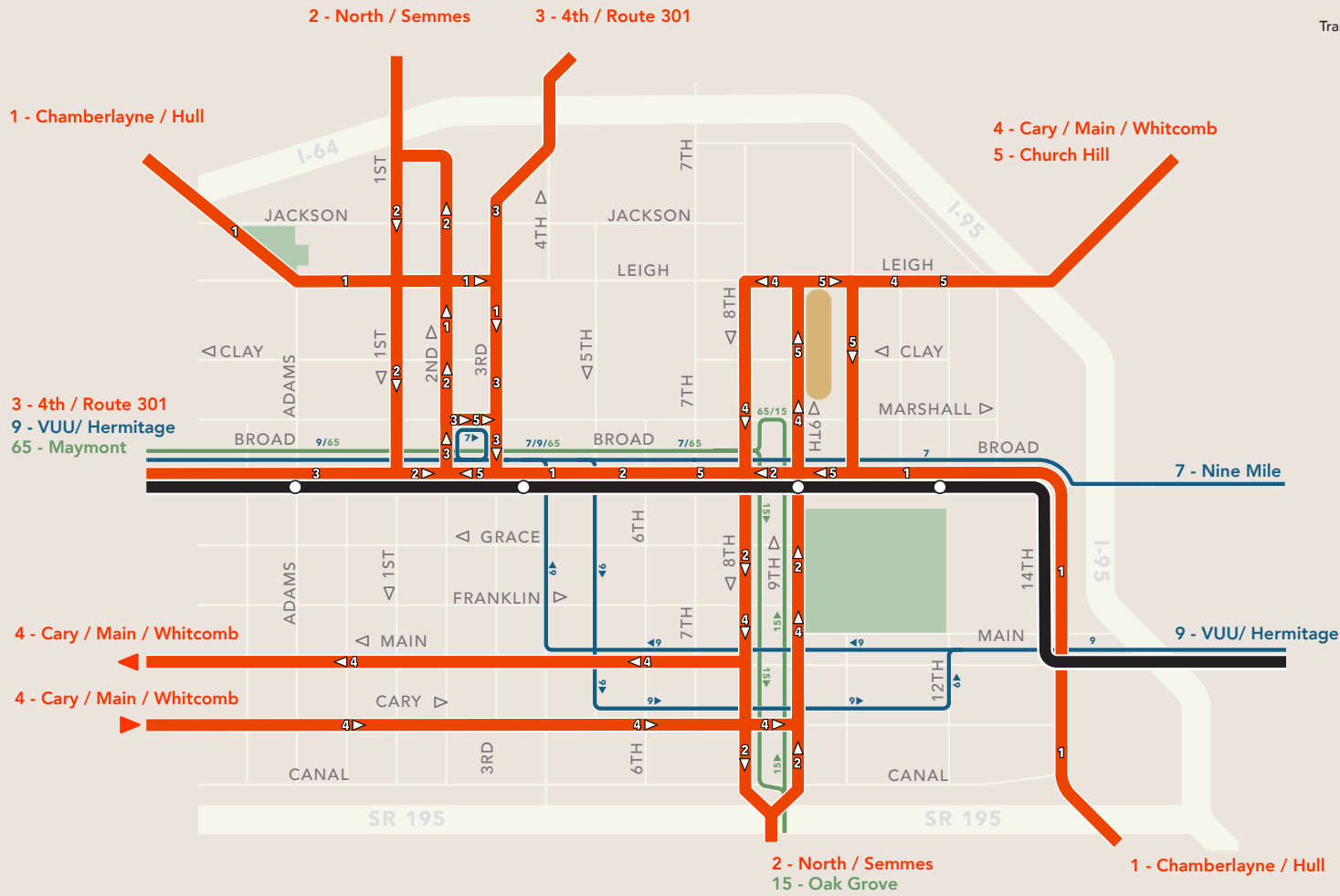
DRAFT RECOMMENDED NETWORK Daytimes, on weekdays and Saturdays

DOWNTOWN ROUTINGS

Transit Service Type and Frequency:

-  **Bus Rapid Transit**
Every 10-15 minutes, all day
-  **Frequent Network**
Every 15 minutes, all day
-  **Every 30 minutes**
-  **Every 60 minutes**
-  **Temp. Transit Plaza**

(Express buses are not shown)



2 Public Input Summary

Thus far, there have been two phases of public involvement in the Richmond Transit Network Plan.

In Phase One, in the spring of 2016, the City and consulting team presented people with abstract choices and trade-offs, and received people's general guidance in response. During Phase One, input was collected through 2,000 responses to an on-board rider survey; 345 responses to a web survey; four public meetings attended by 80 people; and a meeting of a Stakeholder Advisory Committee.

In Phase Two, in the summer of 2016, the team presented people with three different, detailed Network Concepts for Richmond, and received people's responses to the specific trade-offs and ideas shown in those Concepts. During Phase Two, input was collected through 900 responses to a web survey and on-board paper surveys; 8 public meetings out in the community, attended by more than 100 people; and a meeting of a Stakeholder Advisory Committee.

Input received during both of these phases was used, in the fall of 2016, to develop this Draft Recommended Network.



Figure 1: Throughout 2016, public input on key choices for Richmond transit were gathered at public meetings out in the community (at right), in workshops with community leaders (at left), through web surveys and through on-board surveys of current GRTC riders.

Input on general and abstract trade-offs

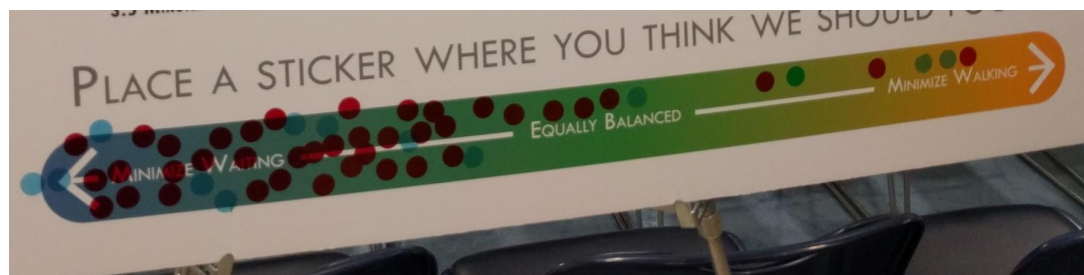
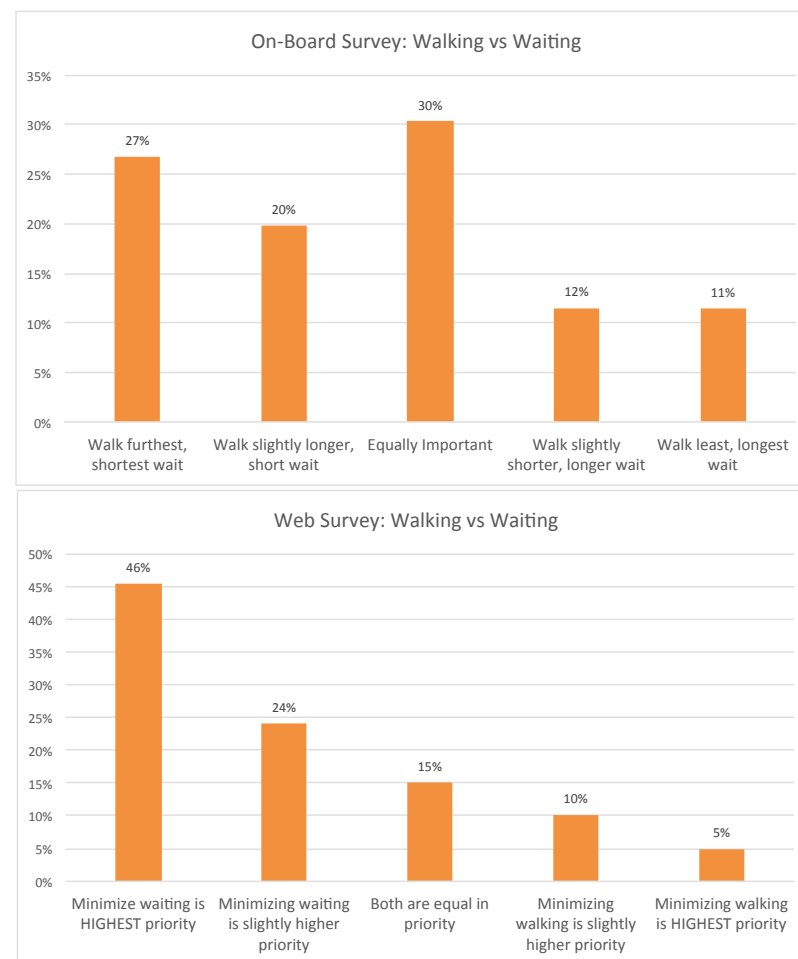
Walking vs. waiting

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, Richmond stakeholders, riders and members of the general public tended to support shorter waits and longer walks.

Figure 2: When asked how they would like the City to balance short waits and short walks, the public showed a preference for shorter waits, and therefore longer walks. Input from existing riders is shown at top, and from responses to a web survey in the middle. At bottom, people attending a public meeting were invited to place stickers on a spectrum to show which they valued more highly, and the stickers are concentrated around "minimize waiting."



Maximizing ridership vs. maximizing coverage

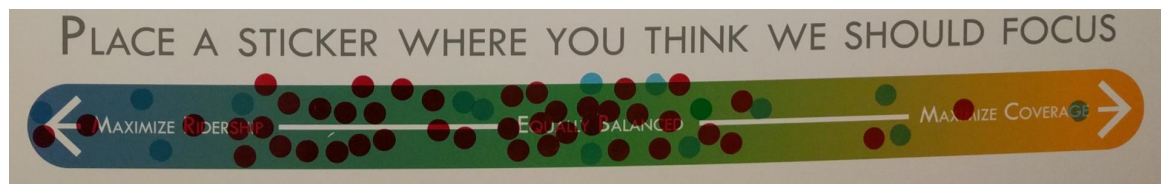
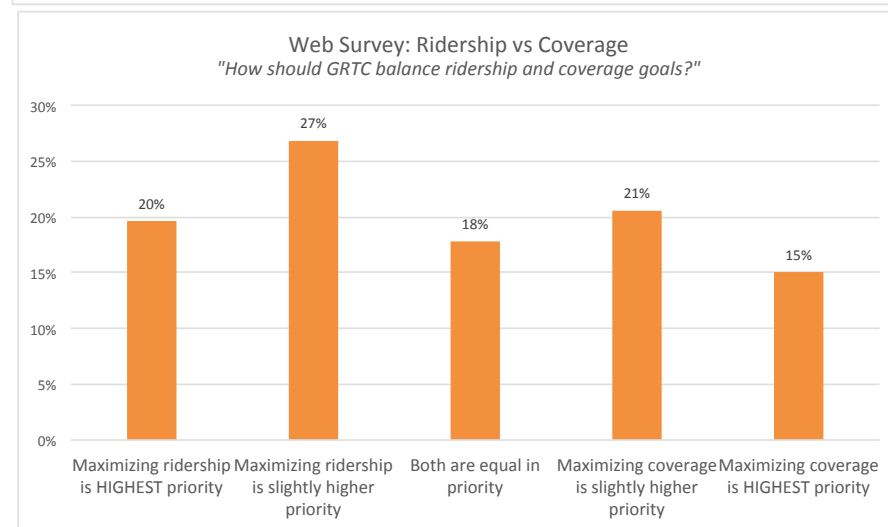
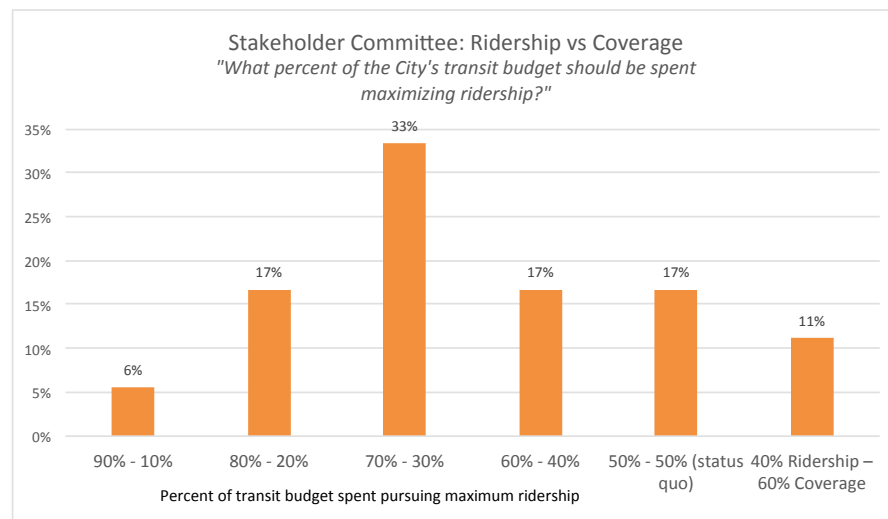
The trade-off between walking and waiting can also be described as a trade-off between maximizing ridership and maximizing coverage.

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. The charts at right show the input received through three different channels.

Today, GRTC spends about 50% of its budget pursuing high ridership, and 50% 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 at top.

Figure 3: The charts at right show responses to questions about how the City and GRTC should trade-off maximizing ridership and maximizing coverage. Most members of the Stakeholder Committee (at top) supported spending more of the transit budget pursuing high ridership. Respondents to an online survey (in the middle) were divided about which goal is more important. At bottom, people at public meetings placed stickers on a board to show where they thought Richmond should be on the spectrum. More stickers were placed on the “maximize ridership” side of the spectrum, or in the middle, than on the “maximize coverage” side.



