Transit Existing Conditions Report

MAY 23, 2022

TriMet Forward Together

prepared by JARRETT WALKER + ASSOCIATES

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Anytime you see a symbol like (A) or (B) in this document, look for the same symbol in a nearby map or image.

1 Introduction

Forward Together: Why This Project Now?

Forward Together is about the design of TriMet's services and schedules: where should the buses go, and when? What should the structure of lines and schedules be? What goals should the agency be pursuing in its service design? Our focus is largely on the bus network since it is the easiest to revise as needs change.

TriMet's most recent systemwide network planning project was the Service Enhancement Plan (SEP) process completed in 2018. Most of the work of developing the individual SEPs happened between 2011 and 2016. The SEPs generated ideas for future bus network structure based on extensive analysis and conversations with the community. The SEP ideas have been the source of many of the service improvements that have been made since then.

Dramatic shifts in ridership and travel demand have occurred since the beginning of the COVID-19 pandemic. The simplest view of the change is illustrated by **Figure 1**, showing the enormous drop in ridership and significant reduction in service since the beginning of the pandemic. The number of riders, the places they are going, and the outcomes the public desire from transit are all changing. For these reasons, TriMet needs to take a fresh look at the network.

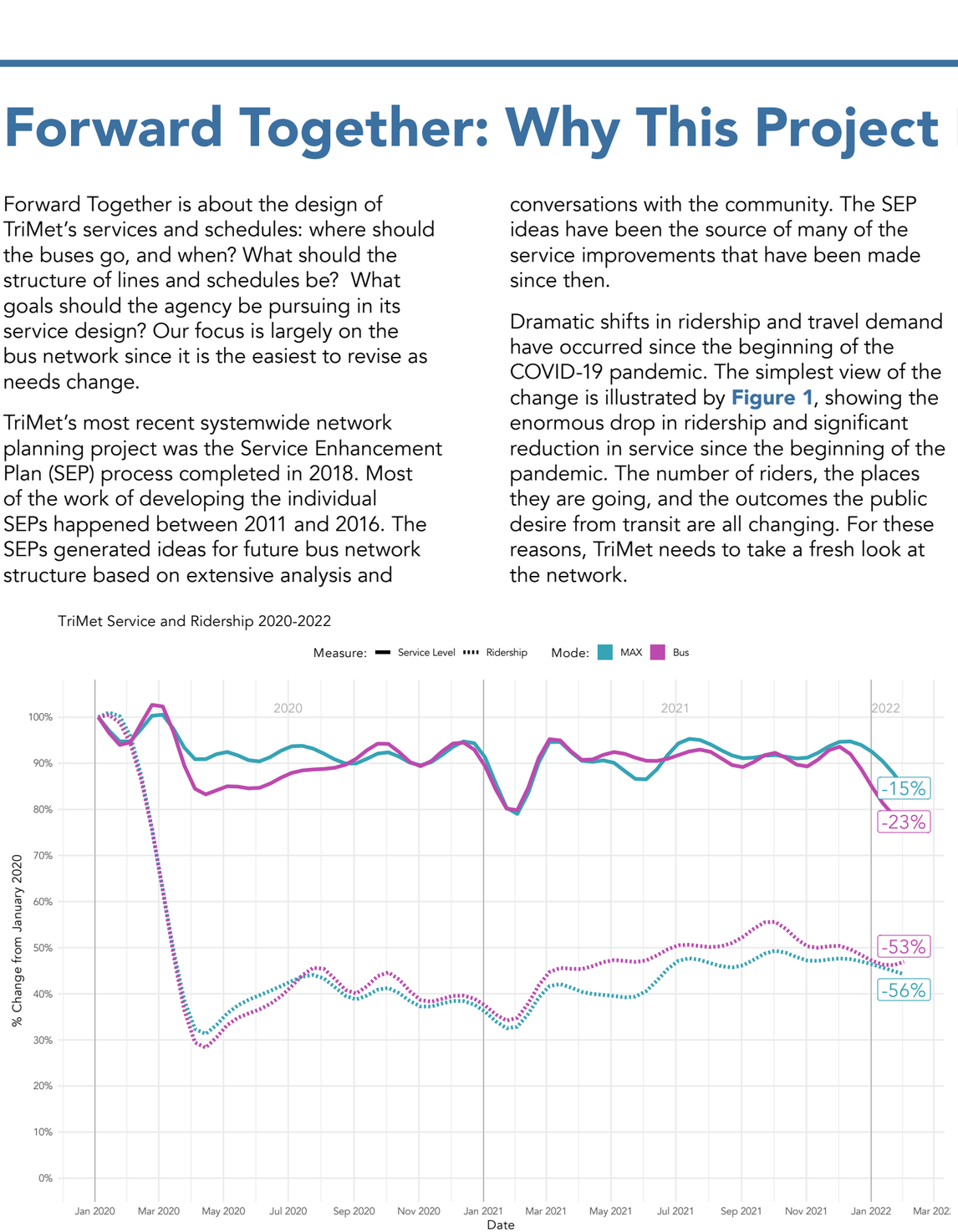


Figure 1: TriMet Service Level and Ridership, 2020-2022

Three Kinds of Change

The last two years have seen abrupt and possibly permanent changes in the life and economy of our region and have raised new questions about what TriMet's priorities should be. Planning forward, we must think about three dramatic changes that have affected TriMet and the communities it serves:

- Changes in Need and Demand
- Changes in Financial Resources
- Changes in Goals and Priorities

With Forward Together, TriMet wants to start a public conversation about how the agency's network should change in the face of all these questions.

Changes in Need and Demand

COVID-19 caused a steep drop in transit ridership that has been returning gradually, but it also changed the shape of transit demand. Rush hour commuting is a much smaller share of our ridership than it was before. What is the future of rush hour demand, which was a significant part of our ridership before the pandemic? Should we prepare for a future in which some office workers no longer commute at rush hour every day?

Changes in Financial Resources

Unlike the SEPs, the Forward Together recommendations will be financially constrained. They will be designed to be financially possible for TriMet to implement in the next three years. This funding level is 9% above the pre-COVID service level, as it accounts for recent Federal assistance and new state funding flowing through HB 2017. It is 32% above the level of service operated now in early 2022, a level that is held down by a shortage of staff. The revenue level assumed in Forward Together is not a statement about how much transit service the region needs or should have; it's merely a description of what, given the current funding sources, TriMet anticipates it can afford.

Changes in Goals and Priorities

The foundation of this effort is the need to update our priorities. Transit plays a central role in many issues that people care about, including urban development, social equity, racial justice, traffic, safety, and climate change. Each of these issues suggests certain priorities for TriMet, but they sometimes push the agency in different directions.

For that reason, Forward Together will develop three alternative network concepts. Each one will consist of a network of proposed lines, specifying how frequently, and at what times, each line would operate. Each concept will be designed to serve one or more popular goals, but they will differ in what their priorities are among those goals. The point is to illustrate to the public several different possible ways that the network could develop – each with clear advantages and disadvantages – so that the community can help TriMet determine which concept should be the starting point for the next changes in its network.

Network Design Goals

About this Document

The Transit Existing Conditions report is about telling the story of today's network: the principles behind its design, its evolution over the past decades, what it does well and where it falls short, and the rapid changes it has endured through the COVID-19 pandemic. This document will serve as a foundation for the rest of the process, providing the baseline that can be used to compare the potential costs and benefits of the network alternatives.

The Transit Existing Conditions Report has 4 sections:

1. This introduction, which covers the project purpose, workplan, and lays out the project approach to goal-driven design and measurement.
2. TriMet's Market, a tour of the key land use, development, employment, and demographic factors that characterize the geography across which TriMet service operates.
3. TriMet's Existing Network. This chapter describes the existing network, its design principles, performance, and how it has changed since the late 2000s recession and during COVID.
4. COVID Travel Market & Trends. This section provides a summary of the key changes in need and demand that have emerged through the pandemic.

Customers

Goals							
	1	**Satisfied riders**	2	**Satisfied community stakeholders and employers**	3	**Supportive broader community**
Objectives	1A	Provide safe service	2A	Improve environmental sustainability and stewardship and reduce TriMet's carbon footprint	3A	Ensure strong support for transit and TriMet
	1B	Increase ridership	2B	Advance mobility for those with limited options	3B	Increase funding for regional mobility expansion
	1C	Improve customer experience, information, and services	2C	Support economic opportunity for all by expanding employee access to jobs and customer access to businesses and services		
	1D	Ensure equitable distribution of services and resources	2D	Help shape the future of cities and our region in line with Metro 2040 Growth Concept		
			2E	Ease congestion by providing attractive travel options during peak periods		

Figure 2: TriMet Customer-Oriented Goals from TriMet Business Plan FY2022-23

TriMet's Business Plan

Transit can serve many different goals. Individual people and communities value these goals differently.

Figure 2 shows the customer-oriented goals in the FY2022 - FY2027 Business Plan[1], which lays out a range of internal and external objectives for the agency. This version of the document is currently out for public comment, but the customer-focused goals are fundamentally similar to prior years.

These goals address a range of widely held values among the public, including environmental sustainability, economic opportunity, equitable distribution of public benefits, reducing congestion, and helping deliver the urban development outcomes of the Metro 2040 Growth Concept.

Some of these goals are only served if many people use transit. For example, transit can only mitigate congestion and reduce greenhouse gas emissions if many people ride the bus rather than drive. We call such goals **"ridership goals"** because they are achieved through high ridership.

Goals related to economic opportunity and equitable mobility are also related to the ridership goal, because for the positive outcomes that affordable, useful public transportation can provide to be widespread in the community, many members of the community must actively use the service.

Other goals are served by the simple presence of transit. A bus route through a neighborhood provides residents insurance against isolation, regardless of whether or not they are able to drive, walk or cycle a long distance. A route may also fulfill political or social goals, for example by getting service close to every taxpayer or into every municipality. We call these types of goals **"coverage goals"** because they are achieved in large part by covering geographic areas with service and ensuring that transit is widely available, rather than by high ridership.

The objectives articulated in TriMet's Business Plan include goals that can only be met by achieving high ridership, and goals that can only be met by providing expansive coverage.

Ridership and Coverage

Ridership and coverage goals are both associated with a range of desirable outcomes, but they lead to opposing approaches to network design with a constrained budget. **Figure 3** is a simple illustration of how ridership and coverage goals conflict with one another, due to geometry and geography.

When transit is designed to achieve ridership, it tends to focus on providing high-frequency service to busy places. Transit designed to be widely available and achieve high coverage must spread those resources out to serve a wider area, so less service is available for high frequency in busy places.

In the fictional area at the top of **Figure 3**, the little dots indicate the presence of people and jobs. The lines indicate roads. Most of the activity is concentrated around a few roads.

A transit provider pursuing only a ridership goal would focus service on the streets where there are large numbers of people. Because service is concentrated onto fewer routes, frequency is high, and a bus is always coming soon. This would result in a network like the one at bottom-left, with all buses running on only two red routes running on the busiest corridors.

