RTA System Redesign Study

JARRETT WALKER + ASSOCIATES

Who are we?

JWA is an transit planning firm founded in 2011

Based in Portland, with a second office in Arlington, VA

Our mission

We foster clear conversations about transit, leading to confident decisions.

Major network design studies in cities such as:

- Houston
- Columbus
- Anchorage
- Indianapoli
- Raleigh
- San Jose
- Dublin, Irel
- Salt Lake C

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Our Team

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What is the System Redesign Study?

RTA has only so much money to run transit service.

This study is about asking the public whether the way service is deployed today matches citizens' priorities.

This week, we'll be designing two alternatives showing network outcomes from different priorities:

- What would the network look like if generating high ridership was our most important goal?
- What would the network look like if geographic coverage is our most important goal?

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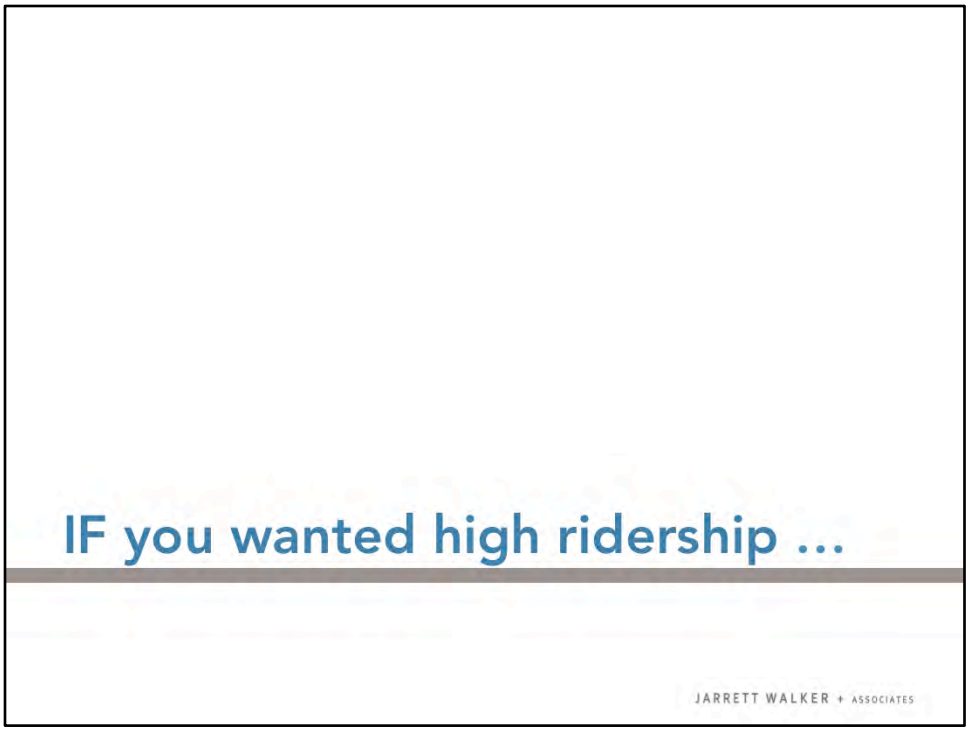
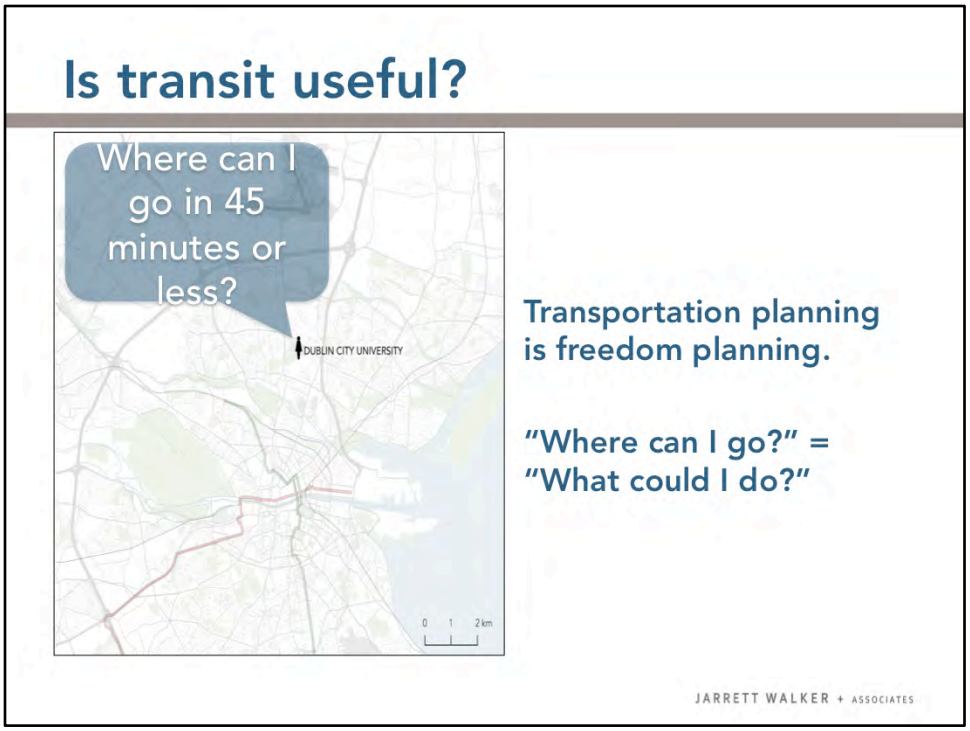
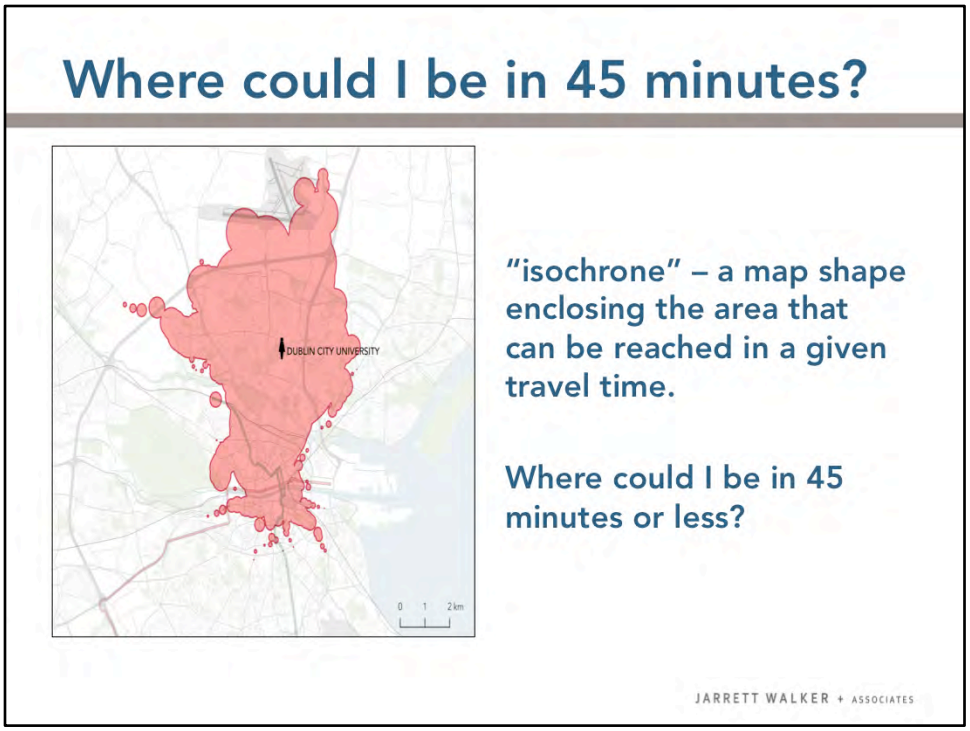


The most important word in this presentation is IF. IF you wanted high ridership, here is what you would do. I am not saying that you should want high ridership. We'll return to that question later.