Peak vs. all-day, all-week service

The more service an agency concentrates on the peaks (rush-hours), the less service is available to keep frequencies high at other times of day, and on weekends.

People were asked how much the City's transit network should focus on providing service during the peaks, as opposed to providing a consistent level of service all day and week. Members of the Stakeholder Committee expressed strong support for shifting service away from the peaks; attendees of public meetings expressed even stronger support for that shift.

However, existing riders were more likely to say that peak service is the most important. It is important to note that most surveys were administered on-board buses and at the Transfer Plaza during rush-hours, so the people responding to this question were in effect selected for their existing interest in rush-hours service. It is reasonable to expect that they value peak service more than people who do not use GRTC service today, and more than people who use GRTC at non-peak times.

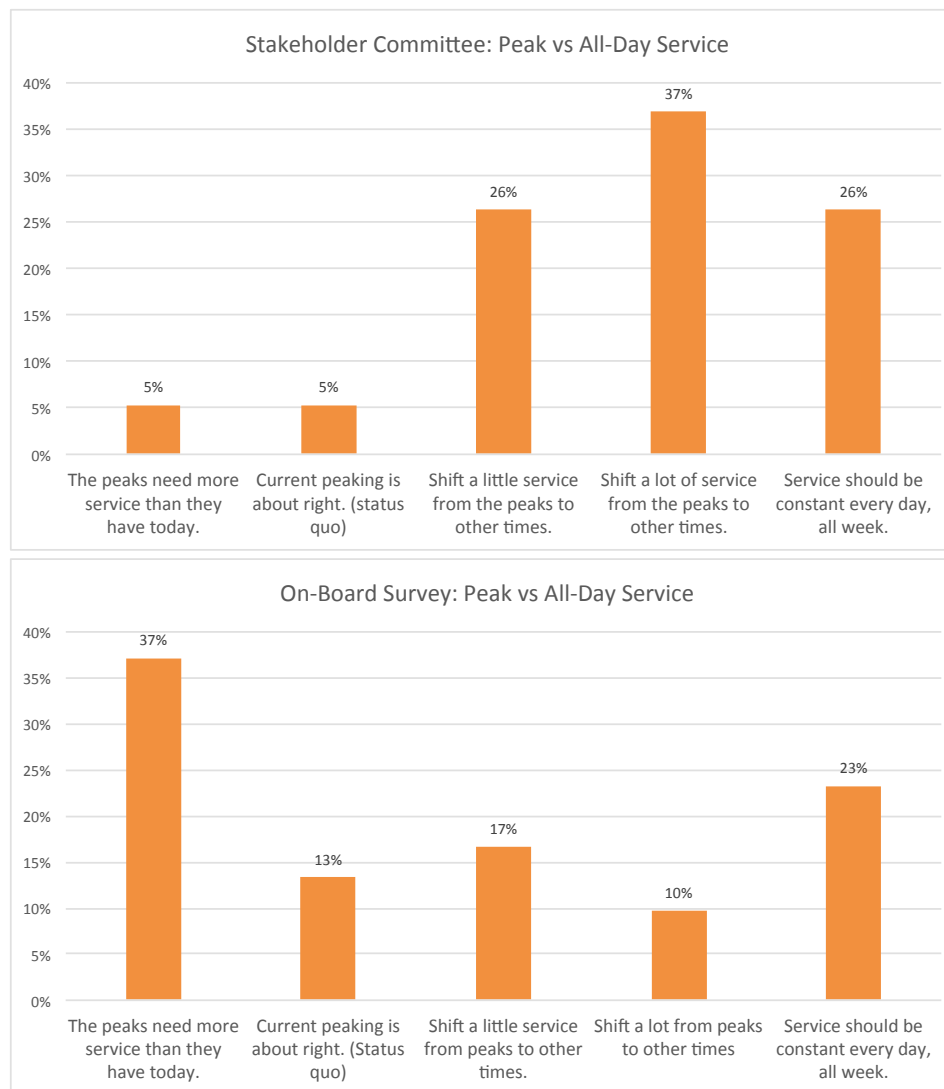


Figure 4: The charts above show responses to questions about how much the City's transit network should focus on rush-hours, as opposed to providing consistent frequencies all-day and all-week.

In contrast, people who responded to the Phase One web survey were more likely than current riders to favor all-day and weekend service, as shown in the chart at right.

At public meetings, people were invited to place a sticker on a spectrum representing the trade-off between maximizing peak service and having all-day all-week service. As shown at right, far more people at public meetings expressed support for all-day, all-week service than for peak service.

In consideration of all of this input from diverse Richmond transit stakeholders, the study team (including City staff, GRTC staff, and consultants) decided to build less peaking, and more all-day all-week service, into the Draft Recommended Network.

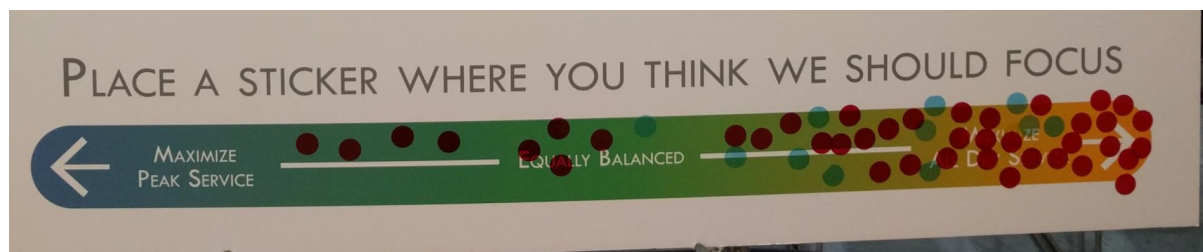
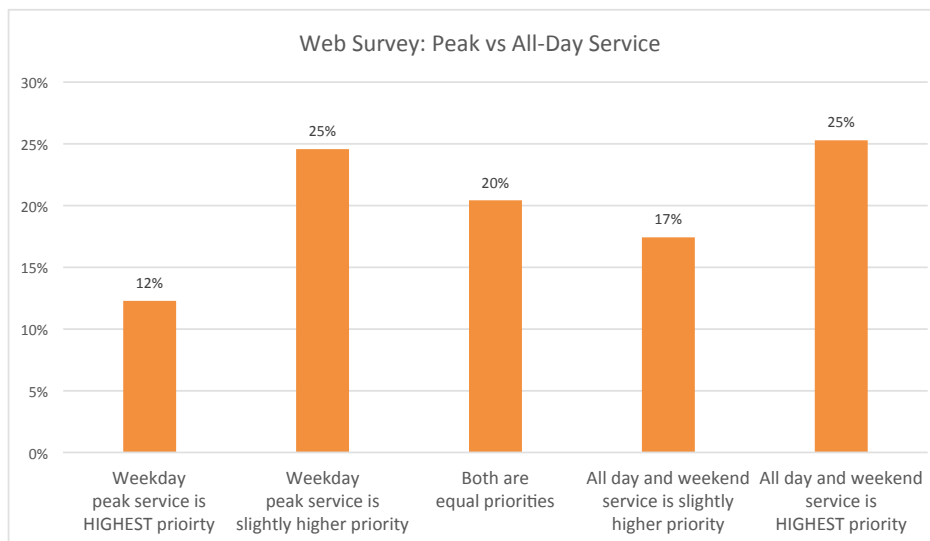


Figure 5: Members of the general public, in response to a web survey (at top) expressed more interest in all-day and weekend service than in peak service. In response to a question on a board displayed at public meetings (at bottom), they expressed very strong support for flatter, less-peaked schedules.

Input on Network Concepts

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

These three Concepts illustrated two separable choices, as illustrated in the triangle at right:

- How much should the network change?
- How should Richmond balance ridership and coverage goals? (And, relatedly, how should walking and waiting be traded-off?)

Maps of the three Concepts are shown on the following pages.

Degree of change

The Concepts illustrated a spectrum from very little change to a great deal of change.

The “Familiar” Concept showed how the transit network could be redesigned to accommodate BRT, but with minimal other changes.

The “High Coverage” and “High Ridership” Concepts were blank-slate redesigns of the transit network, completely re-thinking the

shape of the transit network, to fit modern-day Richmond. They would both incorporate and take advantage of the Pulse BRT.

The High Ridership Concept concentrated service into frequent lines, in places where ridership potential is highest. The High Coverage Concept, in contrast, spread service out to cover a large geographic area, but with low-frequency routes.

STOP SPACING AND SPEEDS

The High Coverage and High Ridership Concepts assumed another type of change, which was the average spacing of bus stops.

Today, GRTC bus stops are spaced very close together. This causes many bus lines to be slow, because the bus must stop at nearly every block for passengers getting on or off. When bus lines are slow, it makes passengers’ trips take longer. It also costs GRTC more to operate a slow bus line than a fast one. If service can be sped up, GRTC will have more to spend on higher frequencies or longer routes.

Spectrum of Choices for Richmond’s Transit Network

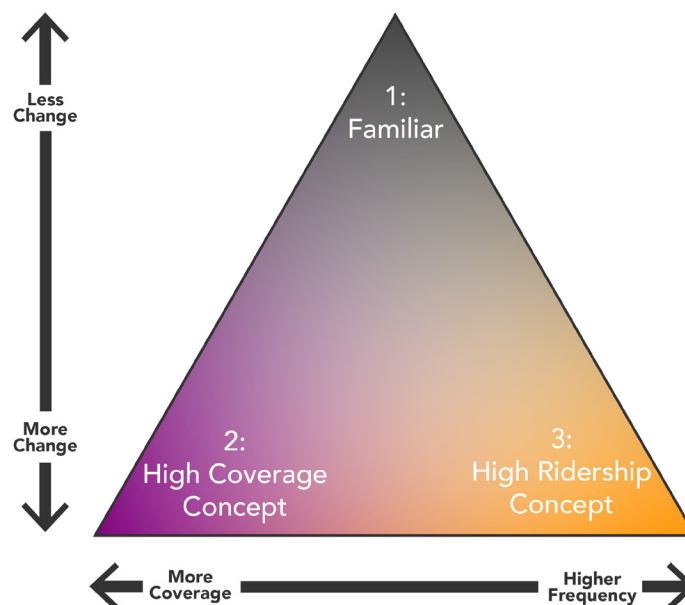
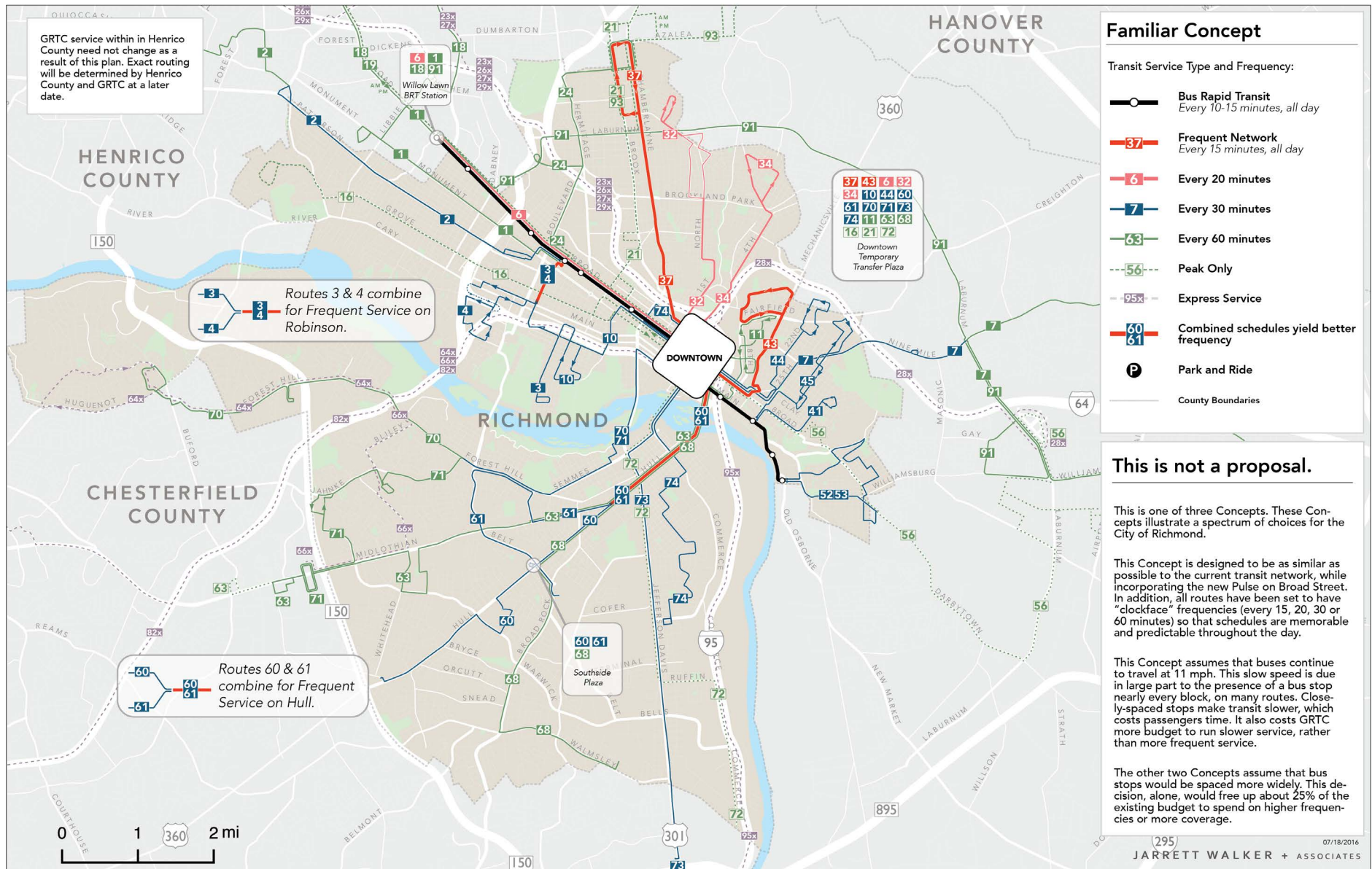


Figure 6: The three Concepts presented during Phase 2, for public input, illustrated two different spectrums of choices: on relating to the degree of change, and one relating to the trade-off between high ridership and high coverage.