If the city were pursuing only a coverage goal, on the other hand, it would spread out services so that every street had a bus route, as in the network at bottom-right. In this example, only one or two buses serve each of the green routes, so waiting times for each route would be longer.

Transit Equity

TriMet is committed to equity across its operations. As the agency's 2019 Title VI Program Update[2] reads:

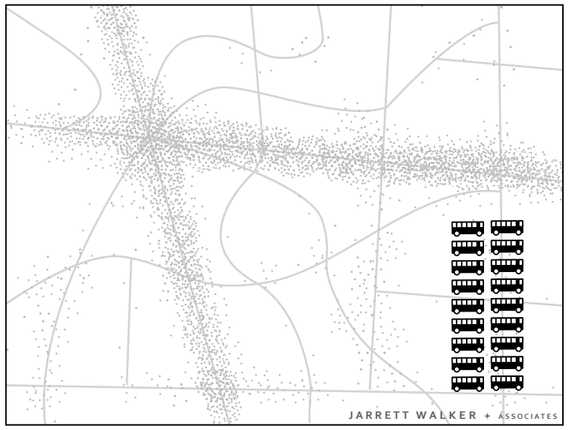
> *Continuing to invest in transit equitably and embracing an inclusive model where equity is a core business objective is critical to TriMet.*

For TriMet, transit equity has three defining elements:

> *Policies that promote the equitable distribution of burdens and benefits*
>
> *Promoting equal access to resources and services*
>
> *Engaging transit-dependent riders in meaningful planning and decision-making processes*

Transit equity goals are embedded within the ridership/coverage tradeoff. One of the challenges that all transit agencies face in planning more equitable service is in defining exactly what the service should be doing, and what more equitable outcomes it should be pursuing.

Should transit become ***more useful*** for disadvantaged populations, reducing the burden of travel time, and potentially cost of vehicle ownership for people of color and lower-income people, and expanding the range of opportunities it can connect them to? This is an equity goal that is embedded within the ridership goal, because it requires a useful service that can attract substantial ridership to ensure that the outcomes it can deliver are broadly felt throughout the community. TriMet's objective of "economic opportunity for all" is an example of an equity goal that requires a useful network capable of generating high ridership.



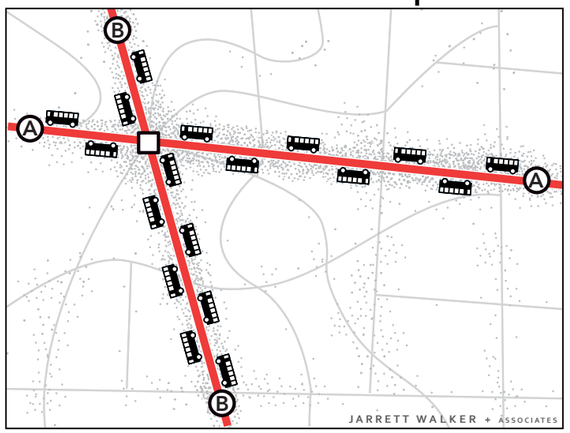
Imagine you are the transit planner for this fictional town.

The dots scattered around the map are people and jobs.

The 18 buses are the resources the town has to run transit.

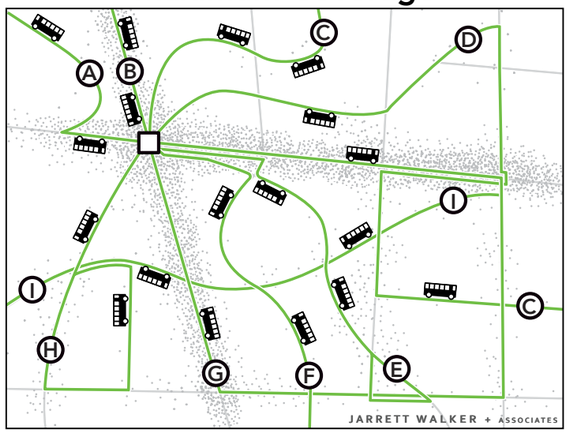
Before you can plan transit routes, you must first decide: What is the purpose of your transit system?

Maximum Ridership



All 18 buses are focused on the busiest area. Waits for service are short but walks to service are longer for people in less populated areas. Frequency and ridership are high, but some places have no service.

Maximum Coverage



The 18 buses are spread around so that there is a route on every street. Everyone lives near a stop, but every route is infrequent, so waits for service are long. Only a few people can bear to wait so long, so ridership is low.

Figure 3: Ridership and Coverage Goals

Illustrating and Measuring Goals

Should transit be ***widely available*** for members of disadvantaged communities, so that everyone that needs transit has access to it? This is a coverage goal, and service designed to achieve it will need to run in places that are unlikely to generate high ridership, to ensure that few people are left behind.

These goals are not always in conflict. It is possible to imagine a network alternative designed to both improve the usefulness and availability of service for disadvantaged groups, and prioritizes these needs first, compared to ridership or coverage-focused services in places with fewer minority or lower-income people. One of the purposes of Forward Together is to better understand which equity goals TriMet should be focused on as it designs service.

Illustrating Goals

While TriMet has only so many resources to run bus service, it has never before conducted network planning within those limits on the basis of a public process informed by a clear sense of goals or priorities. Last decade's major service planning effort, the Service Enhancement Plans, includes a wide range of improvements that address both ridership and coverage goals, at a total cost well above the level of service TriMet is currently able to provide.

The alternatives developed in the Forward Together process will illustrate what it would mean for TriMet's network, with its existing service level, to focus more on achieving a particular set of goals.

For example, what would it mean to focus on transportation equity, providing more useful service to lower-income people, people of color? How would the network look if TriMet sought to serve everyone in the service area? What if the network were designed to focus on climate goals, reducing vehicle miles traveled and getting people out of cars?

Which services would be improved, and which would be reduced, in order to make progress towards those goals?

Forward Together is about illustrating the network changes that TriMet would need to make to focus on goals like these in a concrete way - with specific route maps, and a level of detail that can be rigorously evaluated, to provide the necessary information to support a community conversation about what we want our transit system to do.

Measuring Goals

A clear conversation about transit goals demands a clear set of measurements that can help explain the potential impacts of changes to the transit network. Transit agencies like TriMet are awash in performance indicators and are compelled by federal regulation to document the performance of their service in incredible detail, focusing on measures of ridership, service cost, efficiency, reliability, and many others.

These measurements help TriMet manage service, but they are not the ones we need to have a clear conversation about the goals and priorities for transit service planning. For that, we need a suite of measurements that are focused on people and places, and how transit service can be relevant to them.

Planning in pursuit of a more equitable distribution of benefits and burdens also requires the capacity to measure those outcomes. In TransitCenter's 2021 *Equity in Practice*[3] guidebook, two sets of equity measures are identified:

- Place/neighborhood-focused measures showing outcomes for defined areas of need.
- Person-focused measures showing outcomes for people of certain identities.

We break measurement of transit goals into two groups: measures of transit's potential usefulness, and measures of its availability. These measures are applied at the person-level, describing outcomes for people throughout the service area, and at the place-level, describing outcomes within particular areas, and using detailed maps to visualize how outcomes vary across the service area.

Different types of measurements help us understand whether we are meeting our transit goals. These measures fall into two groups:

- **Measures of Availability - Where is transit service? Who is near service? Which areas lack service? Are transit operating resources distributed equitably?**
- **Measures of Usefulness - What can you reach using transit? Who is transit more or less useful for? Are the mobility benefits of transit distributed equitably?**

Measures of Availability

Some of the goals described on the last page require transit be widespread throughout the community, including goals related to providing service to every part of TriMet's district; to ensuring that a basic affordable mobility option is present in all parts of the community; or to ensuring that TriMet's resources are distributed equitably.

These goals are primarily measured by determining which people, jobs, or significant destinations are near service; when that service is available; and the quantity of service provided.

Coverage-focused availability measures

In a network design process, it is very common to evaluate the impacts of a given change on the "coverage" of the transit system. By coverage, we mean the number of people within a given distance of service - typically either 1/4-mile, or 1/2-mile. When service expands to new areas, the number of people covered increases. An important measure of the impact of a coverage-focused network alternative is how many more people it puts near service than other options.

Ridership-focused availability measures

Availability measures are also important to evaluate network plans oriented towards generating high ridership. Because Frequent Service bus lines tend to be the most useful

routes, generating the most ridership (and carrying the majority of TriMet's bus passengers), measuring the number of people and jobs who have access to high-frequency service is one way to gauge the ridership potential of a particular set of network changes.

Equity-focused availability measures

Measures of availability can be applied to both place and person-focused equity analysis, focused on questions about the distribution of service resources across the service area, or within the equity area identified through TriMet's 10-factor index.

Finally, availability measures are fundamental for the service equity analyses transit agencies conduct as part of their compliance process with the Civil Rights Act of 1964. TriMet's Title VI policy for evaluating Disparate Impacts of major service changes on minority populations is an example of a common way availability measures are used in transit planning. When a major service change happens that produces a decrease in the amount of transit service, TriMet analyzes whether the percentage of minority population living within 1/4-mile of the affected line exceeds that of the service area as a whole.

Measures of Usefulness

Many of the goals described on the last page require transit be useful; that it presents a convenient, reliable travel option that lots of people will choose. Unlike measures of availability, which show how service is distributed, measures of usefulness look at whether that service is actually likely to take people where they need to go.

As the TransitCenter *Equity in Practice* guidebook notes, a "proximity analysis looks at who lives near transit, but this can be quite different from who benefits from transit".

To measure the performance of the existing network or proposed changes towards these goals, we need to use methods that focus on factors like waiting, speed, and travel time. Three of the most common ways to do this are *travel time analysis, access analysis*, and *ridership modeling*.

These are related methods that can be used to understand how a set of changes to a transit network could change its potential usefulness for riders. Each of them depends on a model of the network that can be used to develop trip plans, based on a different set of routes, running at different speeds and frequencies, over different spans of service.

For example, imagine a network change that upgraded TriMet's Line 87-Airport Way / 181st to high-frequency service (an idea present in TriMet's Eastside Service Enhancement Plan). Today, Line 87 runs about every 35 minutes. With a Frequent Service upgrade, it would run every 15 minutes. Any trips along Line 87 would become faster because of the reduced waiting time required.