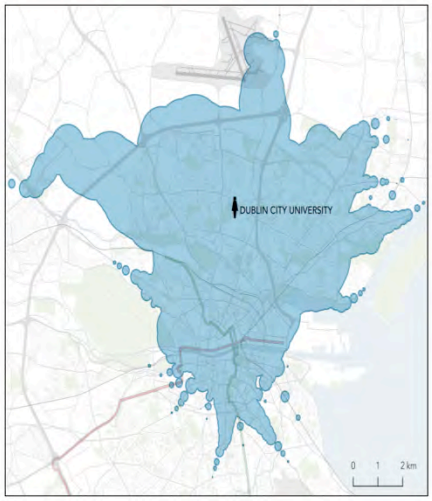


When someone asks this questions, they're really asking "What are my options in life? Where could I work? Where could I study? What organizations could I belong to? Who will I meet?" These questions all boil down to one: "How free am I?" Physical freedom is your ability to go places so that you can do things.



This is an example of a freedom analysis from our current study in Dublin, Ireland. The blob shows where a person living near Dublin City University could get to in 45 minutes on transit plus walking. This is the "wall around her life." In a sense, we are all in prison, where the walls of our prison are the limits of where we could get to in a reasonable amount of time. Beyond that wall are jobs you can't hold, schools you can't study at, and a whole world of things you can't do. We expand freedom in two ways: by moving the walls outward, which is what good transportation planning does, and by building more stuff inside the existing wall, which is what good land use planning does.

Where can I go with the new network?



The differences in the design of the new network produce a different isochrone.

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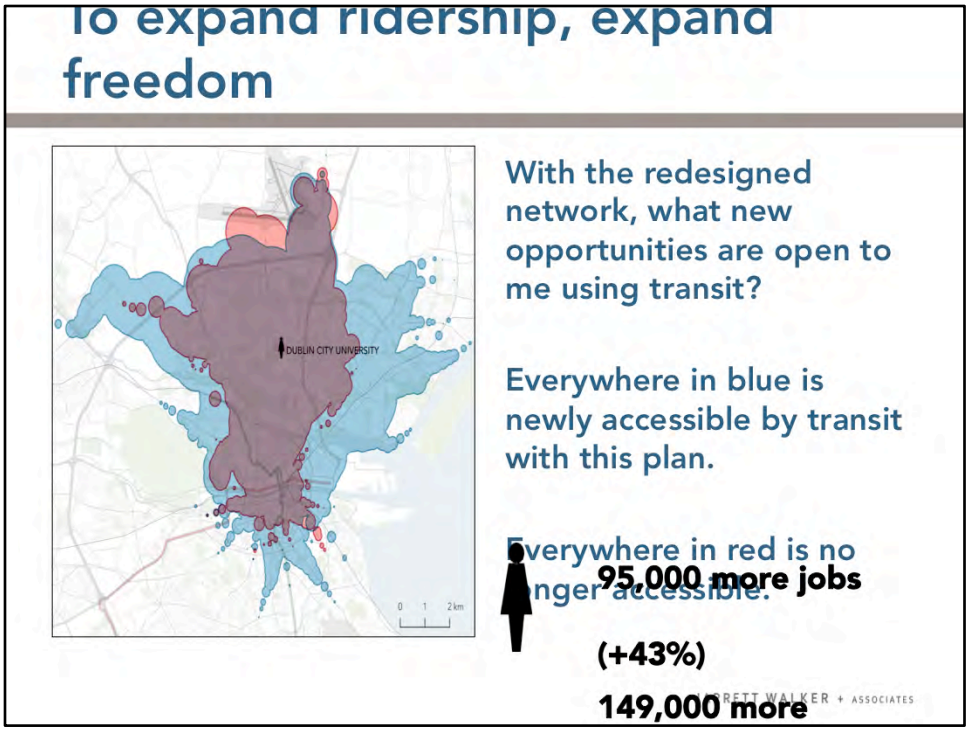
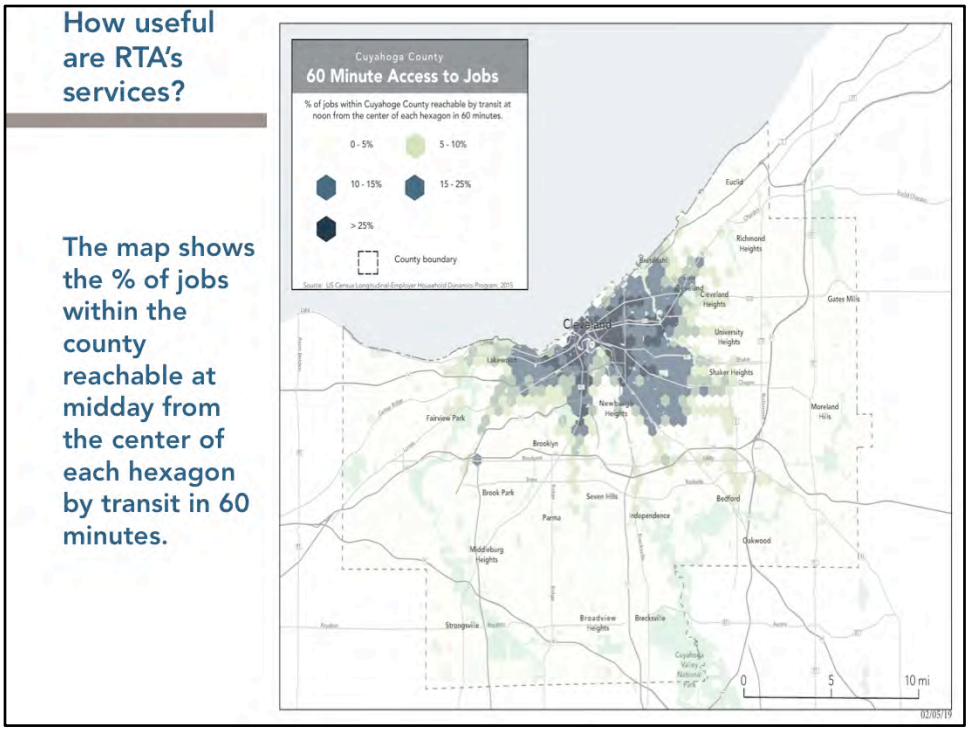
Here is how the blob changes under a proposed redesign.



If Jane can get to 43% more jobs, and if we assume that other kinds of opportunities grows at the same rate, Jane is 43% more free, because she has 43% more meaningful options in her life.



Here's a freedom analysis for the GCRTA area today. For each hexagonal zone, we looked at how many jobs can be reached from there, on transit plus walking, in 60 minutes. The calculation includes average waiting time.

For a proposed service change, we'll be able to show how access to jobs changes, both citywide and for any specific location.

How to design for high ridership?