GRTC service within in Henrico County need not change as a result of this plan. Exact routing will be determined by Henrico County and GRTC at a later date.

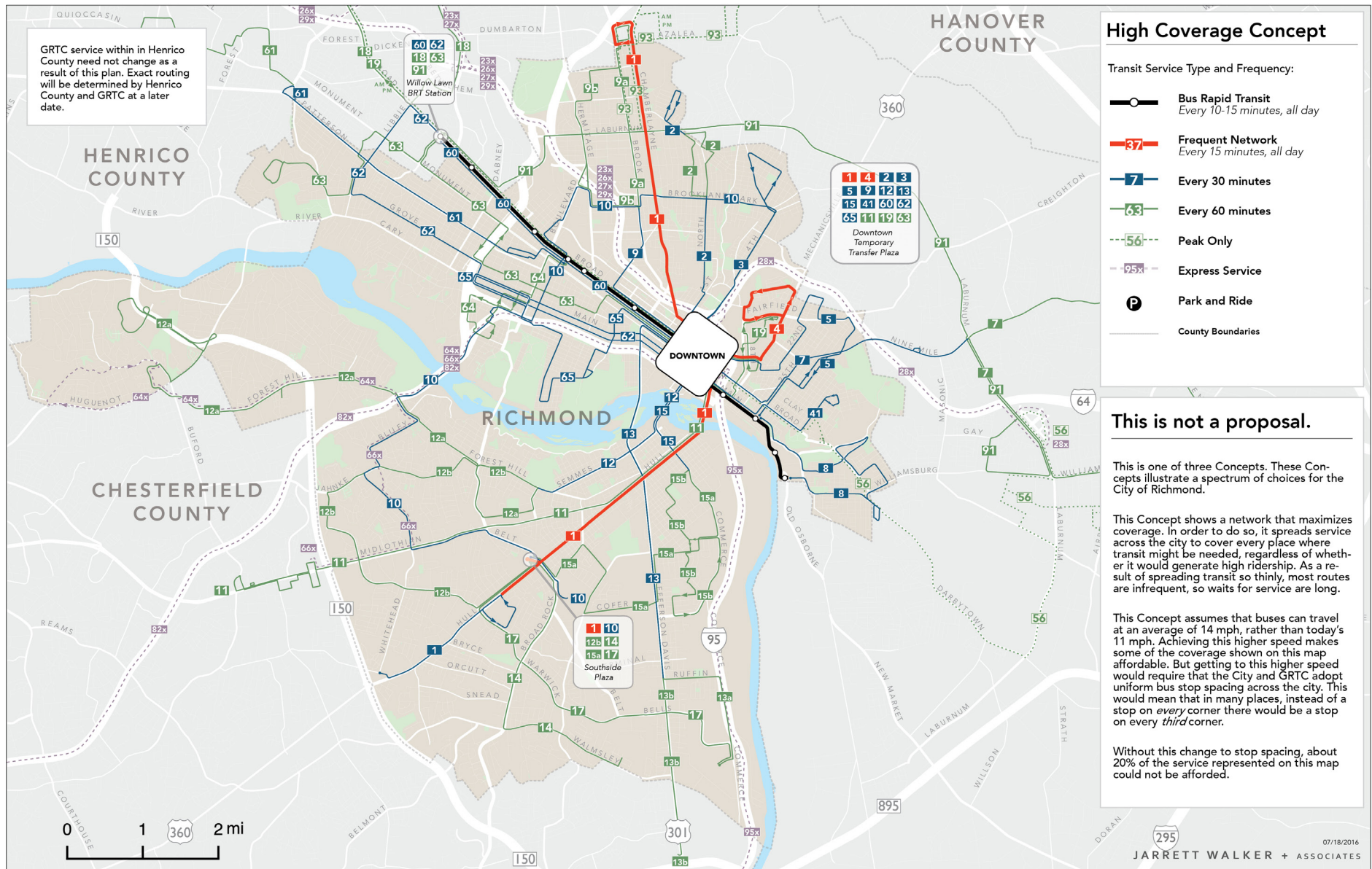
Routes 3 & 4 combine for Frequent Service on Robinson.

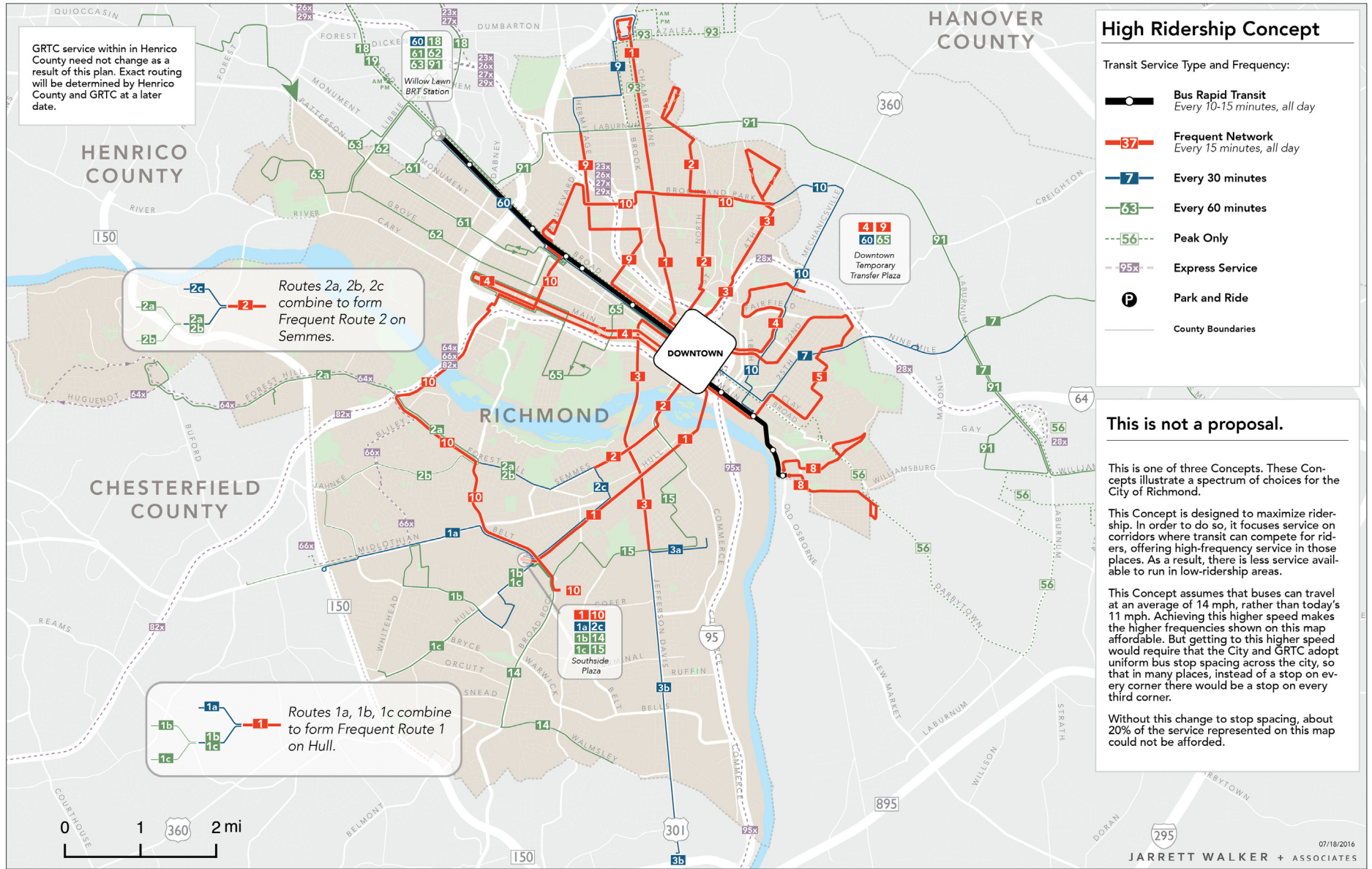
Routes 60 & 61 combine for Frequent Service on Hull.

37 43 6 32
34 10 44 60
61 70 71 73
74 11 63 68
16 21 72
Downtown Temporary Transfer Plaza

60 61
68
Southside Plaza

6 1
18 91
Willow Lawn BRT Station





The High Ridership and High Coverage Concepts were both built on the assumption that GRTC would speed up its routes within the City of Richmond, by changing the average spacing of bus stops from every block to every three blocks.

The public was asked about this particular type of change, and expressed strong support for wider spacing of GRTC bus stops, even though this would result in slightly longer walks to a bus stop for many people.

Removing bus stops is one of the hardest things any transit agency can undertake, even when it results in faster trips for passengers, and more useful service. The Richmond Transit Network Plan presents the City and GRTC with a rare opportunity to make a holistic change, city-wide, so that no rider, neighborhood, route or community is singled out for this difficult change. Instead, everyone would bear the burden and the benefits of the change at once, all together.

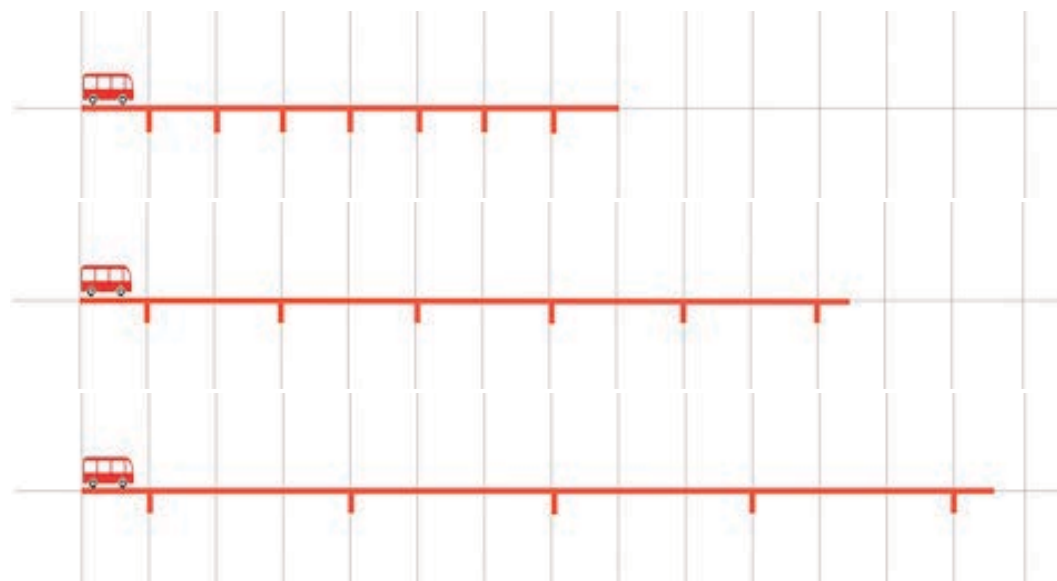
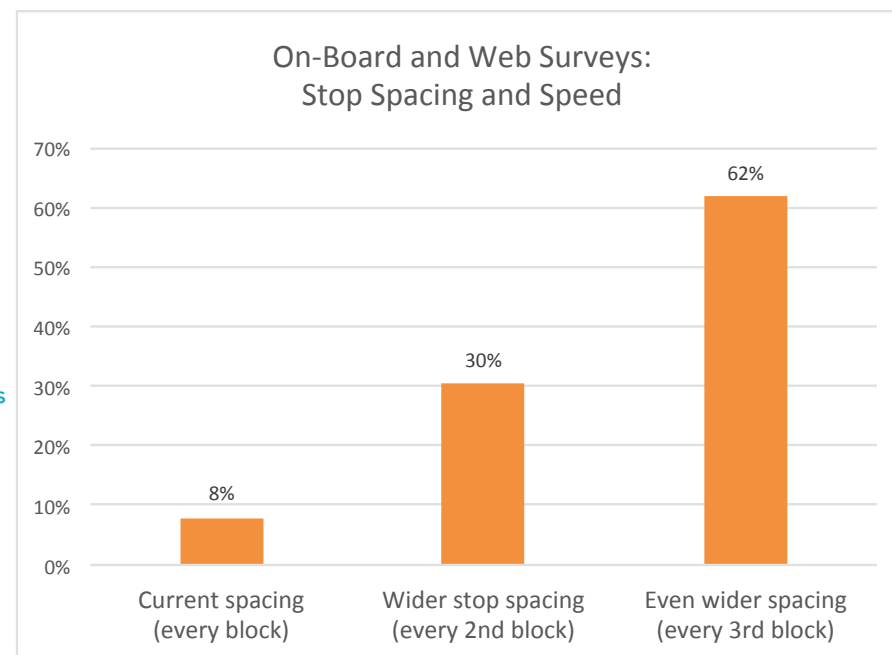


Figure 7: In a survey on the web and at the Transfer Plaza, people expressed strong support for wider bus stop spacing. The drawings above were used to show the potential change; the combined responses from 700 web and rider surveys are at right.