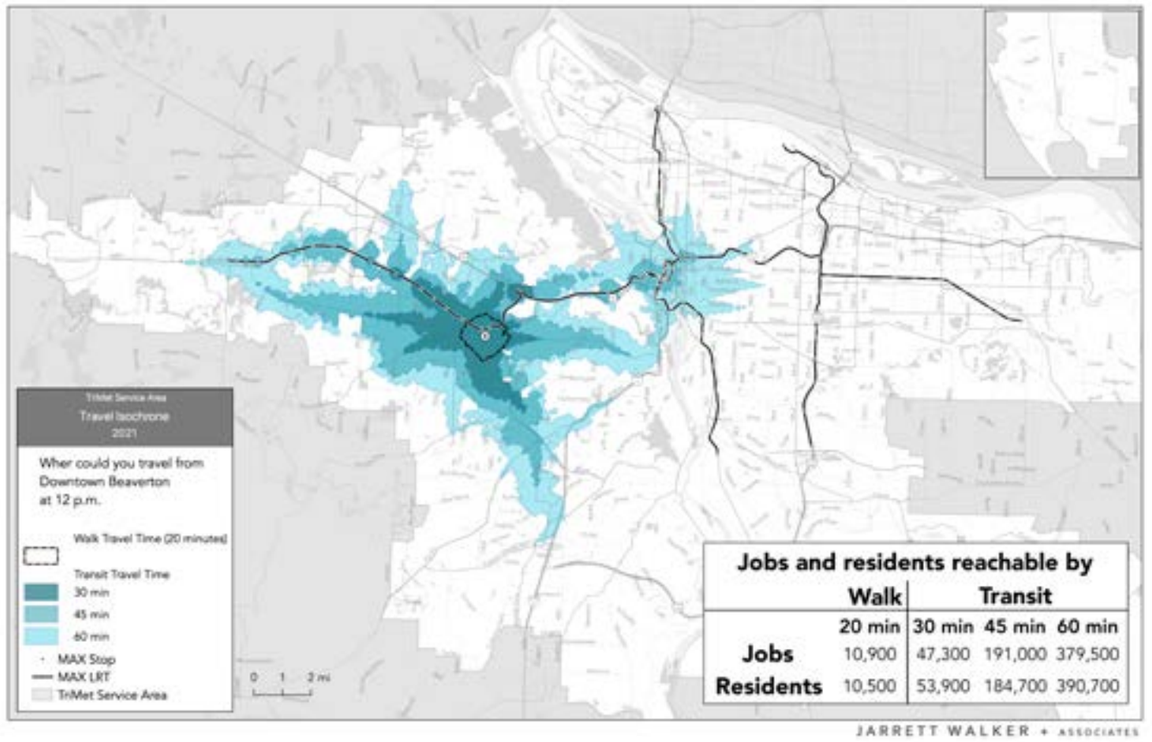


Figure 4: Transit isochrone from Downtown Beaverton

Travel time "isochrones" show an area on a map that is reachable from a starting point in a certain amount of time. Many measures of usefulness depend on isochrones to analyze the number of jobs or other destinations that are reachable on transit.

Travel Time Analysis

Travel time analysis is the most straightforward of the three measures of utility. Simply put, travel time analysis compares how long trips take with the existing transit network and proposed changes.

In a travel time analysis, we can show the impact of changes like a frequency improvement on specific trips. Sometimes, this involves developing a matrix showing the travel time between a set of significant destinations with different transit alternatives. Another common application is to compare travel times using trips between zones, like the US Census Longitudinal Employer-Household Dynamics (LEHD), which measures the flows of workers between their homes and workplaces.

Whatever trips are analyzed, travel time analysis is always about comparing alternatives' impact on specific trips between specific places. This can help us understand the potential impact of a proposed network change on existing travel patterns, existing riders, and connections between important places that lots of people need to move between.

Access Analysis

If travel time analysis is about questions like "will my trip be faster or slower?", access analysis is focused on questions like "where can I go on transit in a reasonable amount of time?". Where travel time analysis shows the impact on specific trips that the existing network makes possible, access analysis helps to understand the range of trips that would be possible with transit.

For customers, the decision to take transit revolves around one key question: where can it take me? If transit can't get you where you

need to go in a reasonable amount of time, by the time you need to arrive, it is unlikely to be an option that you consider if you have other more convenient alternatives.

Access analysis is often used to address questions like these:

- How many jobs could the typical resident reach in 30, 45 or 60 minutes?
- What are the places in the region where transit is most useful to reach jobs? Where is it less useful?
- How many fewer jobs are reachable on Sundays than on weekdays?
- What percent of the region's residents are within a 30-minute transit trip of a grocery store?
- How many people have access to at least some baseline number of jobs or key destinations?
- How does transit usefulness for reaching jobs or destinations vary by race, ethnicity, income, or other demographic characteristics?

In access analysis, we aren't looking at specific trips, or existing travel patterns. We are analyzing how much stuff the transit network can take you to.

Ridership Modeling

Ridership modeling can be thought of as an elaboration of the previous two methods. Rather than simply comparing travel times, or calculating the range of places reachable, ridership modeling adds a behavioral element to evaluate whether a particular set of network changes will result in more or fewer people riding transit.

Ridership modeling is critical in major infrastructure projects, where the ridership return on capital investment is often an important precondition for federal funding.

Equity Applications of Usefulness Measures

Because transit's core benefit is the mobility it can make possible, usefulness measures are important to understanding how those benefits are distributed throughout the community. All three of the types of measures of usefulness described here can be applied to equity analysis. For example, travel time analysis can be used to compare the travel times experienced by members of disadvantaged groups with those of people outside of those groups. Access analysis can be used to compare job access for people living in equity areas and non-equity areas. Ridership modeling can provide insights into who is likely to be using a particular service improvement or infrastructure project.

Sorting Goals and Measures

Figure 5 summarizes how availability and usefulness measures can be applied to ridership, coverage, and equity transit planning goals. This is not an exhaustive list of measures that could be used in this process; it is likely that additional metrics will be identified through the public engagement process to help evaluate the network alternatives. But regardless of the precise measures employed, it is important to evaluate each goal with measures that speak to the outcomes those goals are intended to deliver.

	Example Availability Measures *Where is transit service?*	Example Usefulness Measures *Where can you go on transit?*
Ridership Goals	• % of population and jobs near Frequent Service • % of key destinations or job centers near Frequent Service	• Median number of jobs reachable by residents • % of residents within 30/45/60 minute trip of key destinations • Travel times betweeen key destinations • Estimated number of daily/ weekly/annual riders
Coverage Goals	• % of population and jobs near transit service	• % of population with access by transit to at least x number of jobs
Equity Goals	• % of disadvantaged people near Frequent Service and any service • Title VI Disparate Impact measures • Coverage and presence of transit service and Frequent Service in identified equity areas	• Median number of jobs reachable by disadvantaged populations • Demographic distribution of access • Job and destination access in identified equity areas, compared to other parts of the region

Figure 5: Goal-driven measurement

Forward Together Schedule

Figure 6 shows the timeline for the Forward Together project. This existing conditions phase was conducted concurrently with the first phase of engagement, focused on transit goals.

This first phase of engagement has three main elements:

- The inclusion of questions related to the ridership/coverage tradeoff in TriMet's attitudes and awareness survey, a general survey about the agency and its service that is administered to a statistically valid sample of the region's residents.
- A web survey on the Forward Together website that goes into greater detail on the goals and tradeoffs described in this document.
- Additional engagement with key community partners working with hard-to-reach communities designed to understand the needs and desires of their constituents.

In late Spring 2022, TriMet will design three alternatives focused on illustrating design goals that emerged from the first phase of outreach. These will be presented to the public in Summer 2022 in an effort focused on the goals and values they believe should go into service planning. The network alternatives will help to clearly explain the costs and benefits of each option.

The Final Report detailing the future service recommendation will be developed in Fall 2022 based on the input received in the Summer Phase 2 engagement process. This is not about picking a single alternative as "the" future service recommendation; instead, it will synthesize the feedback received in the engagement processes into a set of lessons for TriMet to carry forward into its future service planning efforts.

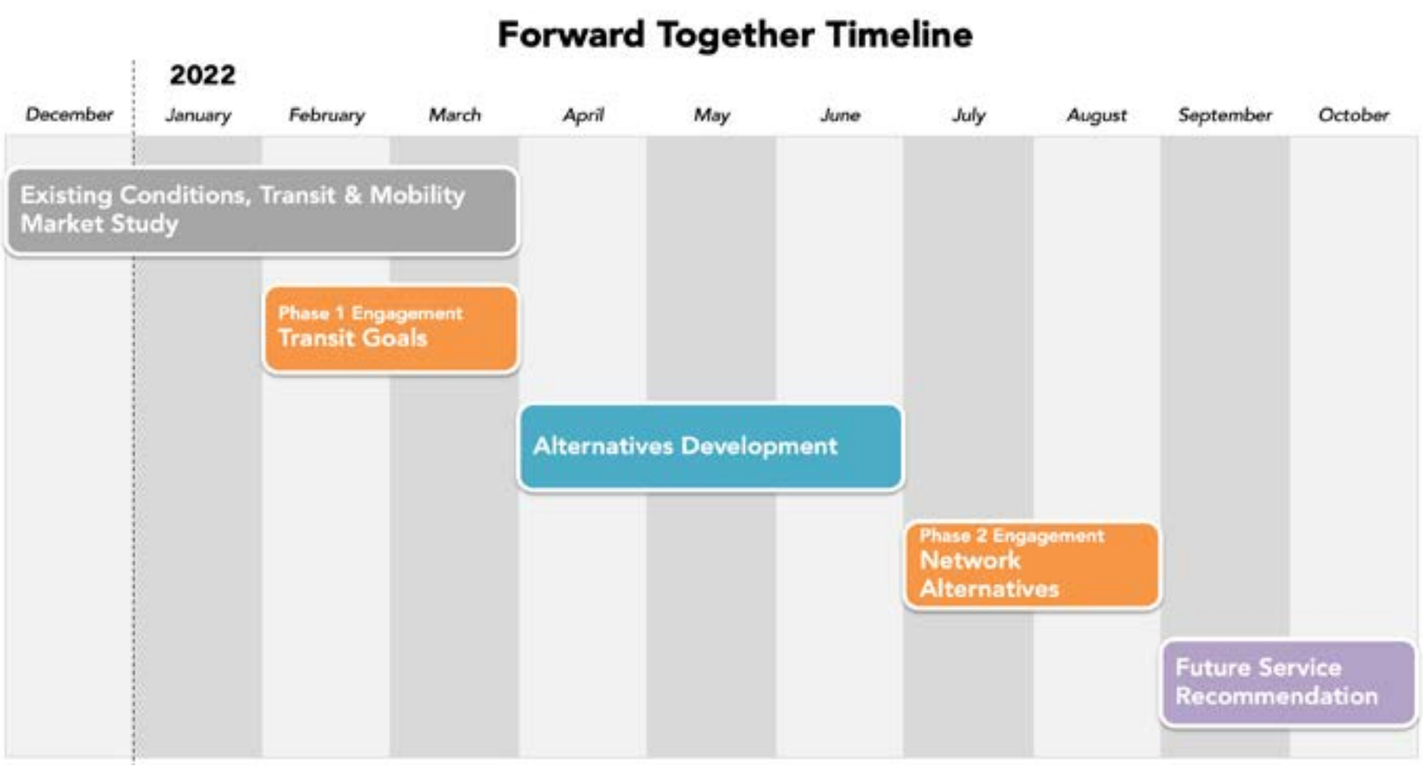


Figure 6: Forward Together Timeline

TriMet's Forward Together process will run through most of 2022, concluding with a final report and future service recommendation in the fall.