Provide useful, liberating service …

- Frequent
- Available when you need it (span of service)

… in places where transit can compete for many trips

- Density
- Walkability
- Linearity (transit can follow straight paths)
- Proximity (transit does not have to cross long stretches of empty space)

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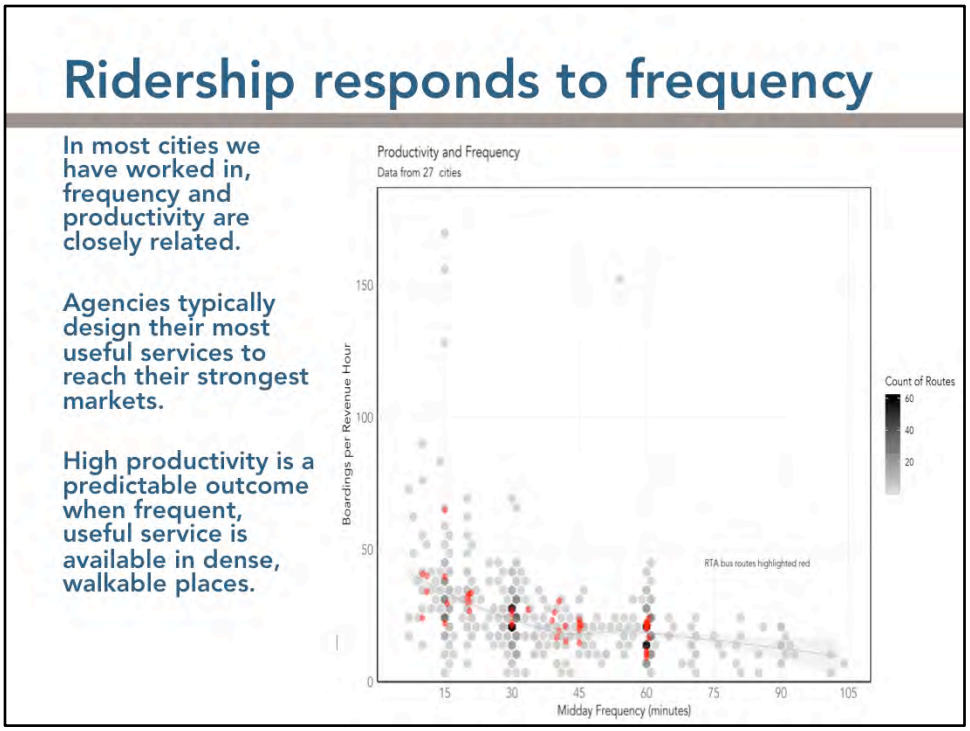
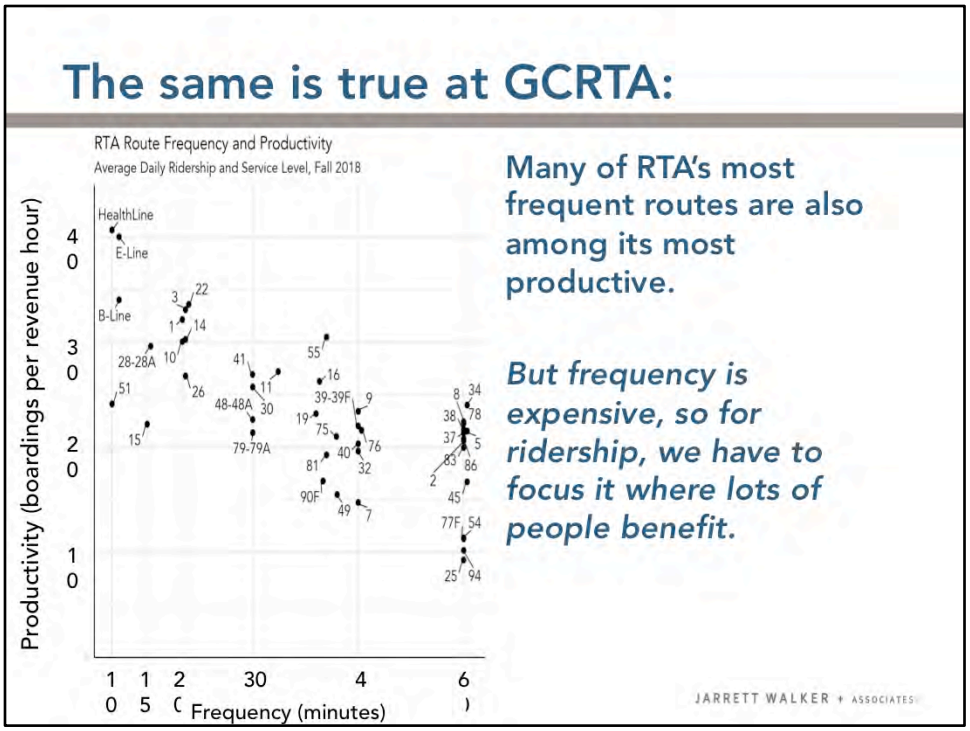
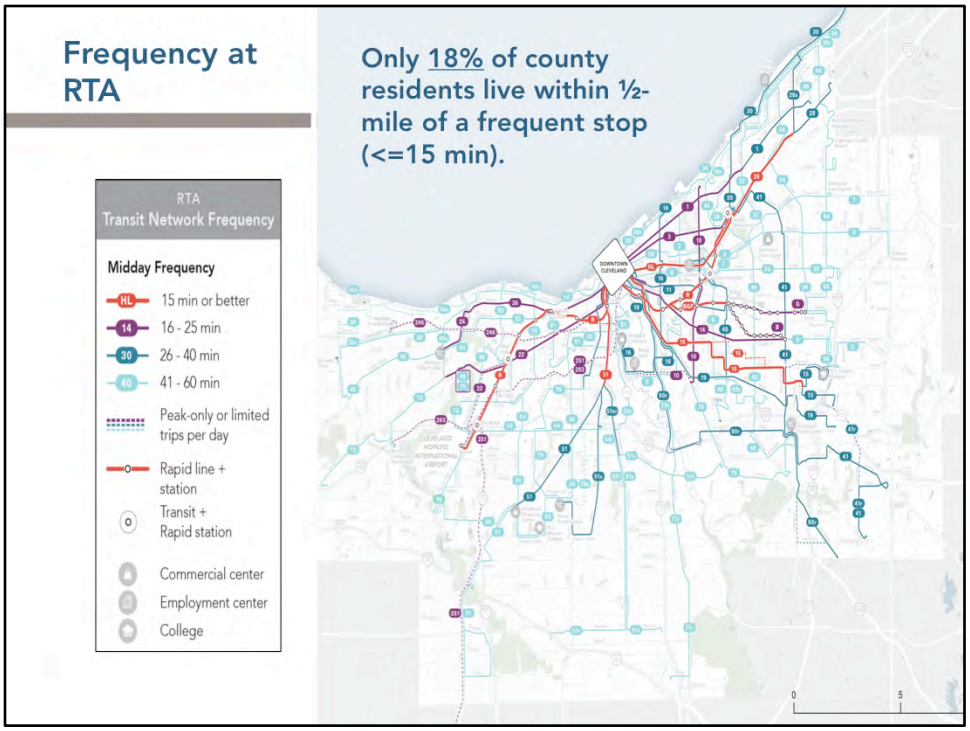


Every time that our firm studies a transit system, we put their route-level data into a database, and the result is this chart. Each dot is one or more routes in some American city. (The red dots are your city's bus routes.) Frequency is on the x axis, with better frequency on the left. The y axis is productivity, ridership divided by the amount of service offered. Note that higher frequency generally correlates with high productivity, and that for frequencies below 15 minutes there seems to be an upward curve. That means that for frequencies of 15 minute or better, we see a nonlinear payoff to frequency.