Measuring access to service

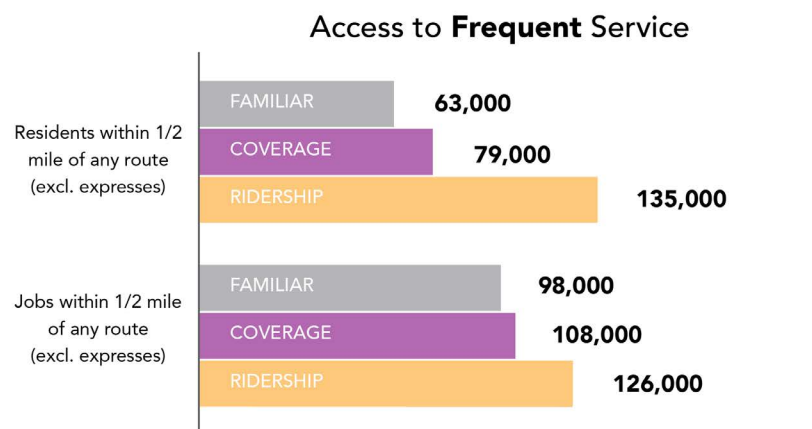
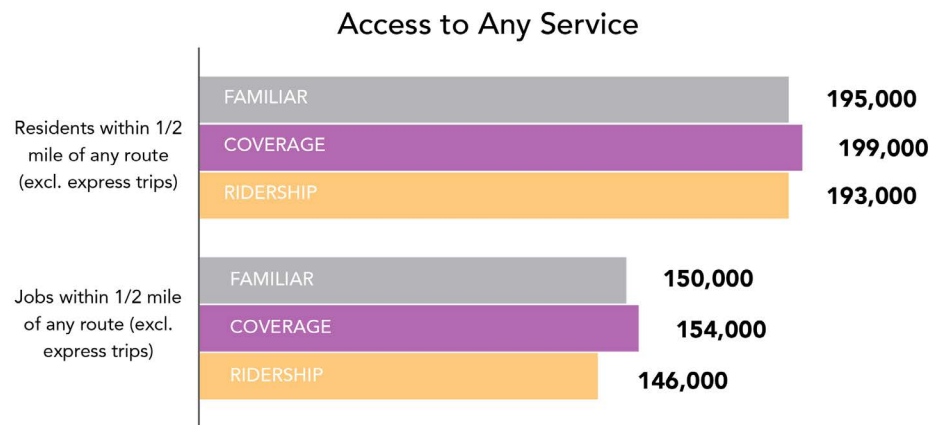
“Coverage” can be measured by the number of residents or jobs close to *any* transit service at all. The High Coverage and High Ridership Concepts would perform about as well as the Familiar Concept (as shown by the set of charts at top, to the right).

Yet the High Ridership Concept, by concentrating service into fewer, more frequent routes, would have required slightly longer walks to service than the High Coverage or Familiar Concepts. These smaller differences in walking distance were made visible on the maps shown to the public and stakeholders during surveys, workshops and public meetings.

The number of residents and jobs that would be close to *frequent* transit service is often used as a way to estimate the potential for high ridership. Frequent service is simply more useful for more people, and so the people and jobs near frequent service represent potential future riders.

As shown in the charts at bottom, the High Ridership Concept would get frequent service close to the most residents and jobs. This is why it would garner more ridership.

How do the concepts affect access?



*Residential calculations are based off 2014 5-year Estimates at block group level from the American Community Survey dataset, while job calculations are based of block level data from LEHD's LODES 2014 dataset.

Figure 8: The charts at left show how well each of the Concepts performed at serving residents and jobs with any service, and with frequent service, within the City of Richmond.

Responses to the Familiar Concept

When asked specifically about the trade-off between close stop spacing and faster, more affordable bus service, most people expressed support for the latter.

People’s responses to the entire Familiar Concept – which assuming close stop spacing and slow speeds, but also preserved most of the characteristics of the existing transit network – were also illuminating.

In a web survey, which was also given to riders on buses and at the downtown Transfer Plaza, people were asked to assign each of the three Concepts a “star” ranking, from 1 to 5 stars. The chart at right shows how many times each Concept received each potential ranking.

The Familiar Concept received the most low rankings (1 or 2 stars) (shown in tan and green bars). It also received the fewest high rankings (4 or 5 stars) (orange and red bars).

This indicates that, among Richmond’s transit stakeholders, there is an appetite for change. The difference between the responses to the High Ridership and High Coverage Concepts illuminates the direction of change that is desired.

Concept Rankings (Rider and Web Surveys)

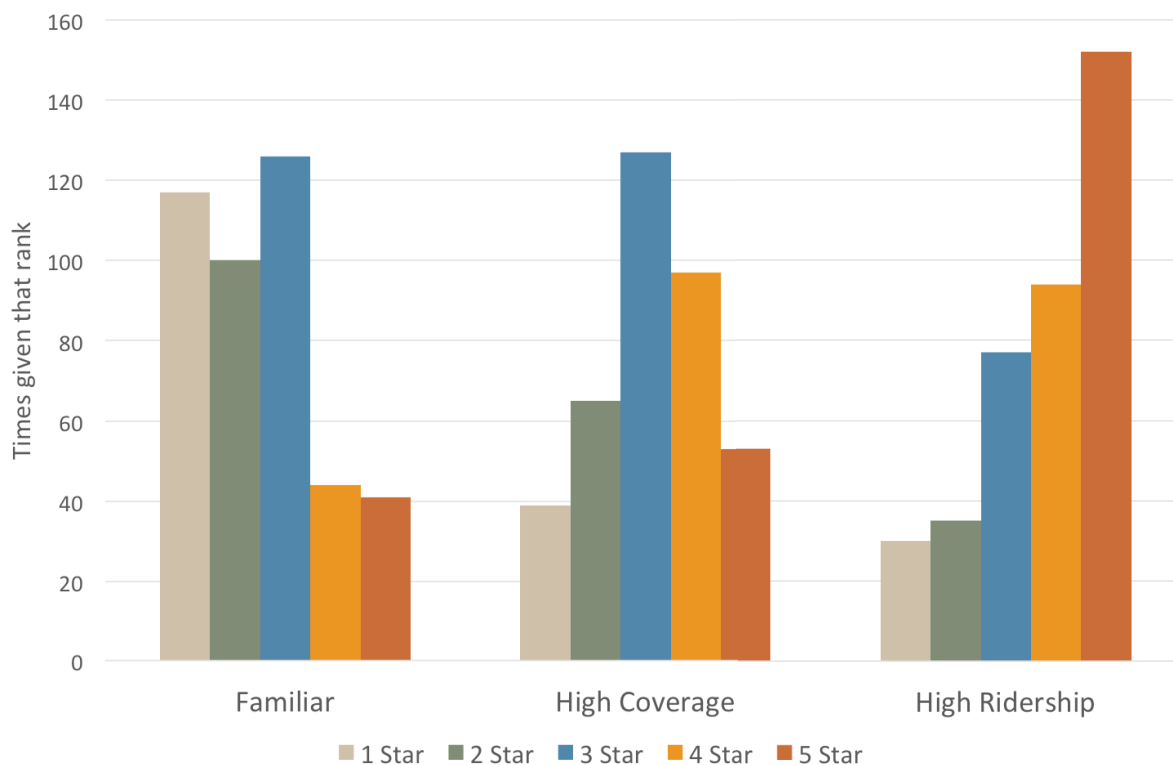


Figure 9: In a web survey and an intercept survey at the downtown Transfer Plaza, people were asked to rank the three Concepts from 1 to 5 stars. The Familiar Concept (at left) received the most low rankings (in tan and green). (A total of 773 people participated in this ranking.)

Responses to the High Ridership and High Coverage Concepts

Richmond stakeholders, bus riders and other members of the public showed an appetite for change and a desire to space-out bus stops more widely in order to speed up service.

However, there is a major choice about what *direction* of change GRTC should take, within the City of Richmond. Public input on the High Coverage and High Ridership Concepts made clear that there is much more support for moving towards higher frequencies, higher ridership, and lower coverage, than there is for maintaining the current high levels of coverage and low frequency.

In surveys of existing transit riders (administered at the Temporary Transfer Plaza) and of the general public (online), people showed a strong preference for the High Ridership Concept.

In the chart above, the High Ridership Concept received by far the most “5 star” ratings (in red). It received a similar number of 4 star ratings as the High Coverage Concept (in orange). It received fewer 1 and 2 star ratings than the High Coverage Concept (in tan and green).

Concept Rankings (Rider and Web Surveys)

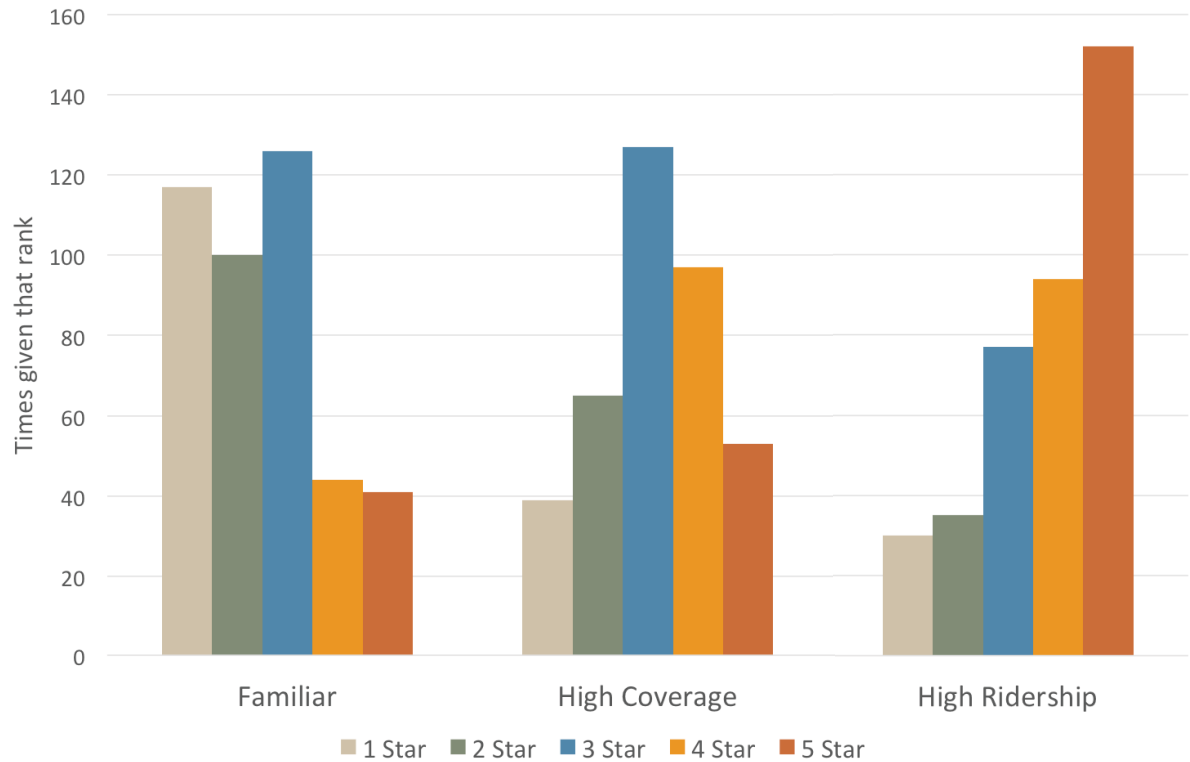


Figure 10: This chart is repeated from the previous page. The High Ridership Concept (at right) received the most high rankings, and the fewest low rankings of the three Concepts.

These results suggest that Richmond would value a shift towards higher frequency and ridership, though not quite as far of a shift as was illustrated in the High Ridership Concept.