2 TriMet's Market

Evaluating the transit market

In this chapter, we present and discuss data that informs three different types of considerations in transit planning:

- **Where are the strongest markets for transit, with potential for high ridership and low operating costs?**
- **Where are there moderate or severe needs for transit, where coverage services may be important even if they do not attract high ridership?**
- **Which areas are likely to be a focus of efforts to improve transit equity and the distribution of the benefits of service?**

A "strong transit market" is mostly defined by *where* people are, and how many of them are there, rather than by who people are. We learn about transit needs mostly by examining *who* people are and what life situation they are in.

This chapter is focused on identifying the land use and demographic indicators that are most relevant to the Forward Together process. It is not meant to provide a comprehensive overview of the demographics and recent changes across TriMet's service area.

Measuring Demand and Need

The maps and diagrams on the following pages help us visualize potential transit markets and needs:

- **Residential density**
- **Job density**
- **Activity density** (combined residential and jobs)
- Maps of **walkability** (evaluated in terms of street network connectivity)
- Residents' **proximity to jobs.**
- Density of **Lower-Income People**.
- Density of **Residents by Race and Ethnicity.**
- Density of **Zero-Vehicle Households.**
- **TriMet's Equity Index.**

About the data used in this chapter

The maps displayed in this chapter rely on data from two main US Census sources:

- The American Community Survey (ACS) 2015-2019 5-year estimates, which provides a demographic profile of all areas of the county at a high level of geographic detail.
- The Longitudinal Employer-Household Dynamics (LEHD) program, which provides public-use information combining federal, state and Census Bureau data on employers and employees.

While 2020 Census data are now available, we do not rely on it for much of this analysis for several reasons:

- Serious concerns[4] have been raised by voices in government, media, and academia about the potential of undercounts particularly impacting minority and low-income communities.
- Serious concerns have been raised by voices in media[5] and academia[6] about the Census Bureau's new "differential privacy" methodology, which adds intentional error and obscures the actual enumeration for all geographies.
- The decennial census does not include detailed questionnaires on topics like poverty and vehicle ownership relevant to transit network planning.

The issues related to potential undercounts, as well as the injection of error of the differential privacy approach both have implications for the utility of 2020 Census small area data (census blocks, block groups and tracts), particularly in small areas that have few residents.

Because the debate on these issues is ongoing, we choose to rely mainly on the ACS for the purposes of this analysis, employing 2020 Census data only to create maps of the change in total population by block group between 2010 and 2020.

Population Density

Anyone who travels makes at least one round-trip from their home each day, so places where more people live are also places where more people could choose to ride transit. This makes residential density an essential consideration when thinking about the transit market and where to locate service. **Figure 7** shows a map of residential density (people per square mile) in the TriMet service area.

This map only represents one side of the overall transit market. The other half is where people go once they leave their homes, such as offices, schools, universities, retail, and recreational areas.

Around 16% of residents in the service area live in areas where residential densities exceed 10,000 people per square mile. Most of the highest residential density is concentrated in Portland, specifically downtown, but there are other key clusters in Southeast Ⓐ and Northeast Ⓑ Portland. Population density exceeds 6000 residents per square mile across most of Portland west of I-205 and east of the West Hills, as well the central area of East Portland between SE Foster Rd and E Burnside St Ⓒ.

Outside of Portland, population density is typically lower, and high-density places are more limited in extent. On the west side, density is highest near regional centers like downtown Hillsboro Ⓓ , Beaverton Ⓔ, and Tanasbourne Ⓕ .The highest-density areas of the west side of the region are all located west of Highway 217.

On the east side of the region outside of central Portland, some of the highest-density areas are near the MAX Blue Line, and in Clackamas near the southern end of the Green Line Ⓖ. South of the Clackamas Town Center / Harmony area, population density is moderate along the McLoughlin corridor Ⓗ and in Oregon City Ⓘ.

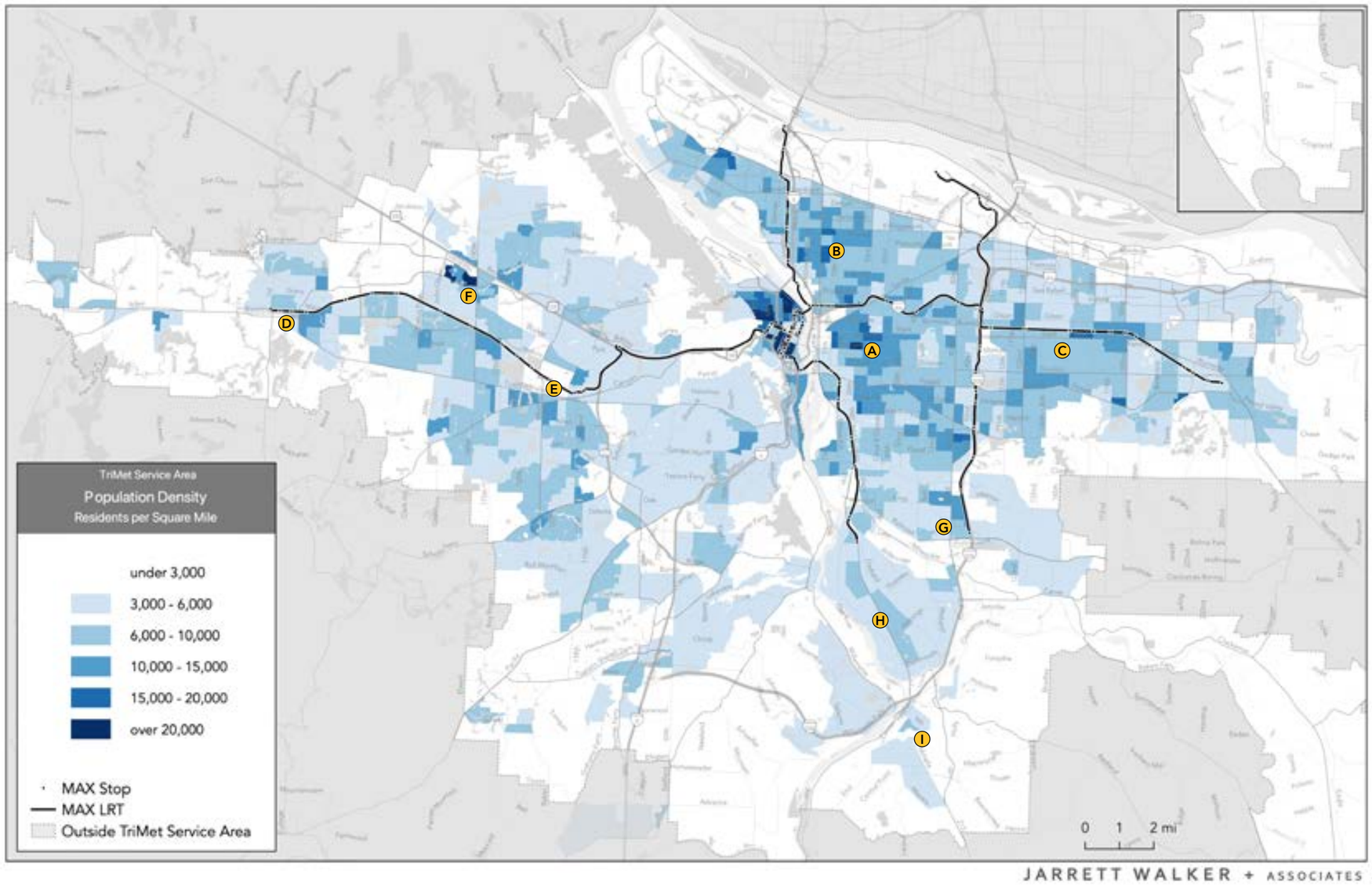


Figure 7: Population Density in the TriMet Service Area
ACS 5-Year Estimates, 2015-2019

Job Density

Figure 8 shows the density of jobs throughout the service area. Job density shows us not only the places people could travel for work, but also places people could go for services, shopping, health care, education, and all other activities that involve employment. ***A person's workplace may be, throughout the day, a destination for dozens or even hundreds of people.***

The region's largest job center is found in Downtown Portland and the surrounding areas (including the Lloyd District, OHSU, the Central Eastside and Northwest Portland). This area is home to a wide variety of job types, with many office, industrial, service, and retail businesses located within the core. Downtown is also the employment area that has faced the greatest challenges throughout the pandemic, and some of the traditional notions about the job center are now being reconsidered. For more information on this, look at Chapter 5 which examines COVID-era changes in demand.

Other key employment clusters in Portland include the industrial area of Swan Island Ⓐ, as well as retail, medical and service-driven hubs at Gateway Ⓑ and Hollywood Ⓒ. While not as intense as these job centers, employment density is also higher along major frequent bus corridors like E Burnside, N Williams, and SE Division.

Outside of Portland, employment density is highest along the Highway 217 corridor Ⓓ, extending west towards Hillsboro. This corridor is home to multiple shopping centers, hospitals, and industrial areas, as well as a number of major corporate campuses in the north off Highway 26 Ⓔ. This corridor accounts for a huge number of jobs, but the development pattern often puts these jobs in places where the street and pedestrian network makes transit or walk access challenging.