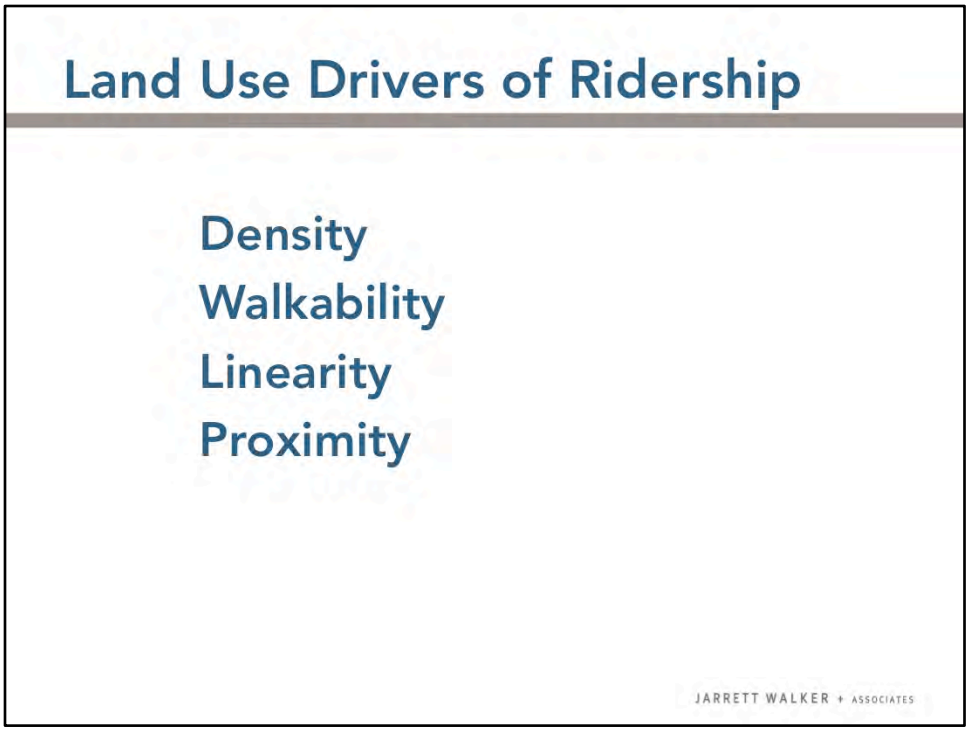


Here's the same chart for your city's routes. Note the similar general relationship.

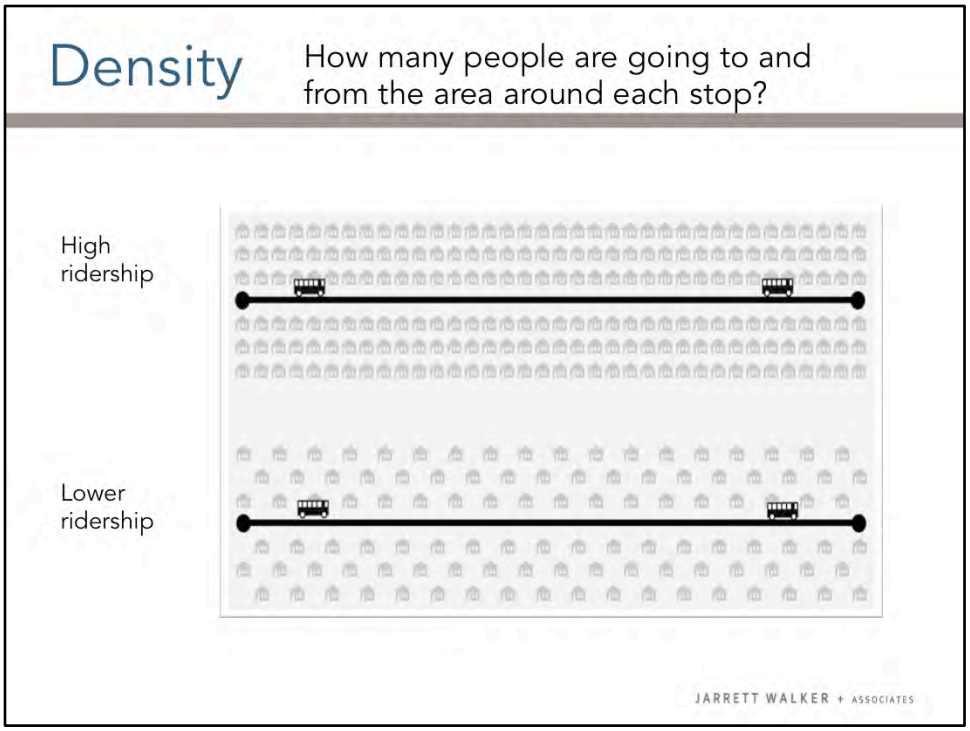


This map shows the current system color coded by all-day frequency. All of the report's maps will be in this style.

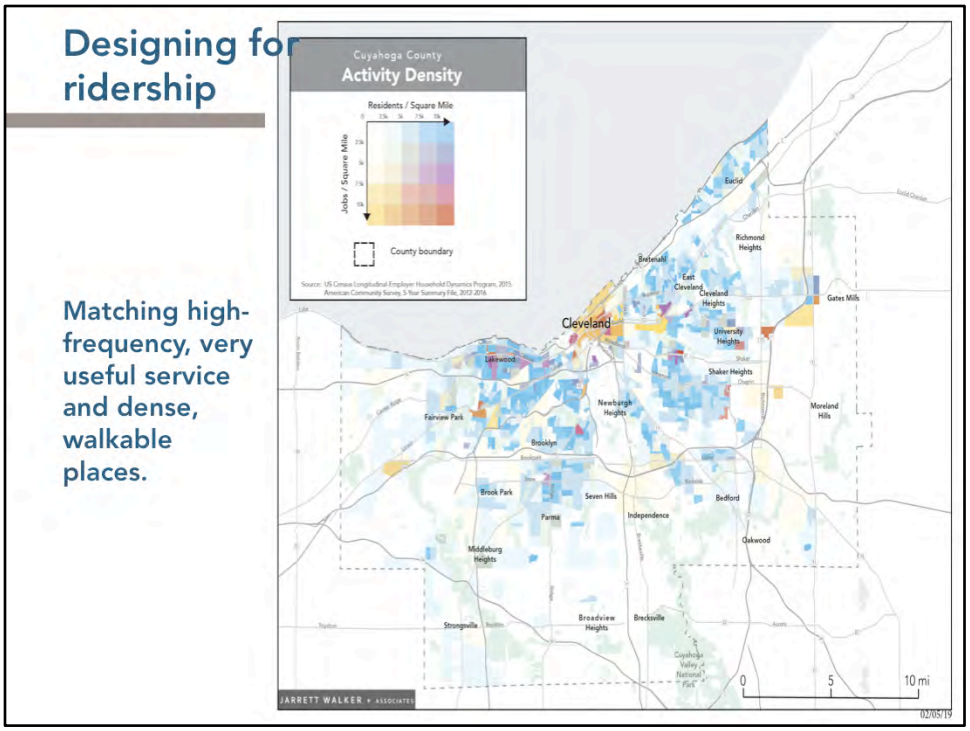
Note that when frequent lines (red) cross, you get a fast connection in many directions, so both lines are useful for going to more places. That doesn't happen much in Cleveland outside of downtown. Many comparable cities have grid patterns of frequent lines, so that there are many such connection points. When we calculate how many jobs people can reach, high-frequency connections tend to raise that number dramatically.