Acting on public input

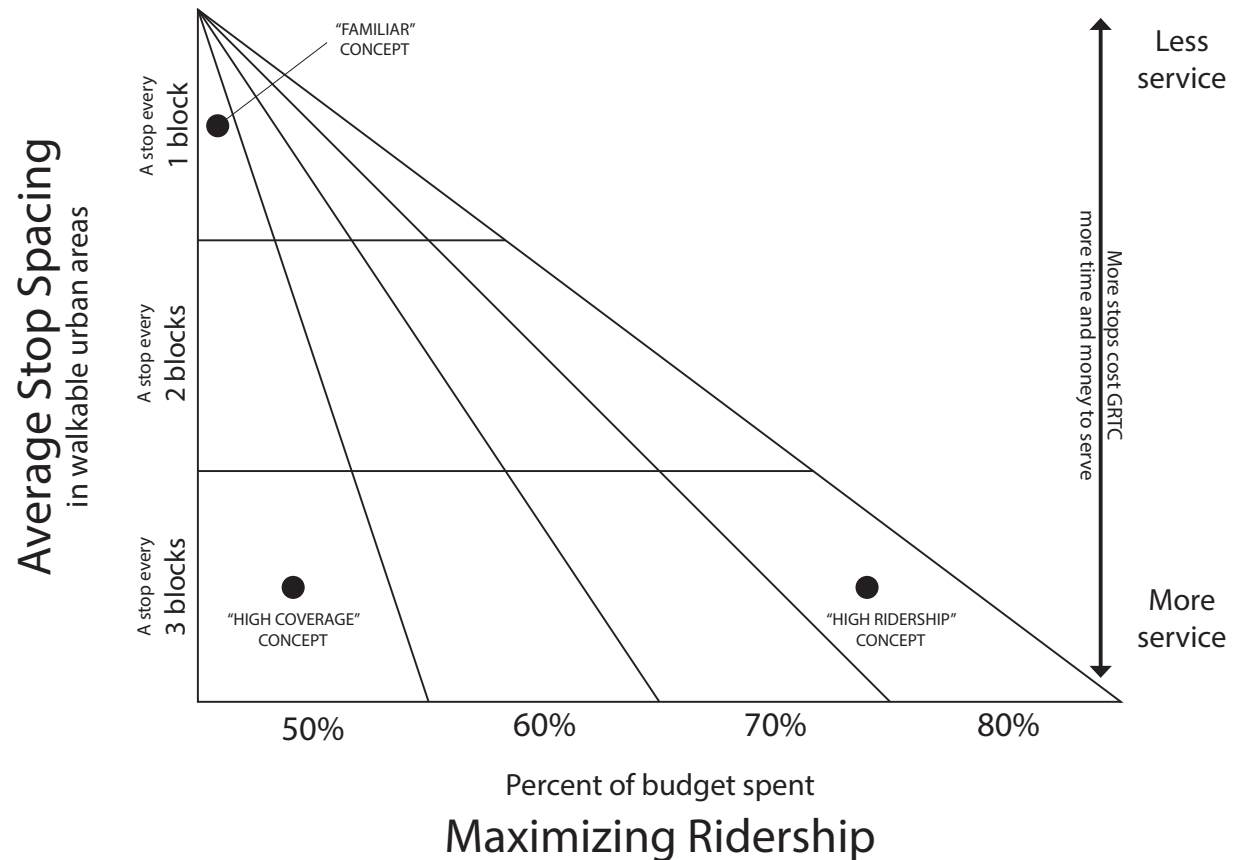
Two major choices were presented during Phase 2:

- A choice about how much to change the network and bus stop spacing.
- A choice about the direction to move with that change.

In order to summarize and quantify the public input received on these two choices, the consulting team added more detail to the “Triangle of Choices” diagram (first shown on page 13).

The triangle at right shows more detailed information about how the three Concepts related to one another. This triangle has been used for conversations among City staff and elected officials, about what policy direction to set for the final Richmond Transit Network Plan.

On the following page, public input is mapped onto this triangle.



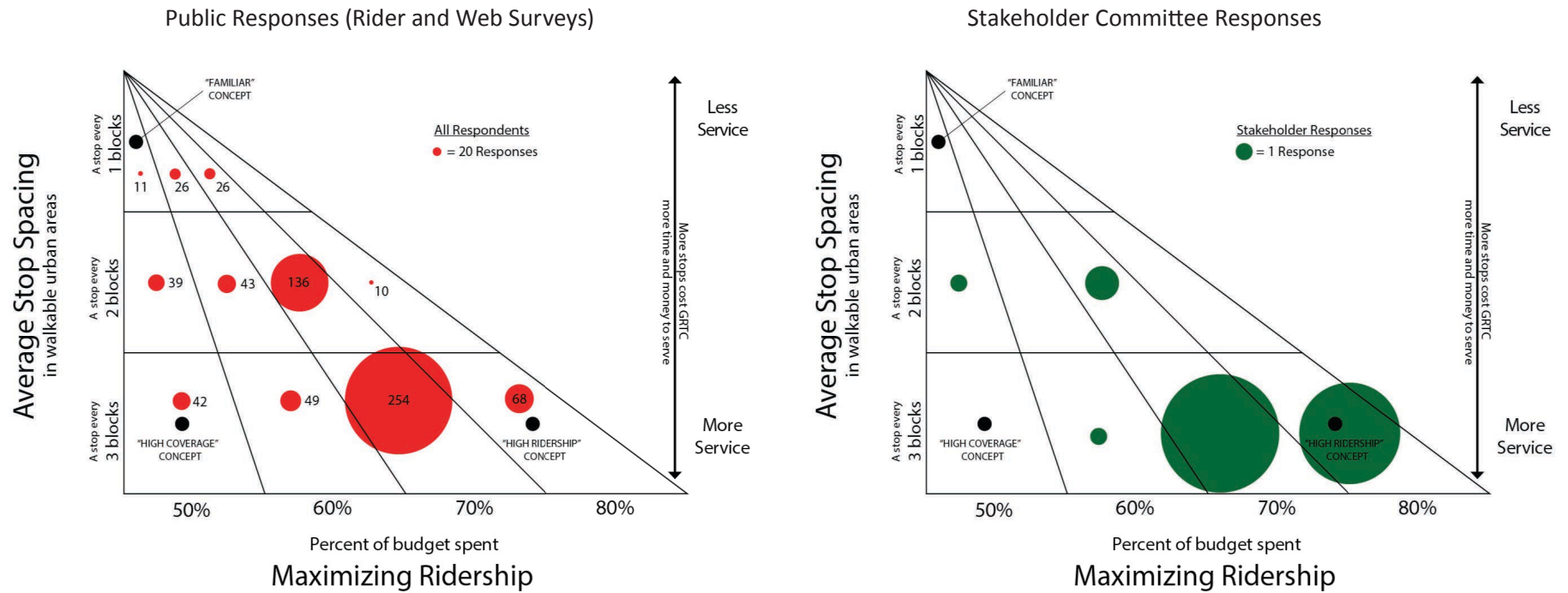


Figure 11: Each person's response to the two key choices can be represented as a single dot in this diagram. At left, the responses from the 652 people who completed surveys on both the Concepts and stop spacing are summed. At right, the responses of the members of the Stakeholder Committee are summed in the same way.

Policy direction for the Draft Recommended Network

Before designing the Draft Recommended Network, City staff reviewed input from Phases 1 and 2, from the general public, current bus riders, and the Stakeholder Committee. Based on this input, they recommended to the consulting team that the Draft Recommended Network be designed to be similar to the High Ridership Concept, but with slightly less frequency and slightly more coverage.

In the Draft Recommended Network, about 70% of the budget is spent pursuing maximum ridership, while 30% is spent providing coverage in places where ridership is naturally low. At the same time, the network is designed with the assumption that bus stops in the urban, walkable parts of Richmond will be spaced out to an average of three blocks, or about 1,000 feet.

This policy position represents the “center” of input received from all sources – slightly less of a shift than would be supported by members of the Stakeholder Committee, but reflecting the majority opinion of the general public and current riders.

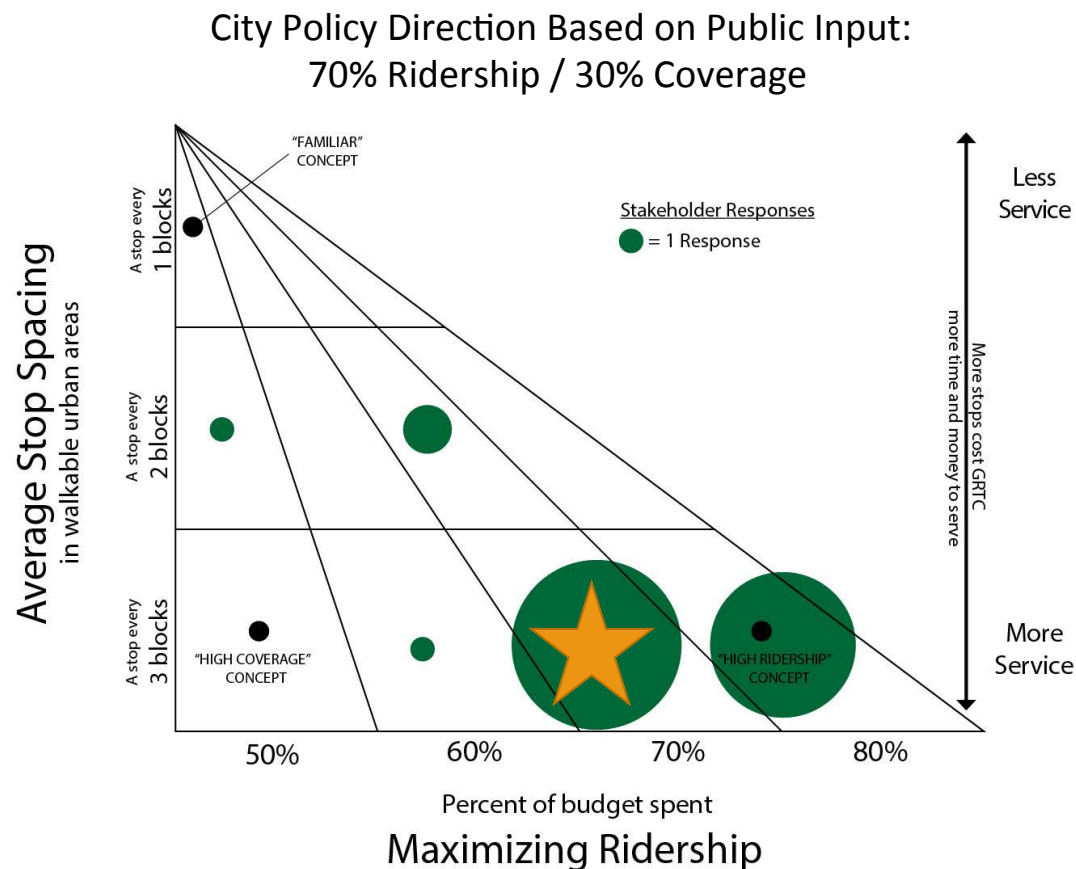


Figure 12: After considering public input from all sources, and from Phases 1 and 2, the City asked the consulting team to design a Draft Recommended Network that is similar to the High Ridership Concept, but with slightly less emphasis on frequency, and slightly more emphasis on providing coverage.

3 Draft Recommended Network

In this chapter, we present maps of the Draft Recommended Network, and information about how it would operate and how it would perform.

This Network was developed by a team of technical experts from the City of Richmond, GRTC, 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.

In early 2017, this Network will be presented to the public, current GRTC bus riders, the Stakeholder Committee, and elected and appointed officials. Feedback on the Network in general, and comments on specific details, will be considered in the development of a Final Recommended Network. The Richmond City Council will consider adopting a resolution of support, and the GRTC Board will consider adopting the detailed network plan, in the spring of 2017.

The maps on the following pages show the network at different times and on different days; at the citywide and downtown scales. The table on page 28 shows the frequency of each route, and its branches, over the hours of each day and the days of each week.

Policy basis

As shown in the diagram on page 23, this network is designed to fulfill a policy direction that:

- About 70% of the operating budget in the City of Richmond 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.
- Bus stops will be spaced further apart, to an average of 1000 feet (three blocks) in urban, walkable parts of Richmond.

This network was designed to fit within existing resources for transit. Specifically, within GRTC's expected 2017-2018 budget for fixed-route service in the City of Richmond. It would cost \$34.5 million to operate, plus 3% set aside for contingency.

Design principles

In addition to public input, certain principles of good transit design are reflected in the Draft 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.

Through-routing across town

Routes may cross the City of Richmond, passing through downtown but not necessarily terminating there. This will allow for faster and more reliable cross-town travel by passengers, and also some operational efficiencies.

However, this will require GRTC and the City to develop driver break facilities at the outer ends of routes, so that drivers needn't take breaks mid-route while their buses are full of passengers.

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.