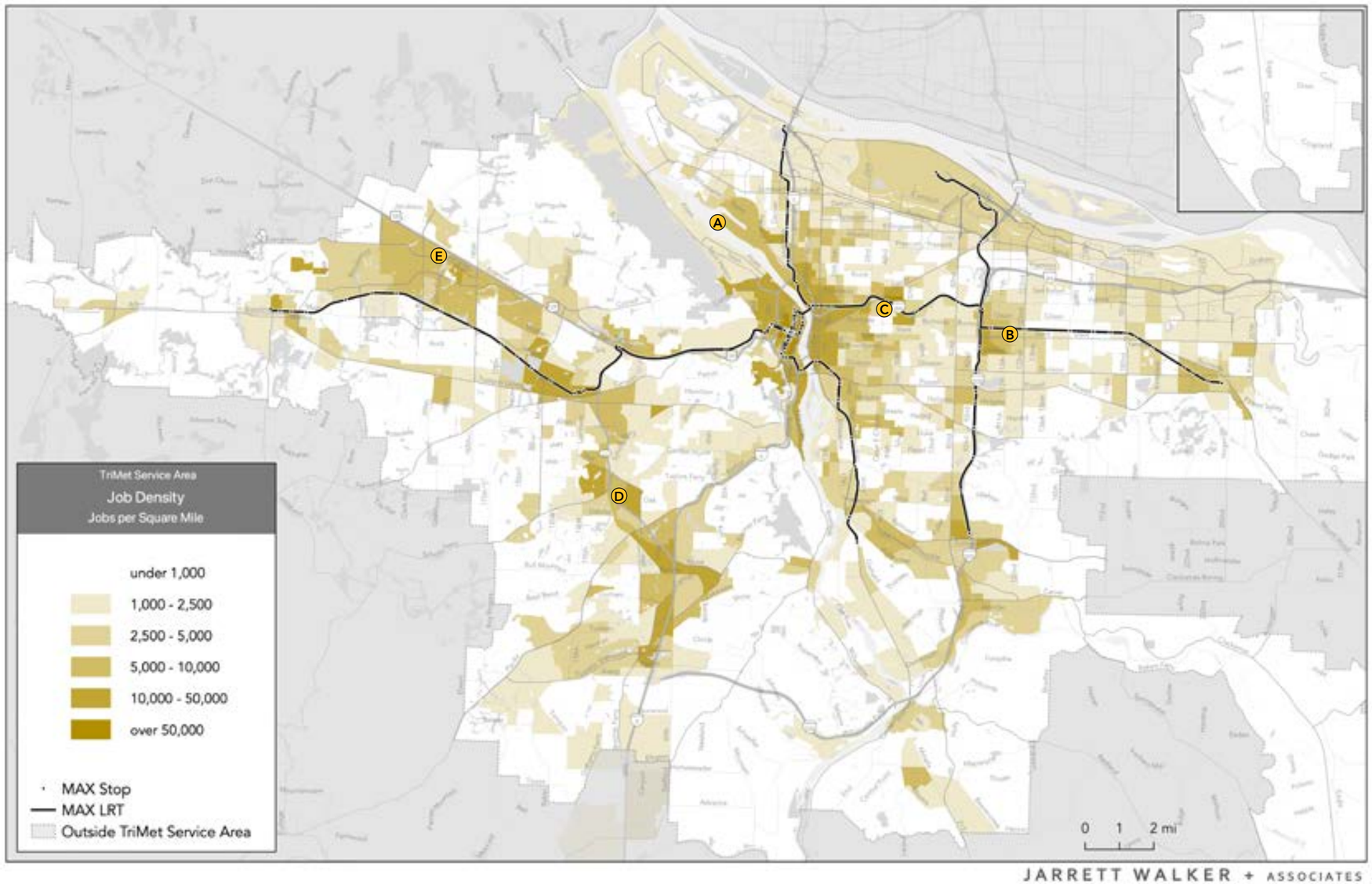


Figure 8: Employment Density in the TriMet Service Area

LEHD LODES 7, 2018

Activity Density

Figure 9 shows job and residential density together, to provide a sense of the total demand generated by different areas. This map uses a five-color scale: residential density is shown in shades of blue, job density is shown in shades of yellow, and places where residents and jobs are both present are shown in shades of red. The darker the color, the greater the number of jobs or residents in the area.

Transit lines serving purely residential neighborhoods tend to be used in only one direction each morning and evening rush hour. In contrast, on corridors where residential, commercial and other uses are mixed, people are traveling in both directions so buses can be full in both directions. Travel demand also goes beyond the weekday rush hours, and is high throughout the midday, evening and weekends, as people move in all directions for work, socializing, shopping and other activities.

Note that some busy places like malls and hospitals are underrepresented on these maps, because only the workers are counted, not the numerous visitors. In addition, data from schools and universities counts only employees, not students, even though many students commute every day.

This Activity Density map allows us to see three ingredients in the Ridership Recipe: high **density**, arranged in **linear** patterns, and **proximate** to other dense places. Some of the seemingly-linear and dense corridors on this map are actually arranged around freeways, or located in places where the layout of streets and degree of pedestrian infrastructure create barriers to operating useful and efficient transit services capable of attracting many riders.

The size of the transit market is determined by the total number of people near a stop who could choose to ride the service.

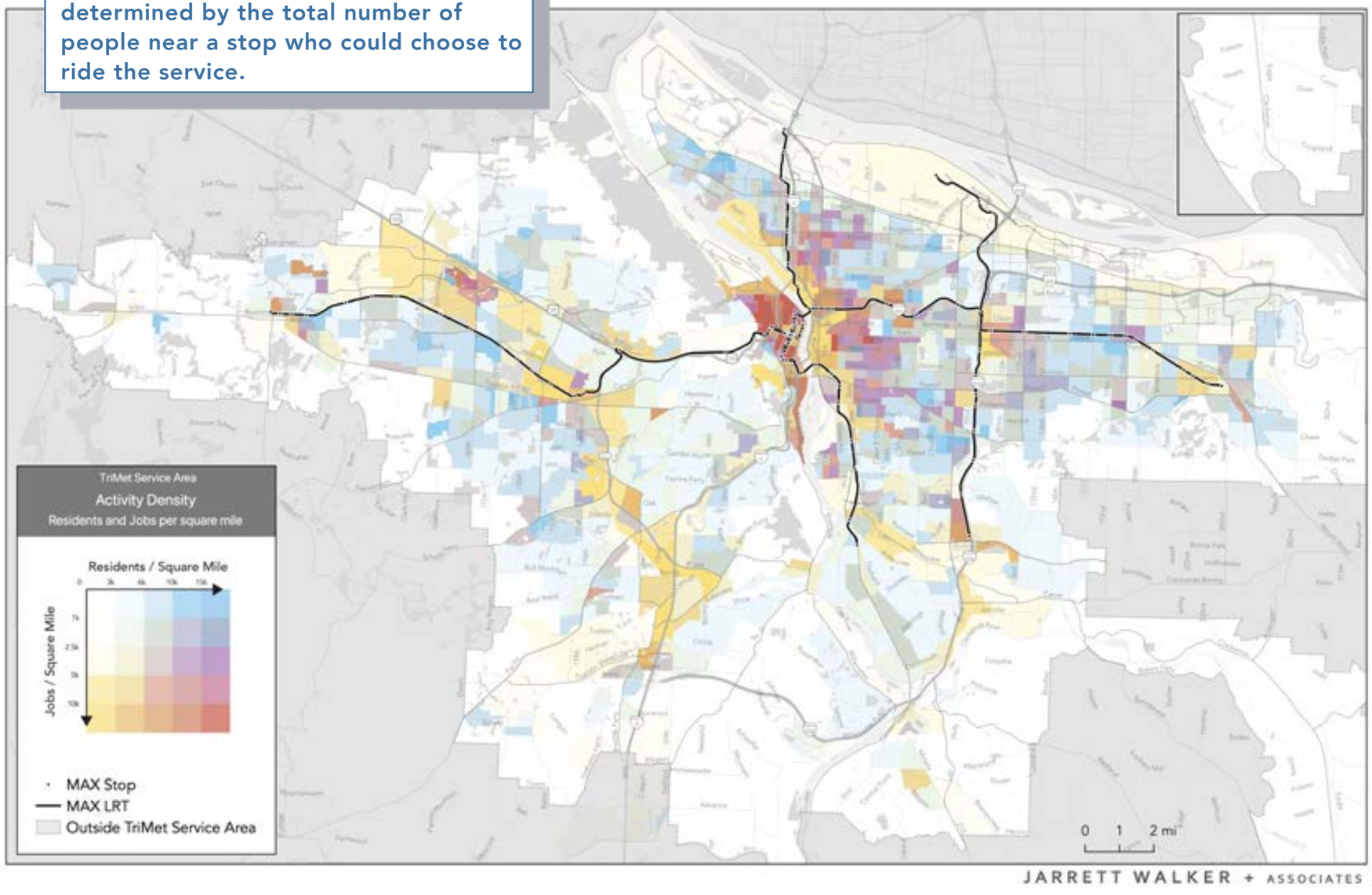


Figure 9: Activity Density in the TriMet Service Area

ACS 5-Year Estimates, 2015-2019, LEHD LODES 7, 2018

Change in Population Density 2010-2020

Figure 10 maps the change in population density by block group from 2010 to 2020 throughout the TriMet service area. This map in based on 2010 and 2020 Census data (not the ACS). With the cautions about 2020 Census small area data in mind, this map is presented to provide a general sense of which parts of the region grew during this period.

As a whole, the Portland-Vancouver-Hillsboro metro area added about 300,000 residents in this span. On this map, green areas are places where population density increased, while brown areas are placed where it decreased. Population increased the most near the service area's edges and its center, including areas like:

- Northwest Portland and the Pearl District Ⓐ
- Inner Southeast Ⓑ and Northeast Portland Ⓒ, where extensive development on key commercial corridors like MLK, Williams, and Division occurred during this time period. Density also increased in many parts of East Portland Ⓓ and Gresham Ⓔ.
- Greenfield residential areas on the westside like North Bethany Ⓕ or Reed's Crossing Ⓖ.
- In Clackamas County, density increased in the most in eastern Happy Valley Ⓗ.

Over the past decade, the Portland metro region added about 300,000 new residents. In the TriMet service area, some of the most intense development activity occurred near the limits of the transit district.