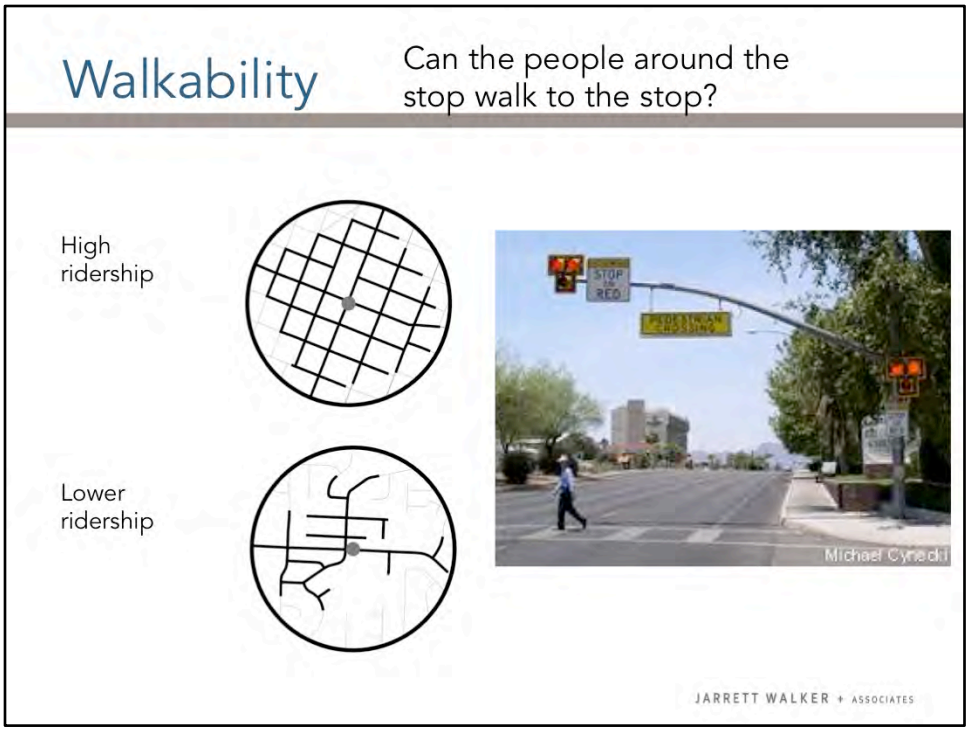
There are four geometric features of a community that matter. Notice that I am not talking about identity or culture. I'm talking about pure, unavoidable geometric facts that arise from how a community and its streets are designed.



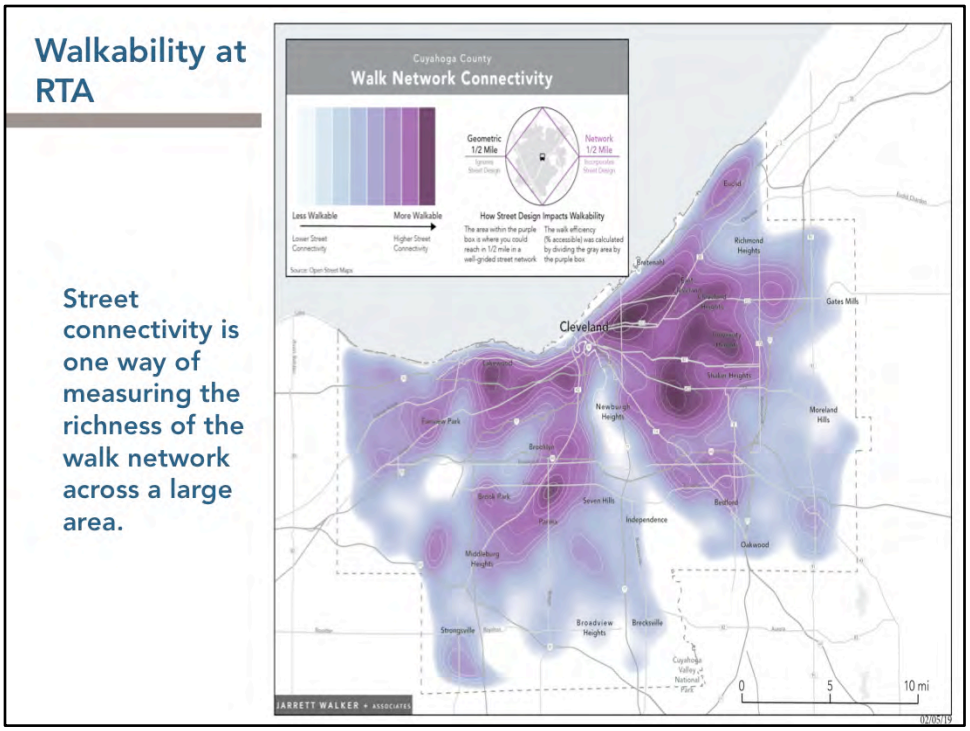
These two bus lines have the same operating cost, because each has two buses running along it. But in the upper image, there are twice as many people around every stop. So if everyone is equally likely to use transit, the ridership/cost would be twice as high in the upper image. In fact, density pays off even more than that, because it often implies other features, such as higher costs and hassle of driving and parking, that mean each person is likely to find transit more useful. So that's two positive relationships between density and transit: Density means a larger market, but also each person is more likely to value transit. That's why the payoffs of density are often exponential, at least until you get to the extreme density of a highrise city where many trips become walk trips.



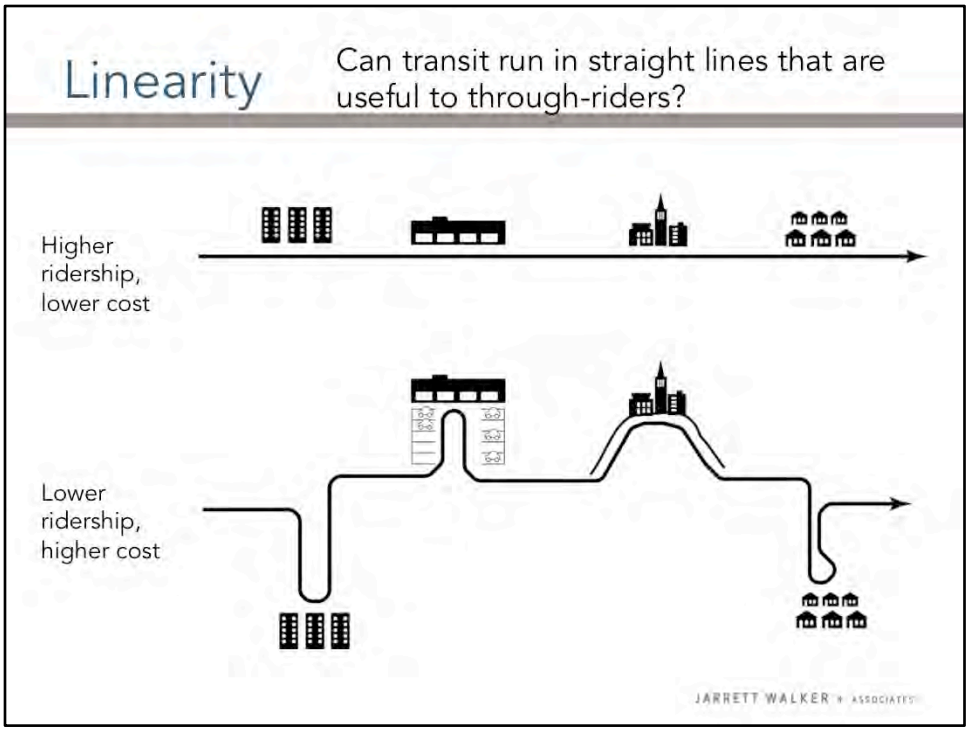
This activity density map summarizes the different kinds of density that matter to network planning. Blue is residential, yellow/gold is employment, red is mixed use, and darker means denser.