BRT and an integrated network

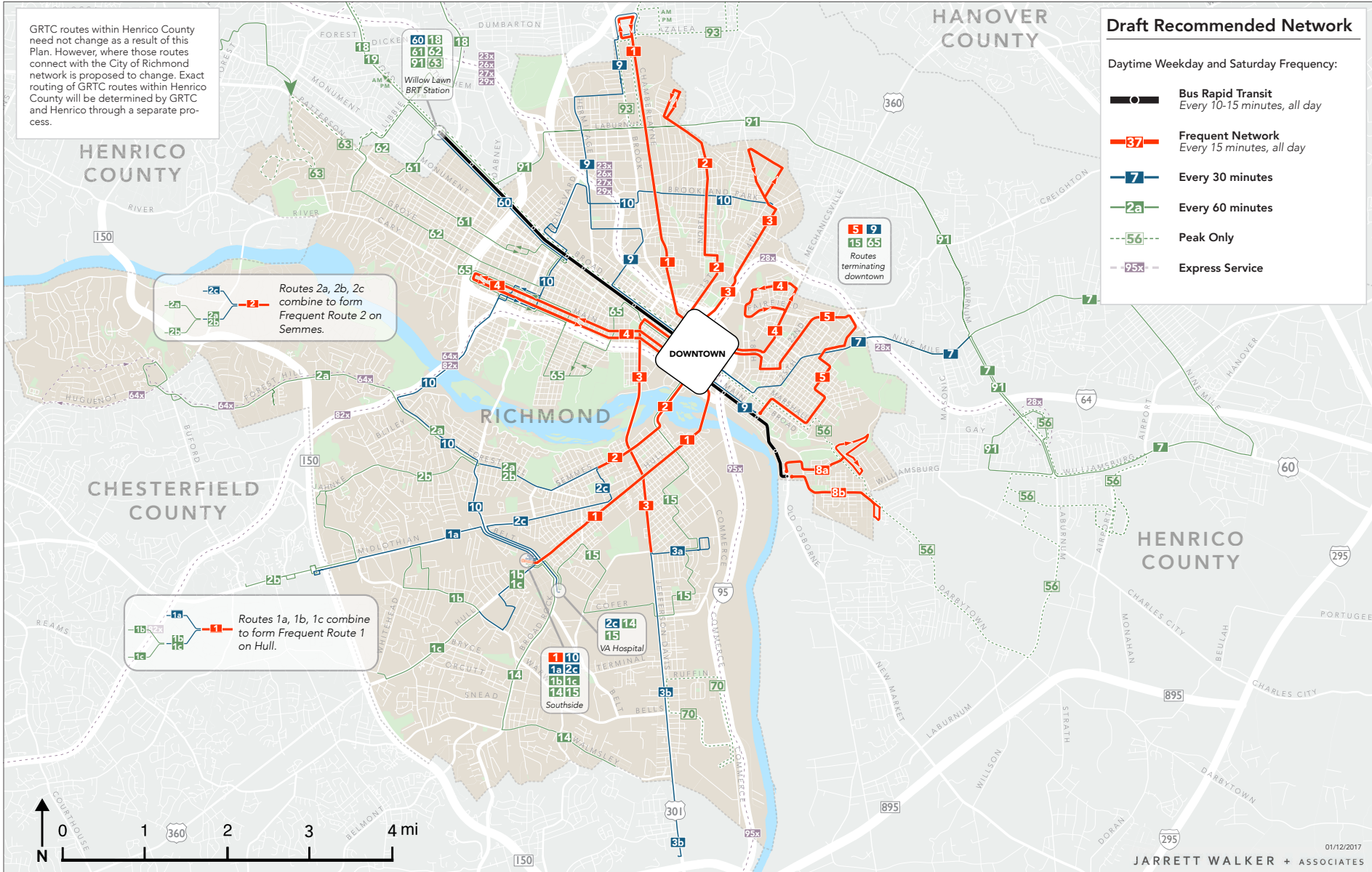
In planning for The Pulse BRT, members of the public expressed a strong interest in a city-wide network plan, that would spread the benefits of BRT line beyond the Broad Street corridor.

A transit network can be liberating to large numbers of people because it is more than the sum of its parts. No single route can bring a all of a city’s opportunities within reach of a person, but a well-designed citywide network has that power. In particular, a frequent network, on which transfers between frequent routes are fast and reliable, provide the kind of “anywhere-to-anywhere” freedom that attracts large numbers of people to transit.

The Pulse BRT will provide a fast, frequent backbone of service for the Richmond transit network. The Draft Recommended

Network takes advantage of The Pulse, making connections to it using other frequent routes (such as Route 5 on the East End), and reducing the costly, duplicative routes that currently run parallel and close to the BRT corridor, freeing up those resources to provide service in other places.






At the end of this chapter, we recommend some future service enhancements in order of priority, should additional funding become available. One of the top priorities is an increase in the frequency of Route 10, which orbits the city (via the Powhite Parkway bridge). If someday Route 10 is a frequent route, its connection with The Pulse BRT will be a very powerful addition to the network, allowing people to reach a great deal of the city, with one quick transfer, without going through downtown.



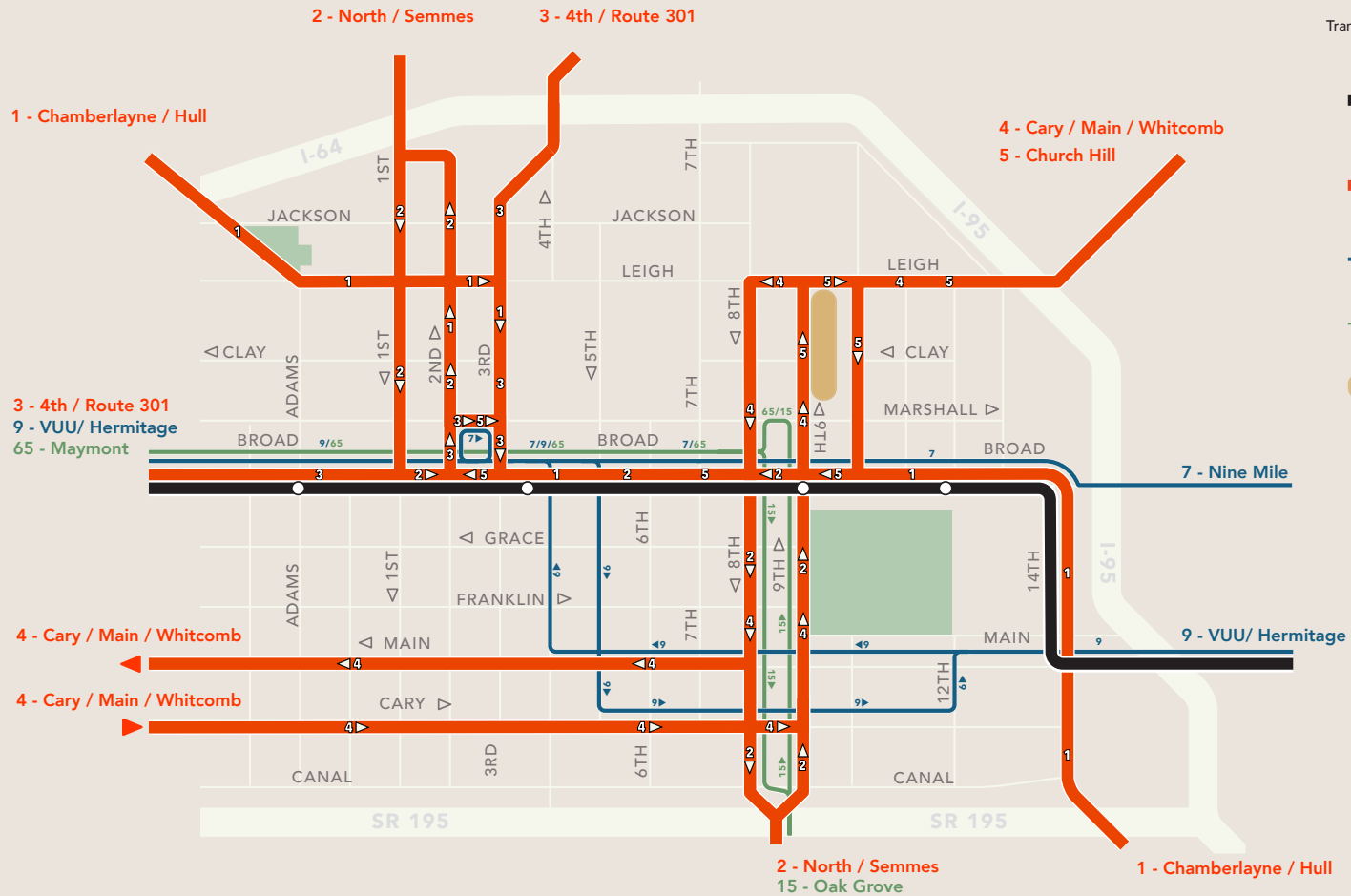
DRAFT RECOMMENDED NETWORK Daytimes, on weekdays and Saturdays

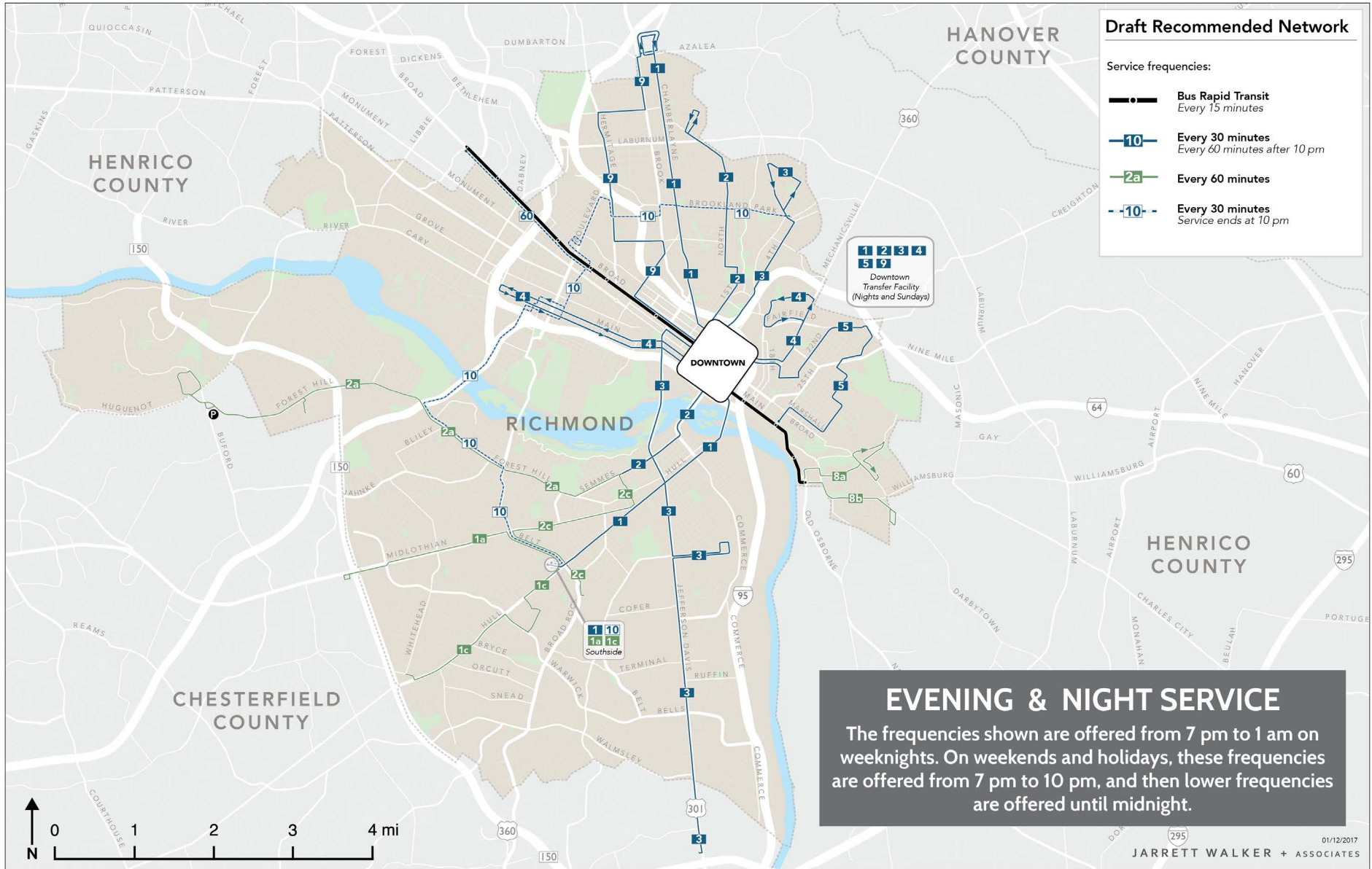
DOWNTOWN ROUTINGS

Transit Service Type and Frequency:

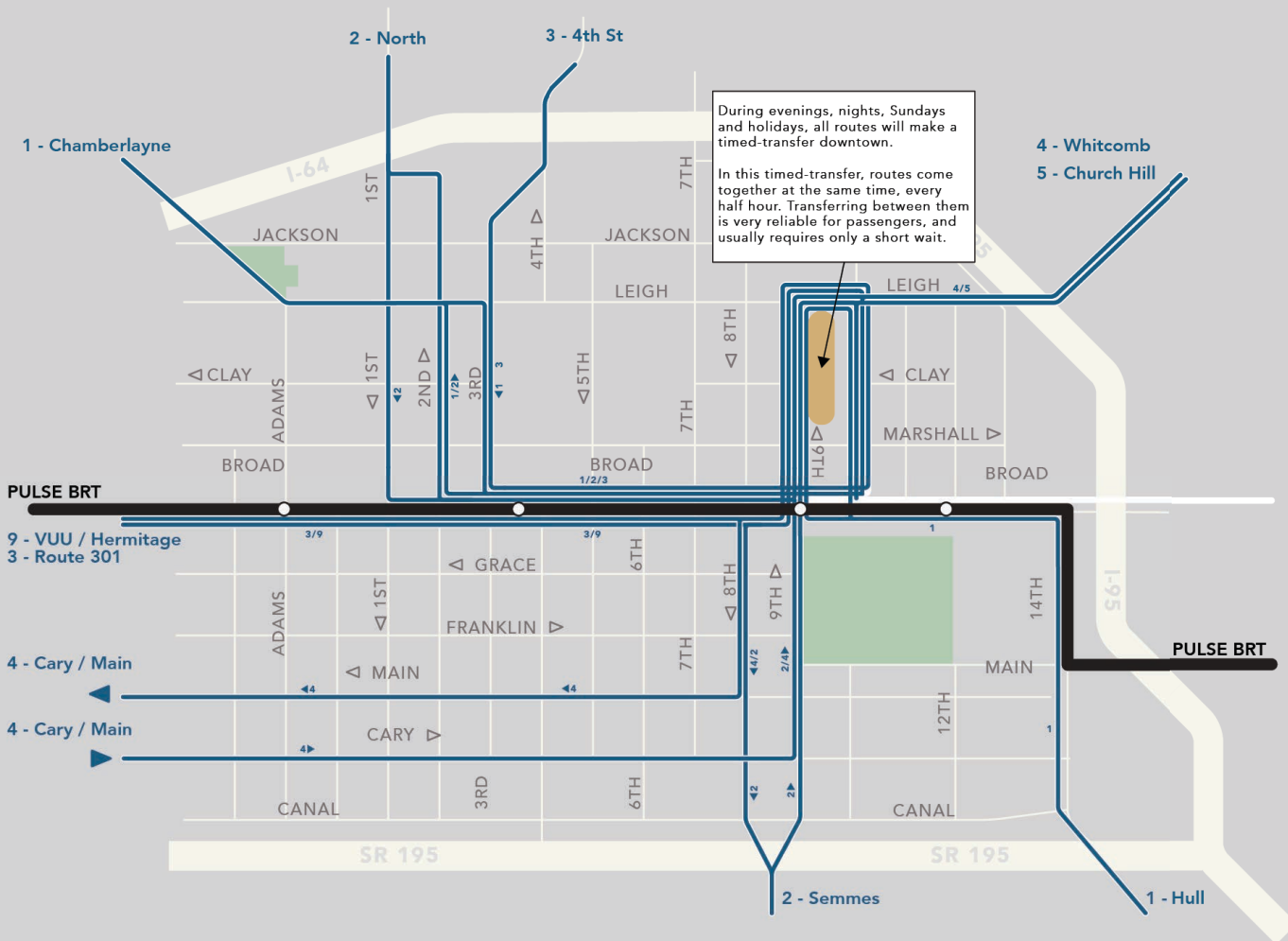
-  **Bus Rapid Transit**
Every 10-15 minutes, all day
-  **Frequent Network**
Every 15 minutes, all day
-  Every 30 minutes
-  Every 60 minutes
-  **Temp. Transit Plaza**