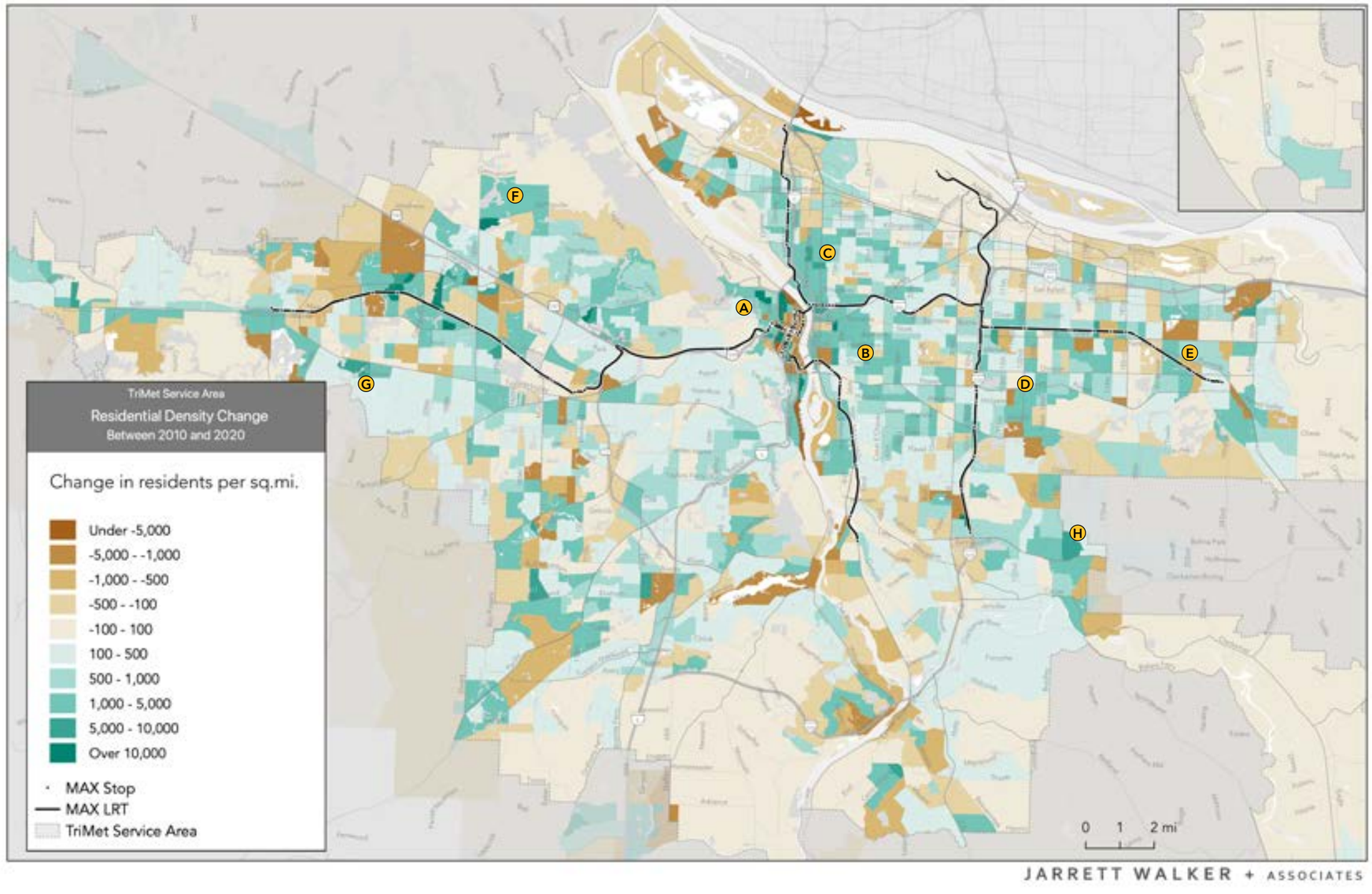


Figure 10: Change in Population Density 2010-2020
2010 and 2020 decennial census

Walkability - Street Connectivity

Figure 11 shows an estimate of how walkable different parts of the Service Area are, based on the percentage of the land area within a half-mile of any given point that can actually be reached by walking a half-mile, using available streets and pedestrian paths. This analysis was conducted using open-source OpenStreetMap data. This measure does not address the quality or presence of pedestrian infrastructure.

Street connectivity is highest in Portland west of I-205 (A) because of the continuous grid layout of the city's streets in this area. Walkability is lower in places where there are major disruptions to the regularity of the grid, as in Northeast and North Portland, where Columbia Blvd (B) is the break between the grid street network of the neighborhoods to the south, and the fewer and more disconnected streets within the industrial area to the north.

Much of East Portland and Gresham are moderately walkable; these areas are also laid out as a grid of arterial roadways, but the local street network is less continuous and more circuitous.

The portions of Washington County and Clackamas County within the service area have many smaller areas where the street grid is at least moderately connective, but these are often separated from one another by natural or constructed barriers. For instance, the center of Hillsboro (C) near the historic downtown area is quite walkable, with a regular, connected street grid, but this walkable area is separated from those further east by Rock Creek and other greenbelts (D), which limit the number of potential walking routes.

Undeveloped land and waterways, and having no streets or sidewalks tend to appear in light shades. Places near freeways and freight rail

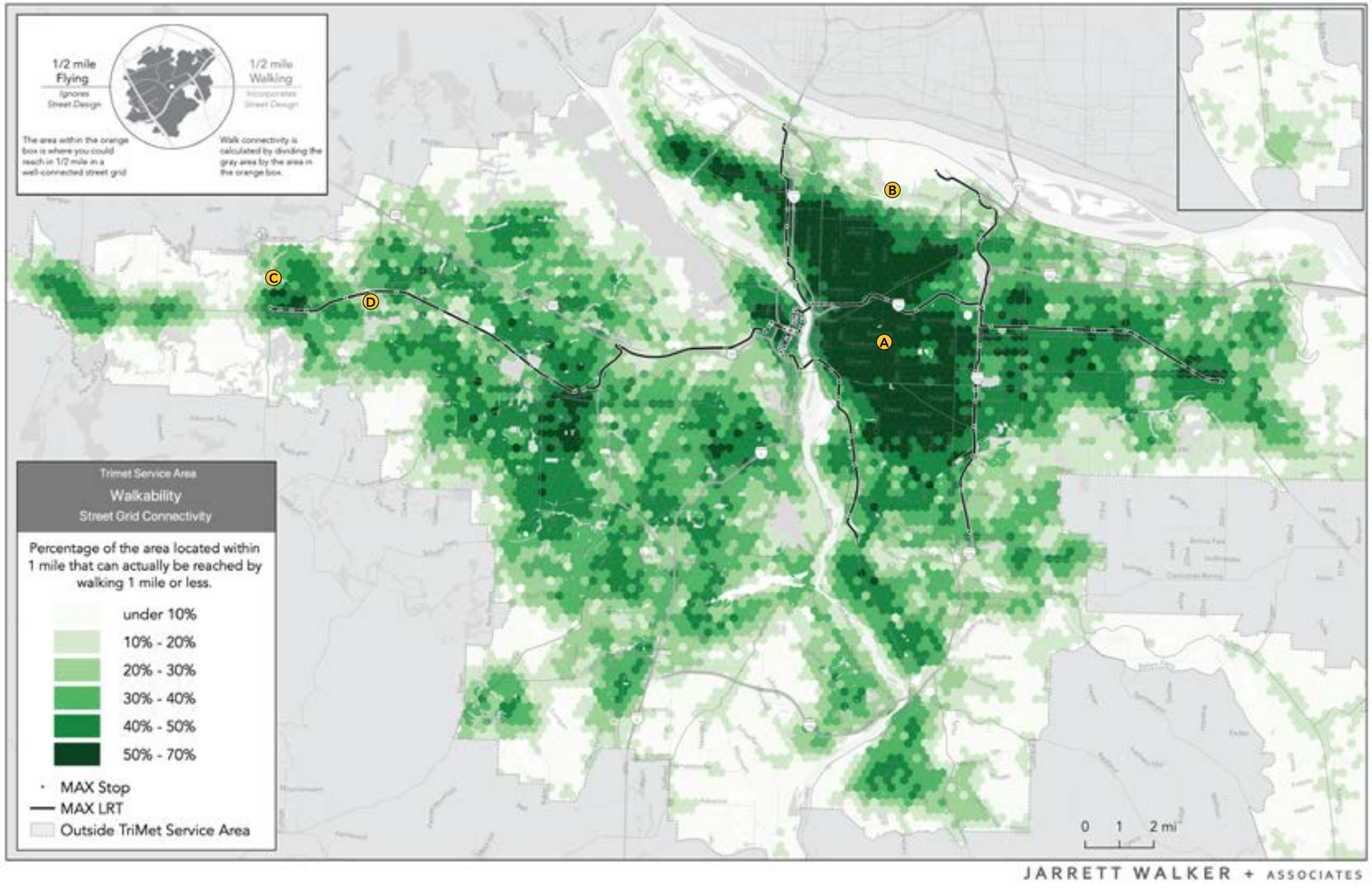


Figure 11: Walkability in the TriMet Service Area
OpenStreetMap

appear in light shades because those barriers reduce the area someone can reach with a short walk.

Most transit trips begin with a walking or rolling trip to the nearest stop. Measuring street connectivity helps understand how long that pedestrian trip is likely to take.

Walkability - Sidewalks

Street connectivity helps show whether the layout of the street network enables walking or rolling trips to and from transit stops, but for that trip to be safe and comfortable, those streets must have sidewalks. Without sidewalks, people are exposed to the risks of traffic, and many trips for people using wheelchairs or mobility devices become more difficult or dangerous.

Figure 12 shows the presence of sidewalks on streets throughout the TriMet service area; blue streets have a sidewalk on one or both sides, and red streets lack sidewalks.

Sidewalk coverage is most consistent in the parts of Portland developed prior to World War II (west of I-205) Ⓐ, Washington County west of Highway 217 Ⓑ, and in Happy Valley Ⓒ.

Sidewalk coverage is more inconsistent in East Portland Ⓓ, Lower SE Portland and Milwaukie Ⓔ, Tigard Ⓕ and Tualatin Ⓖ, but most transit streets in these areas do have pedestrian infrastructure.

Most roads do not have sidewalks of any kind in the West Hills and Washington County east of Highway 217 Ⓗ, and in much of the residential areas of Clackamas County within the TriMet service area Ⓘ.

As with street connectivity, the sheer presence of sidewalks is only part of the walkability story. Other important factors for which comprehensive regional data is not available include the width and slope of sidewalks, presence of ramps, safe crossing points, as well as individual people's perceptions of their own personal safety while walking.

Sidewalk availability provides a baseline sense of where the basic pedestrian infrastructure to facilitate walking is present. Where this basic infrastructure is lacking, reaching a transit stop will require exposure to the inherent danger of