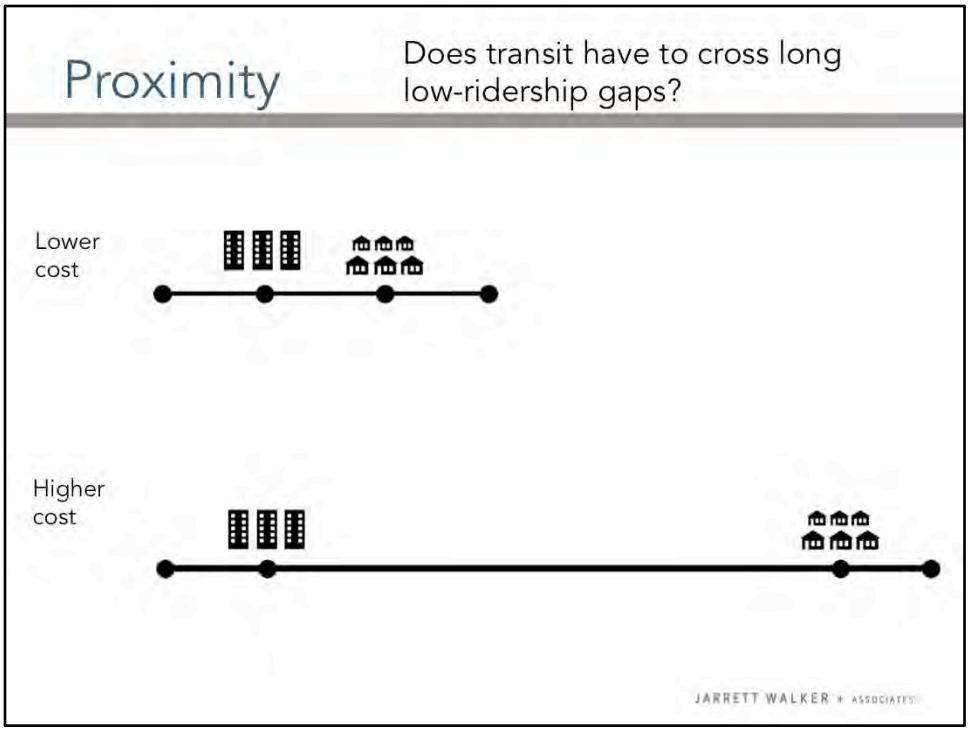
The two images on the left show a bus stop at the center and the abstract 1/4 mile radius that we often think of as the market of a stop. The black lines show places in that circle that could actually walk to the stop in 1/4 mile. A connected grid street network provides much better access to the stop. In the disconnected street network in the lower image, over half of the circle is walled off from the stop. This effectively makes the market smaller, which makes service to the stop a less effective investment for the transit agency. In addition, it must be safe to cross the street at every stop.



This image captures the street connectivity In the RTA area, which is one good measure of the walkability of the RTA area.



Our architecture and development friends understand density and walkability, but they may not all understand linearity, which is a specific need of transit. These two images show two ways that the same four developments could be arranged. In the upper image, they are all in a reasonable straight line, which means that transit can operate on a path.



Finally, all other things being equal, going longer distances costs more than going shorter distances. So sheer horizontal growth, which generates longer average trip lengths, makes transit more expensive and less attractive.

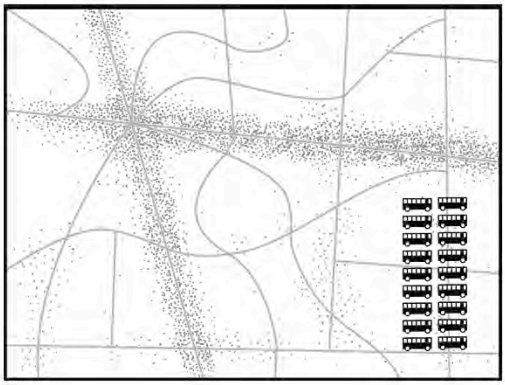
So that's what you would do if the goal were ridership. You'd offer high frequency service focused on areas with good density, walkability, linearity, and proximity. But is ridership what you want?

How should a transit agency allocate its resources?

Fictional Urban Area

Dots = residents and jobs

You have 18 buses



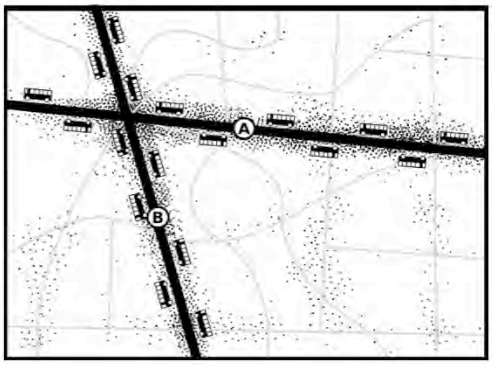
Here's a map of a simple fictional city. The dots are residents or jobs, so dots close together indicate high density. You have 18 buses to deploy. What's the right network design. It depends on the community's goals.

Ridership Goal "Maximum Ridership"

Think like a business, *choosing which markets you will enter.*

The straight lines offer density, walkability, and an efficient transit path, so you focus service there.

Because all 18 buses are focused on few lines, they are frequent.



Performance Measure: *Productivity*

Ridership relative to cost

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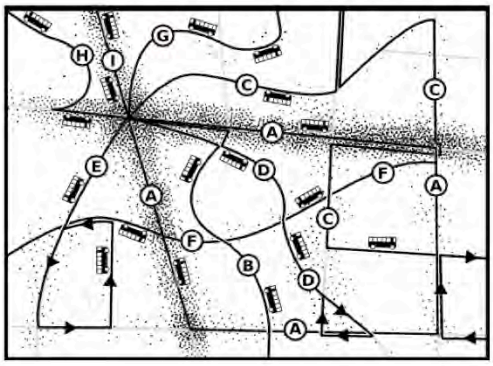
If the goal is ridership, you choose which markets you will enter. You run on the fewest possible streets so that you can afford the highest possible frequency, so that you can take advantage of the nonlinear benefits of frequencies of 15 minutes or better.

But someone living in the SE corner of this city, where density is too low to support high-ridership transit, doesn't like this idea.