(Express buses are not shown)








DRAFT RECOMMENDED NETWORK Weekday nights and Sundays



DOWNTOWN ROUTINGS

Transit Service Type and Frequency:

-  **Bus Rapid Transit**
Every 10-15 minutes, all day
-  Every 30 minutes
-  Temp. Transit Plaza

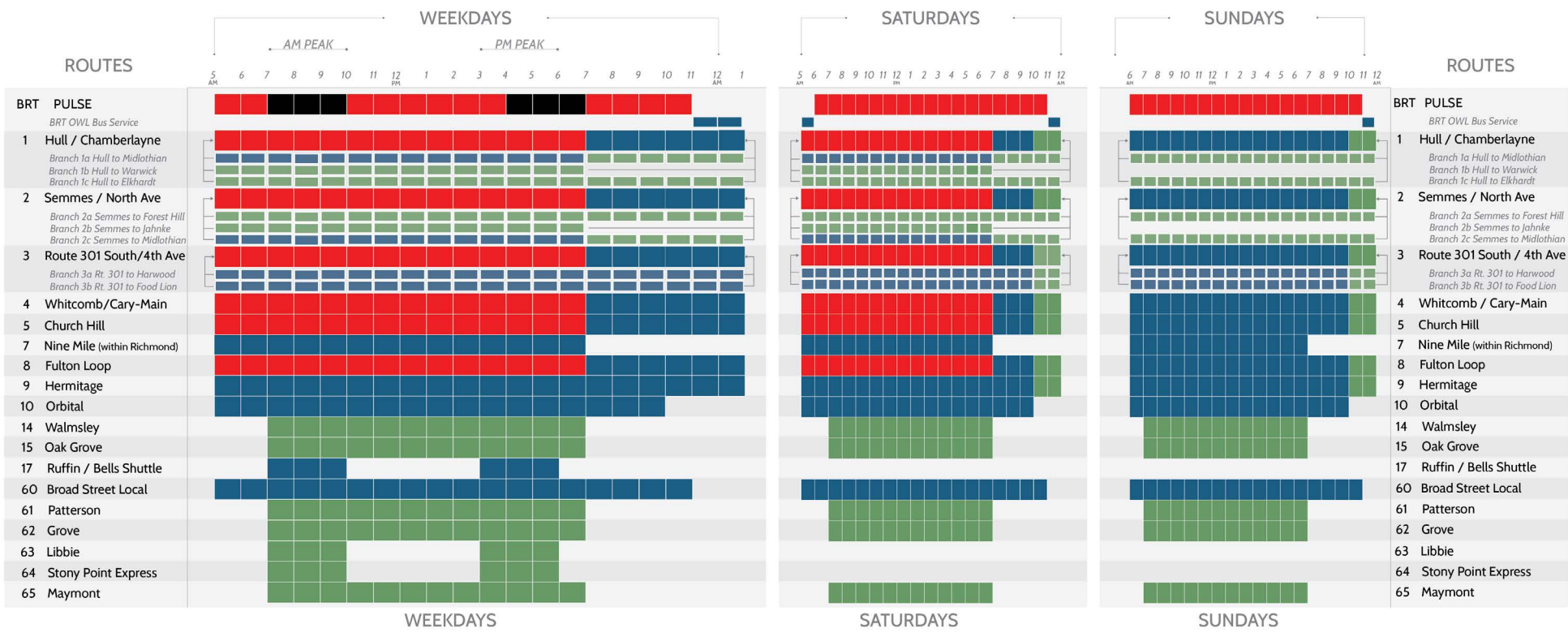
This network would operate during the following periods:

Weekdays: 7pm to end of service
 Saturdays: 7pm to end of service
 Sundays: All day

At night and on Sundays, when the frequencies of all routes are lower, transfers made at random between a pair of routes will take longer. For this reason, the network will include a timed-transfer downtown, in which all buses arrive downtown at the same time, and sit together for a few minutes so that passengers can transfer among any two routes.

For more information about the frequencies of route branches at night, see the map of Evenings & Late Night Service, and the table of Route Frequencies and Span.

DRAFT RECOMMENDED NETWORK Route Frequencies and Spans of Service



HENRICO COUNTY ROUTES:
With the exception of Route 7, GRTC routes that are planned and funded by Henrico County are not included in this table.

FREQUENCY

10 minute
 15 minute
 30 minute
 60 minute

Measuring coverage and access to frequent service

The chart at right shows how the Draft Recommended Network performs in terms of access to *any* service and access to *frequent* service. For comparison, the same measures are shown for the existing GRTC network, and for the existing GRTC network plus the Pulse BRT that will open in 2017.

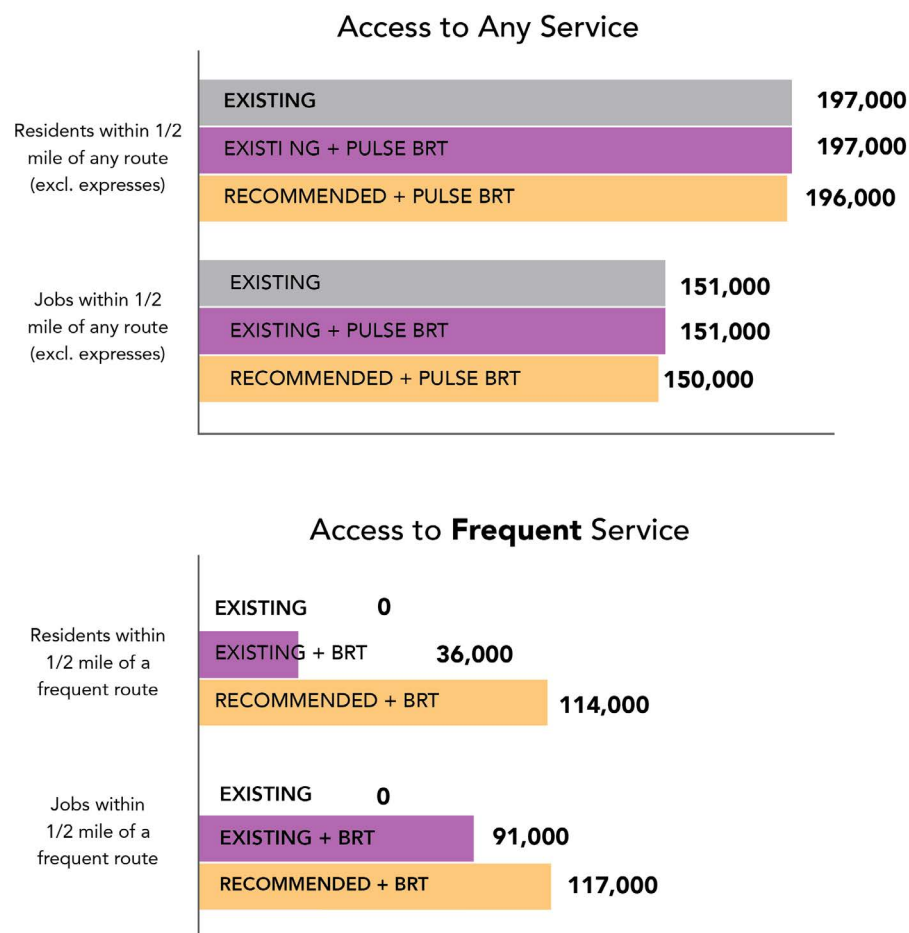
The Draft Recommended Network would reduce the number of jobs and residents with access to *any* service by a very small amount. This is an expected result, since public input and policy direction explicitly call for a shift away from coverage, in order to provide higher frequency service and achieve higher ridership.

The Network would vastly increase the number of jobs and residents near *frequent* service. This is also an expected result, because this is the very strategy that will lead to higher ridership.

Note that the existing network has no frequent service, defined here as a bus coming every 15 minutes or better, consistently throughout the midday. All other changes aside, the Pulse would be the system's first truly frequent service.

Figure 13: The charts at right show how much access the Draft Recommended Network provides to any service, and to frequent service, for residents and jobs within the City of Richmond. (Additional jobs and residents are covered by GRTC services outside of the City boundaries.) By comparing this chart to the chart on page 18, we can notice that this Network would provide slightly more access to any service, but less access to frequent service, than the High Ridership Concept.

How would the Draft Recommended Network change access?



*Residential calculations are based off 2014 5-year Estimates at block group level from the American Community Survey dataset, while job calculations are based of block level data from LEHD's LODS 2014 dataset.

Measuring equity in service changes

Title VI of the 1964 Civil Right Act requires that no program receiving federal funding discriminate against people on the basis of their race, color or national origin. This and other Federal laws make clear that transit service changes may not result in disparate impacts on people of color. Additional laws require that transit service changes may not result in disproportionate burdens on low-income people.

An equity analysis was performed on the Draft Recommended Network, measuring how access to service would change for low-income and minority residents of Richmond, compared to non-low-income and non-minority residents. GRTC is currently in the process of updating its Title VI policy, which sets thresholds for how much impact borne by low-income or minority residents is too much. This process will be completed before any service changes are made as a result of the Richmond Transit Network Plan.

In the analysis presented here, the Draft Recommended Network – including the Pulse BRT line – was compared to the existing network.

This analysis uses the “Person-Trips” method. This method measures impacts to each Census Block Group (a group of several Census Blocks). It takes into account not just the presence or absence of service near people, but the quantity of service. The quantity of service is measured by the number of trips a bus makes past each Census Block Group each year. The more frequent and long-running a route is, the more trips it makes past each Census Block Group that it passes.

The metric this generates is “Person-Trips,” which is the number of bus trips past people, multiplied by the number of people in question. For example, “Minority Person-Trips” describes how many times a real event would occur, each year: a bus would drive past a Census Block Group

where a minority person lives. The more minority residents that bus passes, and the more times it passes them, the larger the “Minority Person-Trips” number becomes.

The very slight decrease in service to low-income residents (-2%) was initially surprising to the study team, because such a concerted effort was made during the design of the network to get frequent service close to large numbers of low-income residents (and low-wage jobs).

Upon further examinations, it seems likely that this apparent decrease is not real, but is rather an artifact of the way the “Person-Trips” method counts bus trips.

In the existing network, all bus routes terminate downtown. In the Draft Recommended Network, many routes are

	“Person-Trips” (service access weighted by population)		
	Existing Network	Draft Recommended Network	Change
Low-Income Residents	4,376,093,611	4,269,124,315	-2%
Non-Low-Income Residents	5,565,652,219	5,756,497,460	3%
Minority Residents	5,710,519,200	6,025,766,780	6%
Non-Minority Residents	4,231,226,630	3,999,854,995	-5%
All Residents	9,941,745,830	10,025,621,775	1%

Figure 14: This table summarizes the change in service access for Richmond residents, when categorized based on race or income.

“through-routed” and continue through downtown. This represents no decrease in service – in fact, it represents an improvement in the usefulness of service, because a route takes someone not only to downtown but across town.

In the Draft Recommended Network, a single route passing through downtown is counted as providing a certain number of bus trips to the Census Block Groups downtown. If we were to break that route in half, and turn all buses around downtown, the “Person-Trips” method counts the bus trips provided by those two routes as *double what would be provided by the single, through-route*. This is despite the fact that there is no more service in the two routes terminating downtown than there was in the single through-route.

Thus the existing network appears to have far more bus trips serving downtown than the Draft Recommended Network, simply because routes terminate downtown. When the same amount of service into and out of downtown is connected into cross-town through-routes that *don’t* terminate downtown, there is an apparent drop in service to downtown.