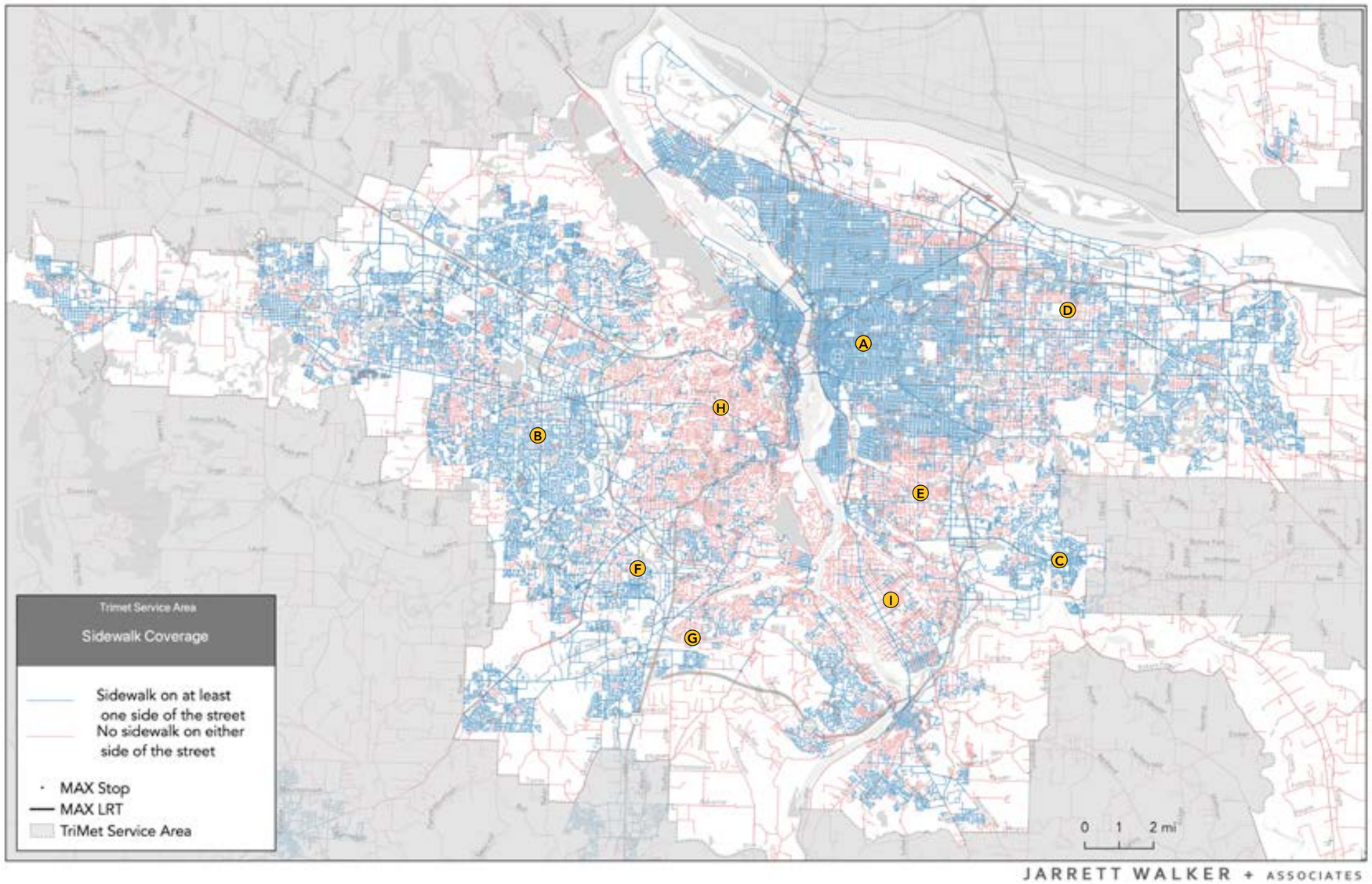


Figure 12: Sidewalk Availability in the TriMet Service Area
OpenStreetMap

automobiles, and present a strong incentive for people to seek other travel options. This will always be a barrier to transit ridership so long as the infrastructure problem is present.

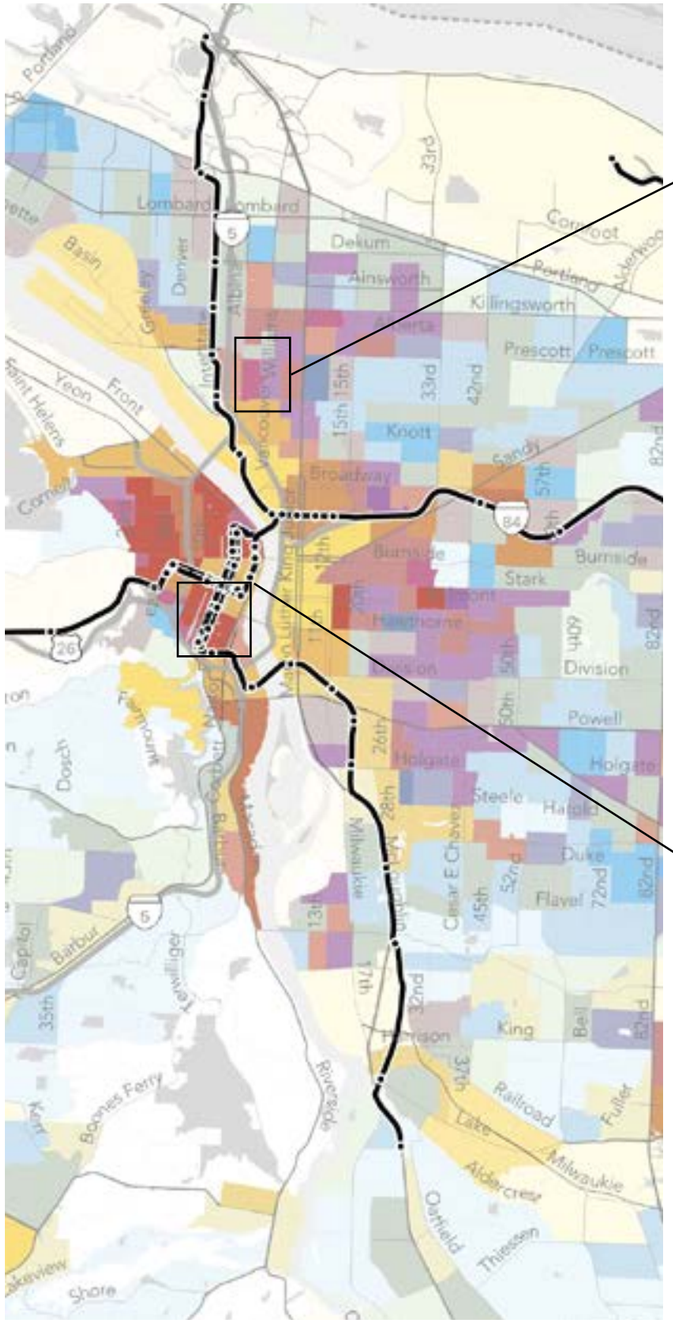
Sidewalks are a key piece of infrastructure that make access to transit safe and comfortable. The presence of sidewalks varies widely across the TriMet service area.

Density and Walkability

Density, mixed land uses, and walkability combine to support high-ridership transit services. But there is nothing inherently walkable about a high-density neighborhood, and no reason why a low-density neighborhood can't feature good pedestrian connections.

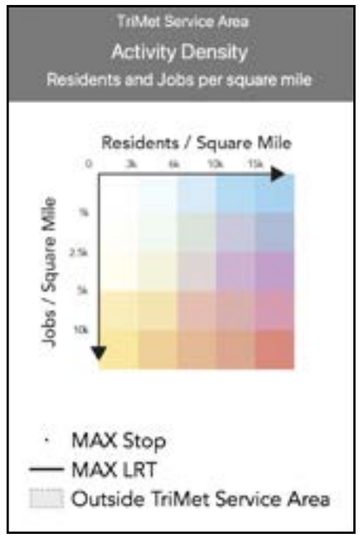
The maps and images in this and the following pages help us understand with a few examples how density and walkability exist in different combinations across the service area.

Downtown Portland and the east side feature a regular street grid, sidewalks on both sides of most streets, and higher densities of population and employment (often in the same place). These are key elements of highly useful, high-ridership service.



This picture shows a section of NE Portland between Mississippi and Vancouver. It has a combination of high job and residential density that is supported by a connected pedestrian grid. Most of the jobs and services are located along two corridors where residents can easily walk to.

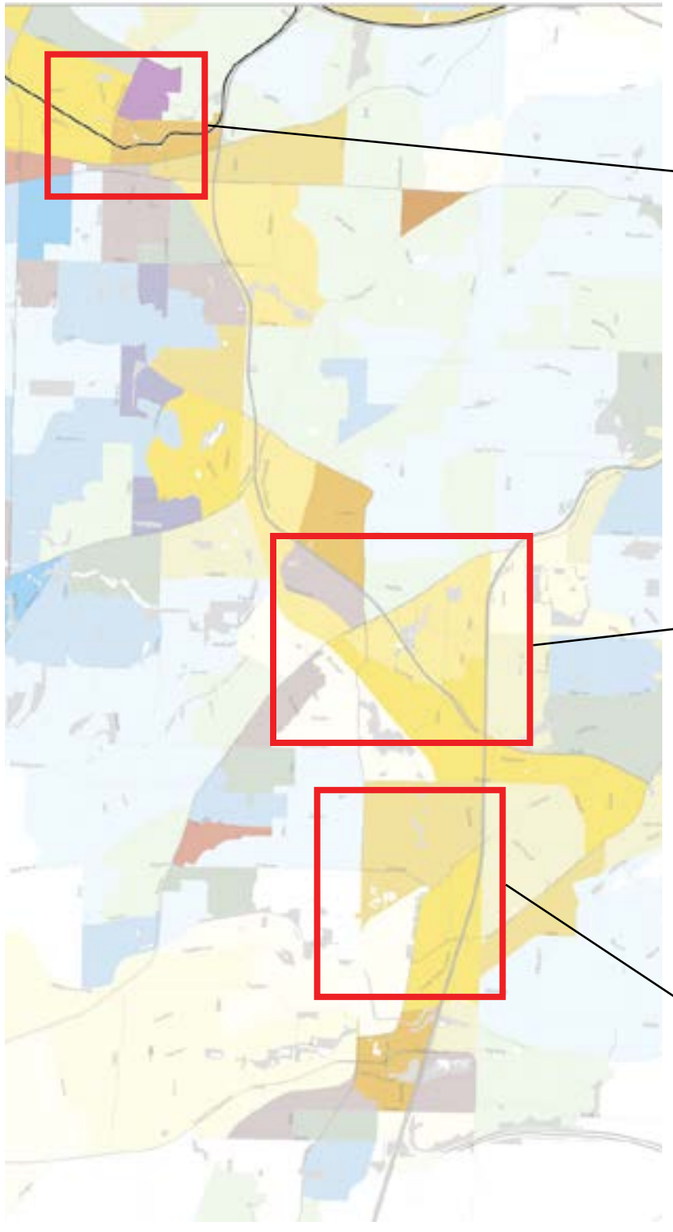
This type of land use can easily support high-ridership transit, because it puts a lot of people near each stop and there are few pedestrian barriers to reaching that stop. Much of the central area of the network between the West Hills and I-205 has these basic features, but there are lots of other places across the region where smaller areas have them too.



The center of Downtown Portland has the highest employment density in the TriMet service area. Downtown features a 200 foot pedestrian grid supported by sidewalks and crosswalks that allow easy access to opportunities. This area is home to a mixture of uses, including major office buildings, high-rise residential buildings, educational and arts institutions.

Density and Walkability

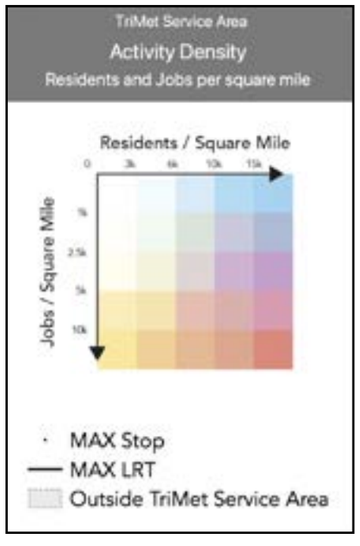
The Highway 217 corridor on the west side has some of the highest employment density across the entire region, but within a development pattern where the street network is discontinuous, and employment and residential land uses are separated.



Some of the highest density, mixed-use areas are found near MAX stations. The purple area on the activity density map indicates the dense, mixed-use district around the Beaverton Central MAX station.