Coverage Goal "Some service for everyone"

Think like a government service. Try to serve everyone, *even those in expensive-to-serve places.*

The result is more routes covering everyone, but less frequency, more complexity, and lower ridership.



Performance Measure: *Coverage*

% of population and jobs near some service

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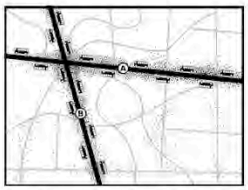
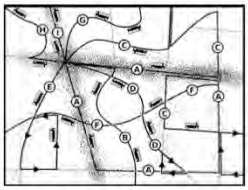
The opposite approach is to start with the goal of maxing service available everywhere. Now we have 10 routes instead of two. As with any resource, *spreading it out means spreading it thin*. So while buses in the Ridership concept might come every 15 minutes or better, these buses come once an hour. The low frequency means not very many people find the service useful, so ridership is low. But service is *available* everywhere. This is the coverage goal: availability, not ridership.

Both goals are important, … but they lead opposite directions!



Ridership Goal

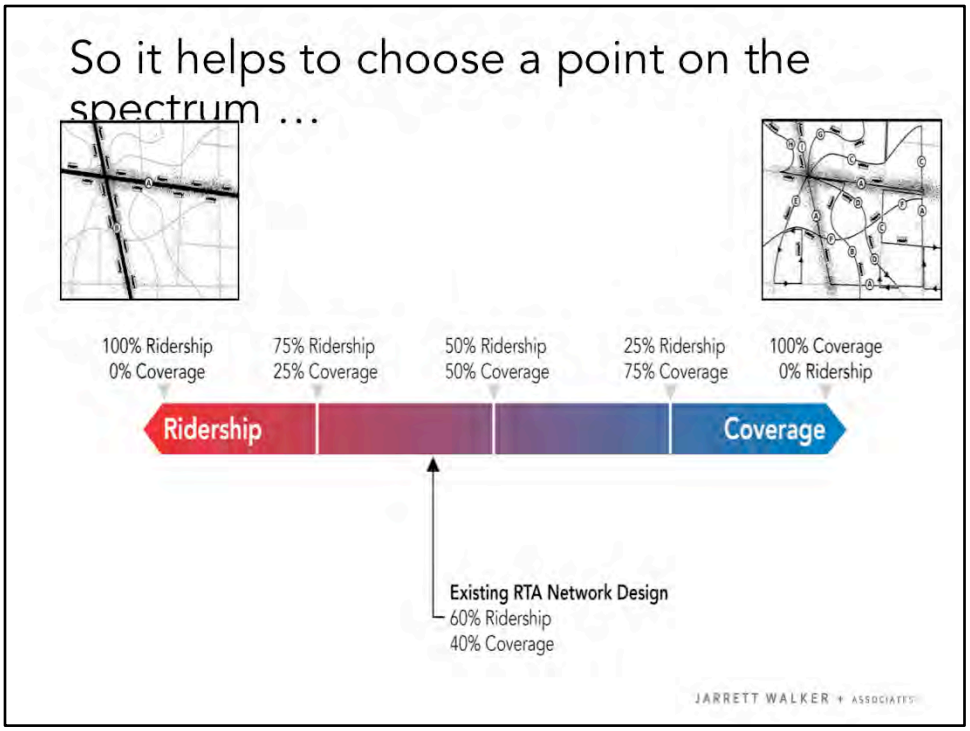
- *"Think like a business."*
- Low subsidy, high farebox return.
- Support dense and walkable development.
- Maximum VMT reduction.
- Protect economy from congestion.



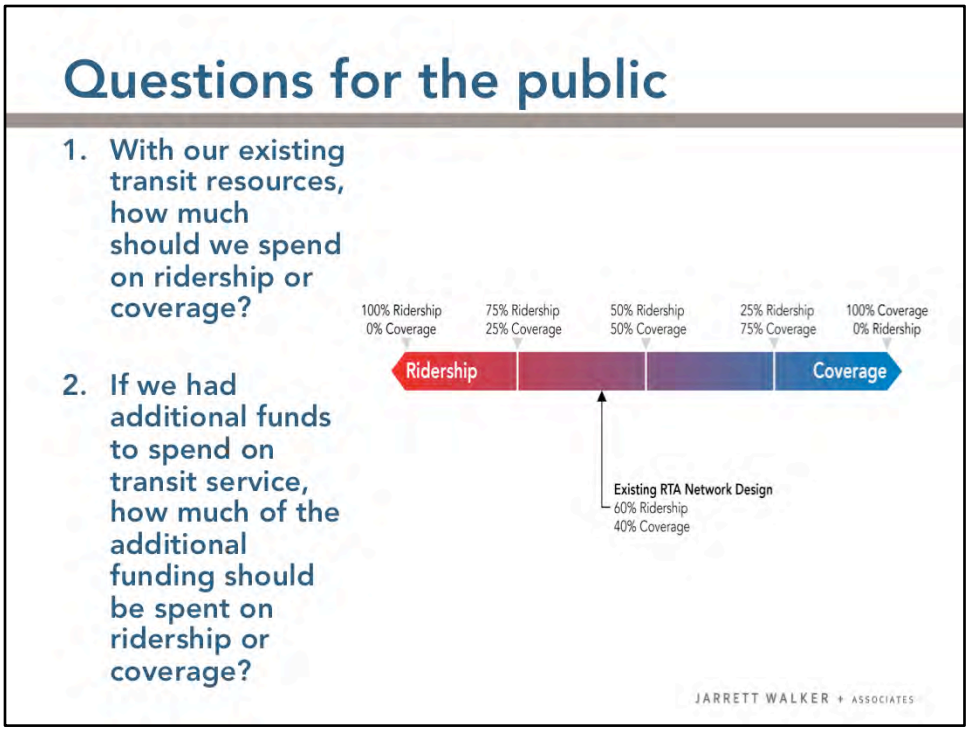
Coverage Goal

- *"Access for all"*
- Support suburban low-density development.
- Lifeline access for everyone, no matter where they live.
- Service to every city or electoral district.

Ridership and coverage goals are universally popular, but because they lead, mathematically, to opposite kinds of network, policy boards and elected officials need to choose what balance they want between them. If you claim to be doing both, you are telling your staff to do something that's mathematically impossible. Impossible demands guarantee failure, and this is one of the reasons that it's easy to mis-describe transit as failing: Coverage services are counted as services that are failing at a goal of ridership, when in fact ridership isn't their goal and is therefore not a valid basis for assessing them.