This is not a real drop in service, only an unfortunate artifact of an otherwise robust

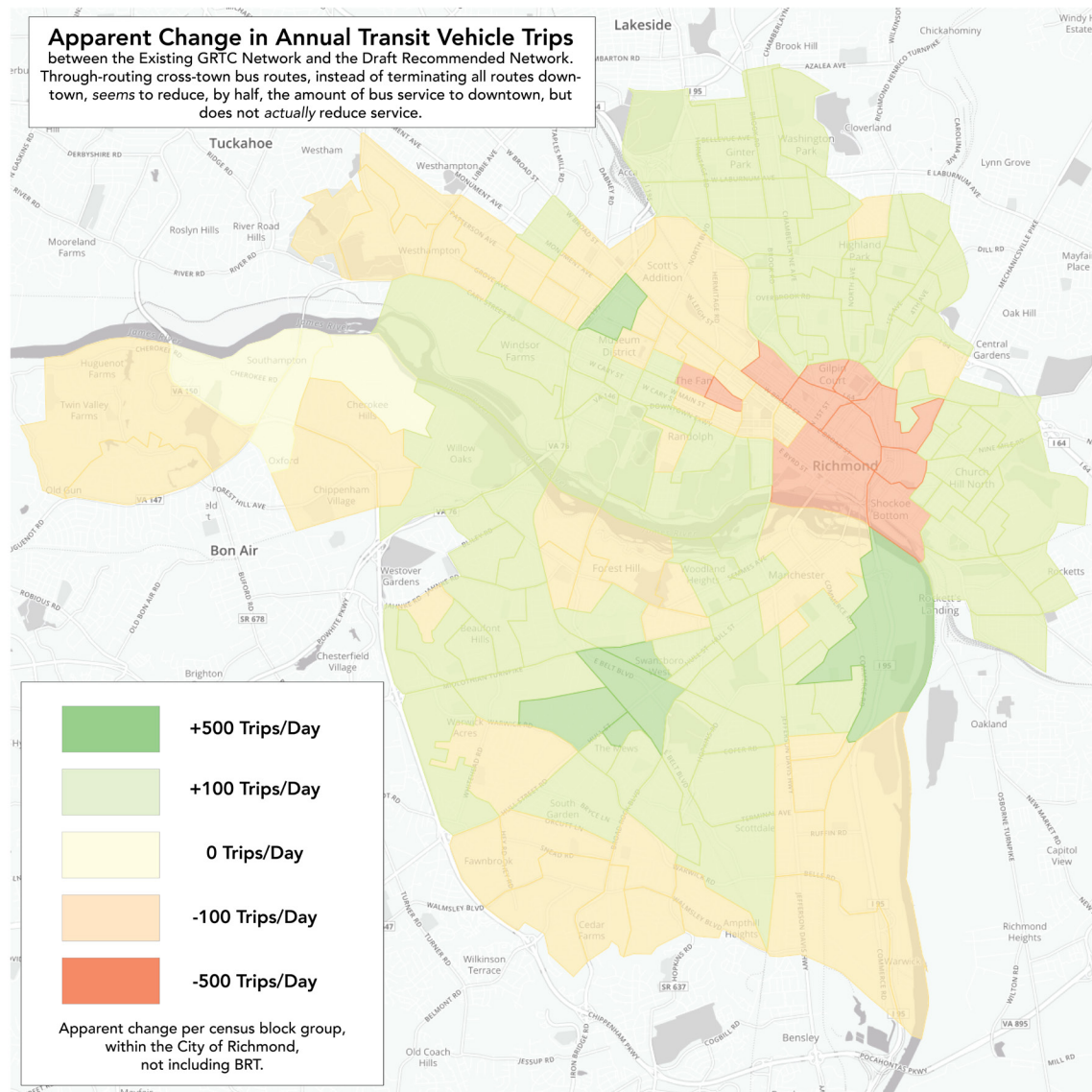


Figure 15: The “Person-Trips” method under-counts the number of bus trips through downtown in the Draft Recommended Network, due to the re-connection of cross-town bus routes.

methodology for measuring levels of service to residents.

Downtown residents tend to be low-income (many are University students), but are not predominantly minority (as shown in the small maps at right). An apparent drop in service to downtown would be expected to show up in this equity analysis as a decrease in service to low-income residents, but not to minority residents, which is exactly what we see in the equity analysis results.

This preliminary analysis suggests that service would not, in fact, decrease for low-income residents of Richmond.

In preparation of the Final Recommended Network, in March 2017, the study team will conduct a complete Title VI Service Equity Analysis. As part of that analysis, the team will further investigate how much service to downtown would actually change in the implementation of this plan, and determine whether the apparent small negative impact to low-income residents is real or simply an artifact of through-routing bus lines.

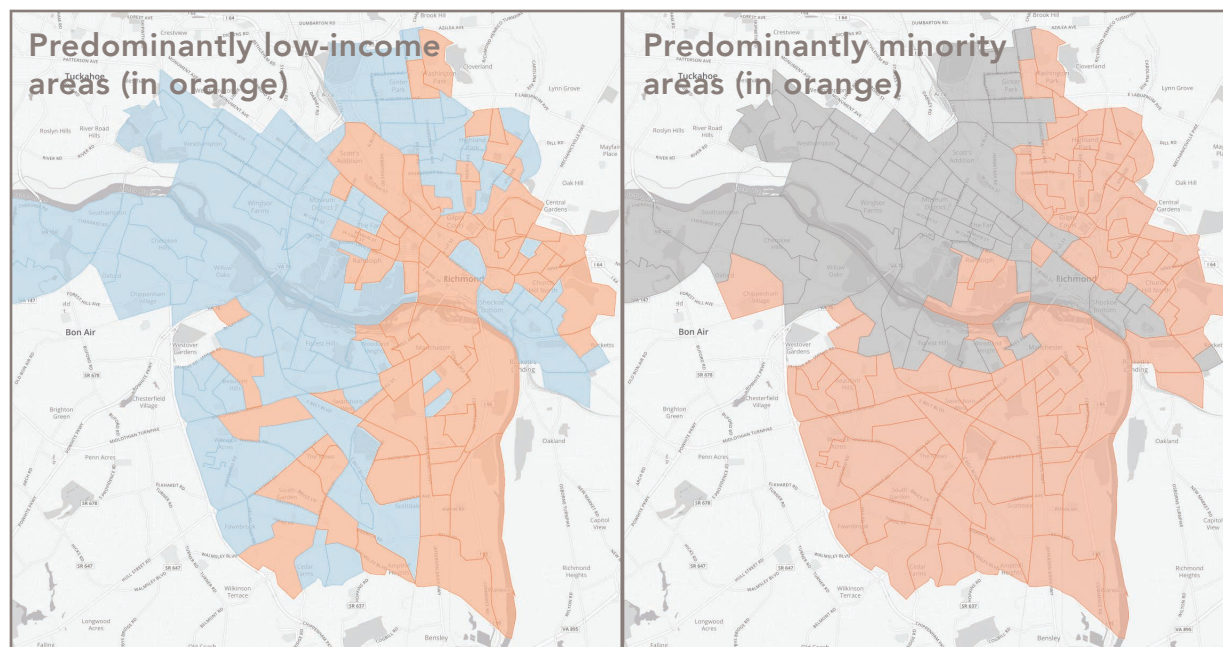


Figure 16: The map on the previous page showed the apparent (but not real) reduction in service to downtown. This pair of maps shows which parts of Richmond are home to predominantly low income residents (at left) or minority residents (at right). Most of the downtown areas that seem to receive less service on the previous page are home to many low-income residents. This likely explains the apparent drop in service to low-income residents, shown in the table on page 32, and suggests that low-income residents, in downtown and elsewhere in the city, would not in fact experience a decrease in service in the Draft Recommended Network.

Costs

Operating

The major costs of transit relate to the time that buses are driven on a route, rather than distance. For that reason, in designing a transit network, the “design budget” is often set in terms of hours of service provided, or “service hours.”

The Draft Recommended Network would require 345,402 service hours to operate. This operating cost includes all GRTC routes within the City of Richmond, the 64X express route, and The Pulse BRT. It does not include routes funded by Henrico County (like Route 7), nor express and seasonal routes funded by other partner agencies.

GRTC estimates that its operating cost for delivering each service hour will be \$100 in fiscal year 2017-8. This means that the cash operating budget for the Draft Recommended Network would be about \$34.5 million, which is within GRTC’s expected operating revenues for City of Richmond transit services in 2017-8.

In addition, before setting this operating budget for the Draft Recommended Network, the study team set aside 3% of expected 2017-8 operating revenues

Annual Operating Cost for Draft Recommended Network (in Service Hours)	
Local City network	312,956
The Pulse BRT	32,083
Contingency (3%)	10,096
Total Service Hours:	355,135

for one-time implementation costs and contingency. With contingency funds, the total operating cost in 2017-8 is estimated to be \$35.5 million.

Capital

While the Draft Recommended Network is designed to function within existing financial and physical resources, certain small capital improvements will be necessary in order to implement it.

The most urgently-needed improvements mostly relate to bus stops and driver break facilities.

The change in service patterns downtown will require moving many bus stops, and will benefit from the creation of a few “super-stops” at downtown locations where multiple routes come together, and people can be expected to transfer between them.

This Draft Recommended Network converts many radial routes that currently end downtown into crosstown through-routes. These provide more mobility for passengers (without the hassle, or the cost, of a transfer). However, these through-routes do *not* provide a break for drivers downtown. Thus GRTC and the City may need to make some small capital investments in new driver break facilities at the outside ends of routes, so that drivers needn’t take mid-route breaks downtown while their buses are full of waiting passengers.

When frequencies are lower at night and on Sundays, all routes are designed to make a timed connection downtown. Buses from all routes will dwell for five minutes at a single point downtown, allowing passengers to quickly and reliably transfer from any route to any other route.

This “night line-up” (which also takes place all day on Sundays and holidays) will require space for at least 13 buses to dwell near one another. The existing Temporary Transfer Plaza is large enough to accommodate the night line-up, though it may require improvements for this use.

Recommended future service enhancements

The tables on this page show the service enhancements that the consulting team recommends, should additional revenue become available. Some of these enhancements were included in the High Ridership or High Coverage Concepts, but had to be cut to create a network that compromised between those two ends of the spectrum.

These enhancements have been divided into two lists: those that are likely to grow ridership relative to cost, and those that would provide valued coverage, but are unlikely to grow ridership relative to cost.

The enhancements are listed in priority order. Each of the enhancements is presumed to take place *after* the enhancements above it. The costs of certain enhancements may be different if they are implemented out of this sequence.

All of the costs quoted here assume an approximate hourly service cost of \$105, which is higher than GRTC’s current cost of service.

Enhancements to Increase Ridership	
Enhancement	Estimated annual operating cost
1. Increase frequency on Route 10 to every 15 mins	\$2.35 million
2. Operate Routes 1, 2, 3, 4, 5 & 8 at every 15 mins on Sundays	\$1.8 million
3. Extend 15 minute frequency on all frequent routes to 10 pm	\$2.65 million
4. Increase Route 9 frequency to every 15 mins	\$1.35 million
5. Increase Route 8 frequency, nights and Sundays, to every 30 mins	\$0.3 million
6. Increase Saturday and Sunday night frequencies to every 30 mins	\$0.75 million
7. Increase frequency of Route 7 within Richmond to every 15 mins	\$1.15 million

Figure 17: Making each of the enhancements listed in the table above to the Draft Recommended Network would likely increase ridership relative to cost. The enhancements listed in the table below are unlikely to increase ridership relative to cost, but would provide valued coverage.

Enhancements to Increase Coverage	
Enhancement	Estimated annual operating cost
1. Extend night service to 2 am on all routes, every night	\$1.15 million
2. Lengthen Route 2A to reach Stony Point Fashion Park (6.1 miles)	\$0.75 million
3. Lengthen Route 70 (Ruffin/Bells shuttle) to Southside (6.7 miles)	\$0.25 million
4. Lengthen Route 65 to the University of Richmond (7.3 miles)	\$0.4 million
5. Lengthen Route 60 to cover entire BRT corridor (8.8 miles)	\$1.25 million

4 Next Steps

What happens next?

The Draft Recommended Network will be presented to the general public, transit riders, community organizations, and other transit stakeholders in Richmond for review and consideration.

Public meetings about this network will be held in January, and are listed at the website below.

The public will have the opportunity to provide comments on the Draft Recommended Network at these meetings, and at other community presentations. In addition, the study team will be directly engaging bus riders with a survey at busy bus stops around the city.

In addition, the City will take any public input and comments on this Draft Recommended Network through the project website until February 14, 2017:

<http://www.richmondtransitnetwork.com>

All of the comments received will be considered before the preparation of the Final Recommended Network.

In February 2017 the study team will also conduct a full Service Equity Analysis, in keeping with Title VI of the Civil Rights Act, to ensure that the Final Recommended

Network does not disproportionately impact low-income or minority residents of Richmond.

The Final Recommended Network will be delivered to GRTC in February of 2017.

What about the long term?

While this plan is about the immediate redesign of the existing transit network, it can and should affect long term planning of the city and its transit system. By defining high frequency transit corridors, this plan can help guide future discussions about where major new developments, and especially affordable housing and job centers, should be encouraged.

Over the next few years, the City of Richmond will likely undertake updates to citywide land use plans. This updated network plan highlights corridors on which transit is most likely to be frequent and therefore useful, for the long term.

In most cities, permanent and frequent transit corridors are places where higher density development can be accommodated, which contributes to transit's success and to economic vitality. This network plan is one step in an iterative land use and transit planning conversation

for the city, which can and should continue indefinitely, helping to build a more prosperous and livable Richmond.