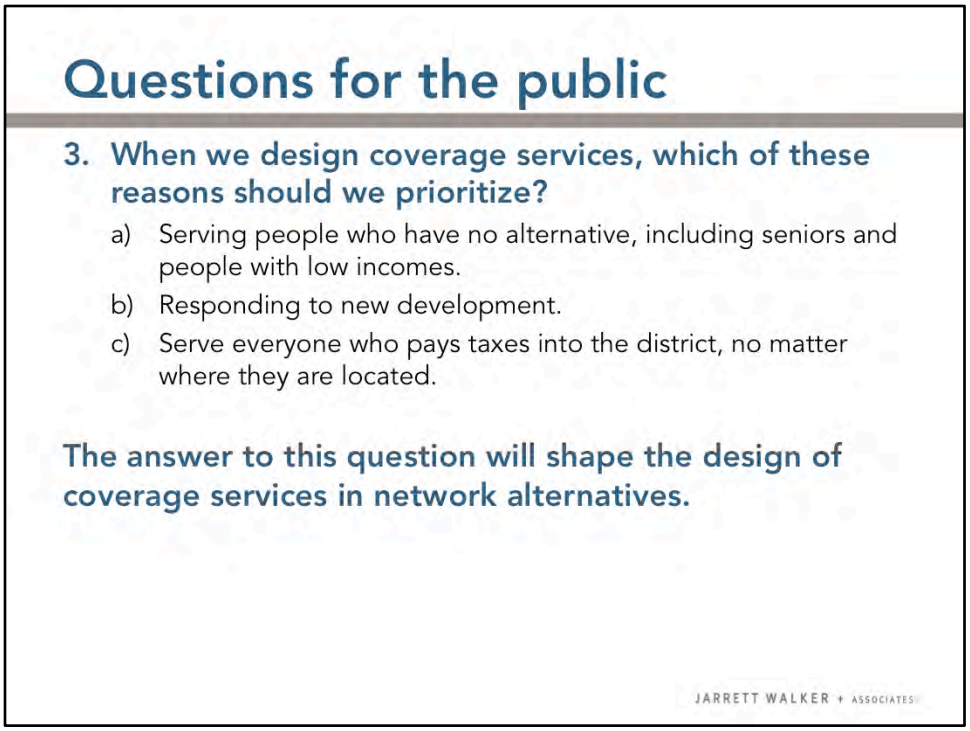
Of course, the ridership-coverage tradeoff is not "either-or". It's a spectrum. You can choose any balance between these two goals, but if you move toward one you are moving away from the other. Currently, about 60% of your transit service is where it would be if ridership were the only goal, so we say that your network is about 60% ridership, 40% coverage.



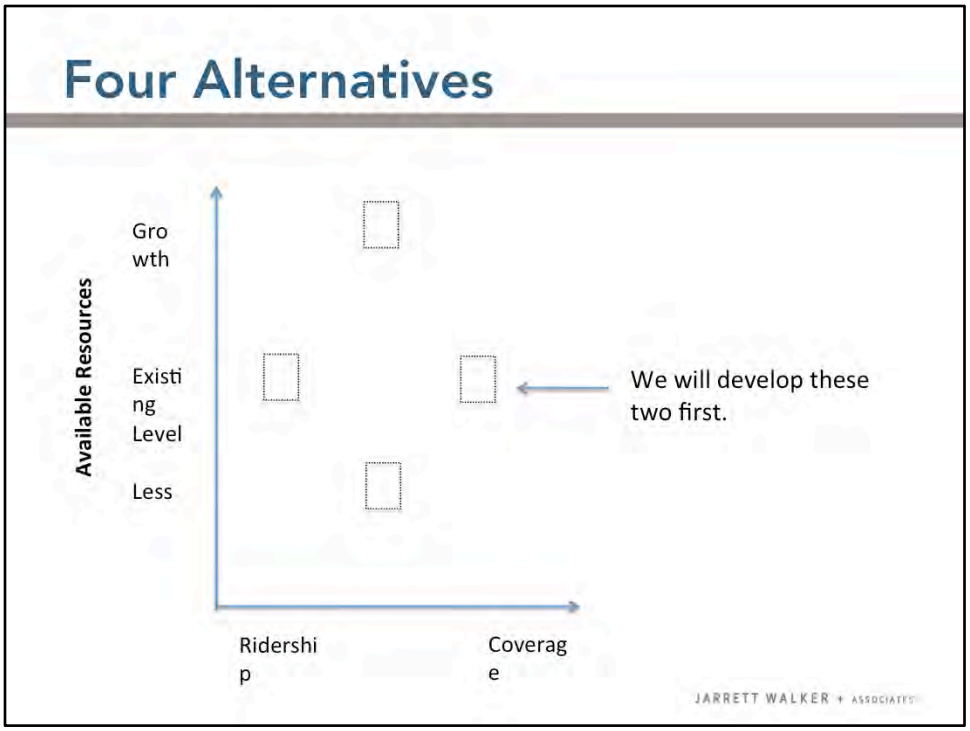
In our current survey, we're asking the public these questions.

In the first question, we assume no growth in the budget for service. That means that if you increase frequency, you must cut coverage, and vice versa.

The second question asks what to do if there were more money for service. Would you add mostly ridership service, or mostly coverage service?

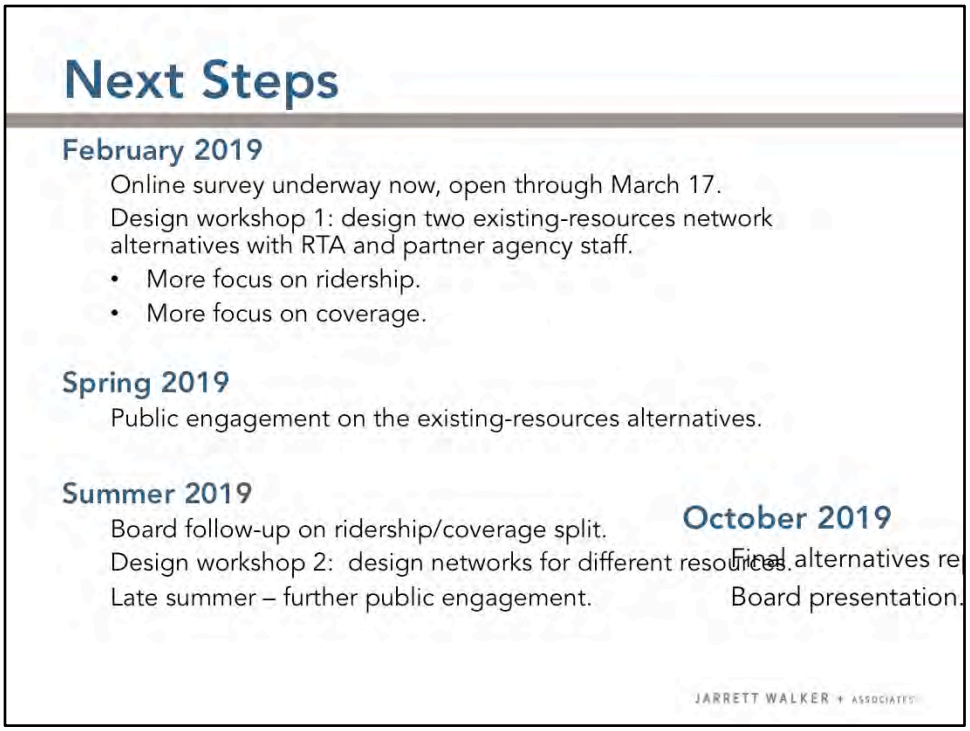


Finally, there's an interesting question about why we run coverage service, which has some impact on how coverage service is designed? Is it to meet urgent social needs? To support new development (such as the new community college off of I-90 near the Lorain County line)? Or does it have to go everywhere in response to the taxes people pay? The last option would lead to the most extensive, and therefore infrequent, network.



In the course of this study we'll sketch four alternative networks. The first two presume the existing budget for service, but illustrate what it would mean to shift the goal toward ridership, or toward coverage. The resulting maps will trigger broader public discussion about what the priorities should be.

Later, we'll sketch alternatives showing what the network might look like if there were more money service, and also one where there is somewhat less.



Here are the next steps that we plan at this time. Note the many cycles of engagement.