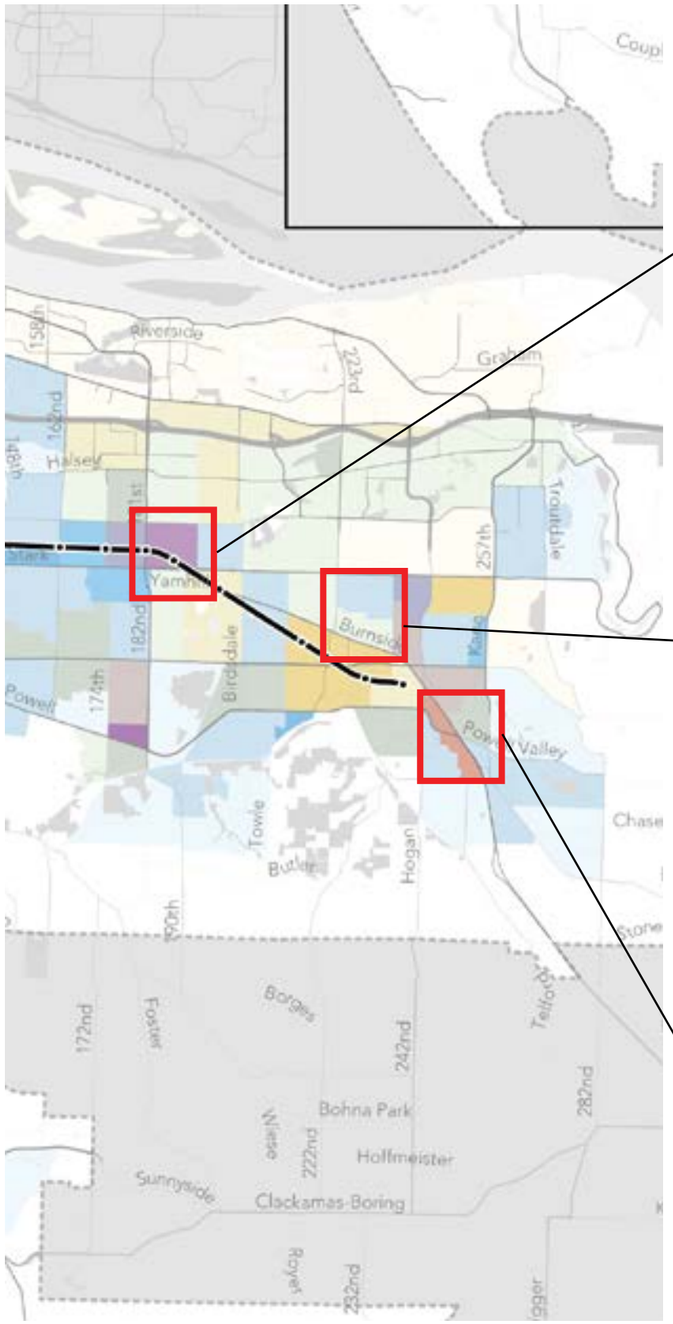
In the Tigard Triangle, several major retailers are separated from nearby residential areas by Highway 217 and I-5 (as well as the difficult-to-cross 99W). These retailers' sites are designed to prioritize car access, with the actual destination behind large parking lots.

The employment areas along SW 72nd and Upper Boones Ferry Rd are home to many jobs in the surrounding industrial and business parks. While many people need to travel to this area, the layout of the area presents a barrier for transit riders, due to the lack of continuous sidewalks and safe crossing points along SW 72nd.



Density and Walkability

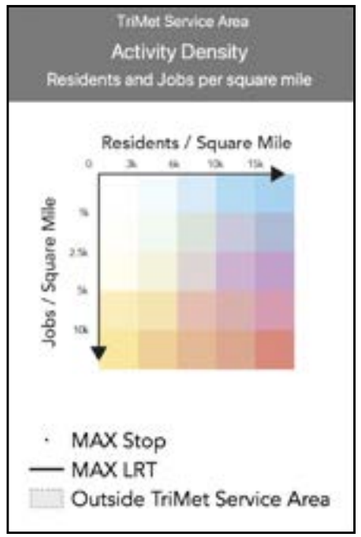
On the east side of the service area, in East Portland and Gresham, there are fewer areas of very high employment density, and fewer major street network disruptions. The street network is not a regular grid, but it is possible to walk from transit streets to most places within the "superblocks" formed by major arterials.



A few of the MAX Blue Line stations stand out as areas of higher density, including the two stations serving Rockwood. The residential area around the stations includes a mixture of single family homes, apartments and mobile home developments, resulting in higher-density than to the north and south where single-family residential development is more ubiquitous.

This residential area north of Burnside near 223rd is an example of a development that is continuous (there are no gaps or major obstacles between destinations), but where the street pattern is circuitous. The curving and irregular street layout extends the distance pedestrians must travel to traverse it, compared to the straight lines possible with a regular grid.

Highway 26 and Burnside converge at a node with a dense mixture of employment activity and residential density. This busy area is east of the end of the MAX Blue Line, and is served by two local routes (Lines 80 and 82), as well as a rush hour service, Line 84.



Proximity

Wherever you are, there is a limited area you could reach within a reasonable amount of time. What's in this area affects your options in life: for employment, school, shopping, health care, or whatever other places you might want to reach. If fewer things are close at hand, you will spend more time, money and effort traveling to reach the things you want and need to do.

Figure 13 combines the population density, job density and walkability maps to provide a sense of how many destinations are nearby throughout the entire service area. Each dot on this map represents 25 residents; they are colored based on the number of jobs reachable within a 1-mile walk. Red dots can reach fewer jobs; blue dots more jobs.

TriMet decides where transit goes, but it has little control over where jobs, housing and opportunities are located. Housing and job locations are decided by cities, counties, state and federal authorities, banks, and the private real estate market in general.

Places where a lot of people live near a lot of jobs area focused on the center of Portland, especially inner southeast and northeast neighborhoods. By contrast, people living in moderately dense areas of East Portland Ⓐ, Cully Ⓑ and St. Johns Ⓒ have fewer jobs nearby; they must travel farther to reach many destinations.

On the west side, a blue strip extends along the job-rich Highway 217 and Highway 26 corridors. Some areas along this strip have a lot of residents, like Tanasbourne Ⓓ; but in others further south, there are few dots, indicating the separation of residential and employment land uses.

There are also some places that have a lot of residents, but almost no jobs nearby. These

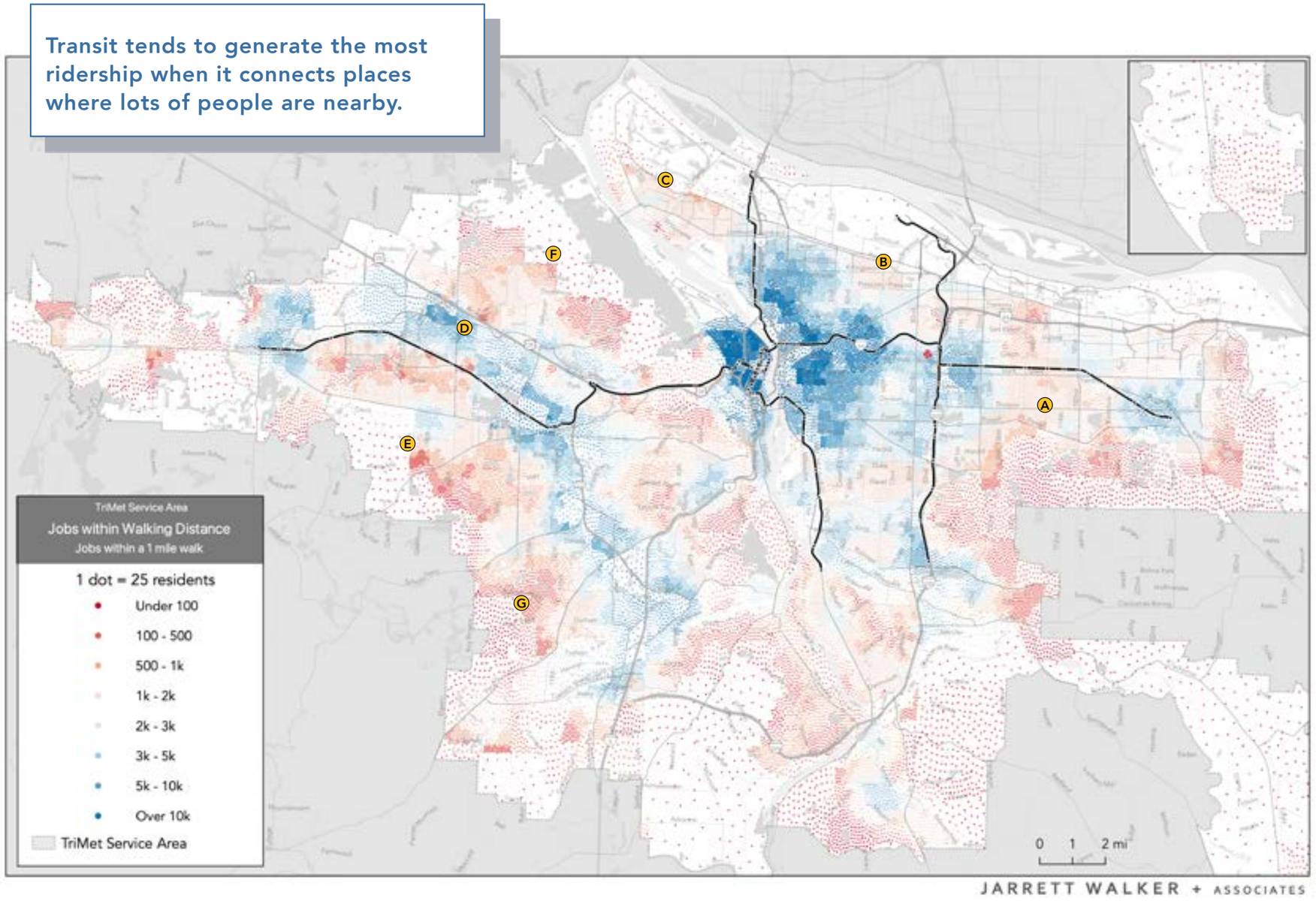


Figure 13: Proximity in the TriMet Service Area

ACS 5-Year Estimates, 2015-2019, LEHD LODES 7, 2018

are often newer developments at the edges of the service area, including places like Arbor Vineyards Ⓔ near Farmington Rd and 209th, North Bethany Ⓕ, or Bull Mountain Ⓖ.

Poverty Density

Transit is often asked to focus on serving lower-income people as an affordable travel option, particularly for those without access to cars. Income can also be a powerful driver of ridership, when a transit agency is able to provide a useful service that is much more affordable that driving.

The more carefully a person must manage their money, the more attractive transit's value proposition may be. This doesn't mean that lower-income people will automatically choose transit because it's the cheapest option. As with all riders, the time of lower-income people is valuable; when transit doesn't provide an option that is workable for a particular person's schedule, they will have a strong incentive to seek other options.

Figure 14 shows the density of people in poverty in the service area. Around 17% of residents in the TriMet service area are under 150% of the federal poverty line.

The most extensive area with higher densities of lower-income people spans the east side of the service area, from Foster-Powell and Lents, through East Portland and Gresham.

Density of lower-income people is highest at specific points around the region, including near PSU and the Center City, where many students live; throughout the Pearl District and Old Town, home to a large number of affordable and supportive housing units; and in block groups containing large numbers of affordable housing units, like the New Columbia Ⓐ public housing development in North Portland.

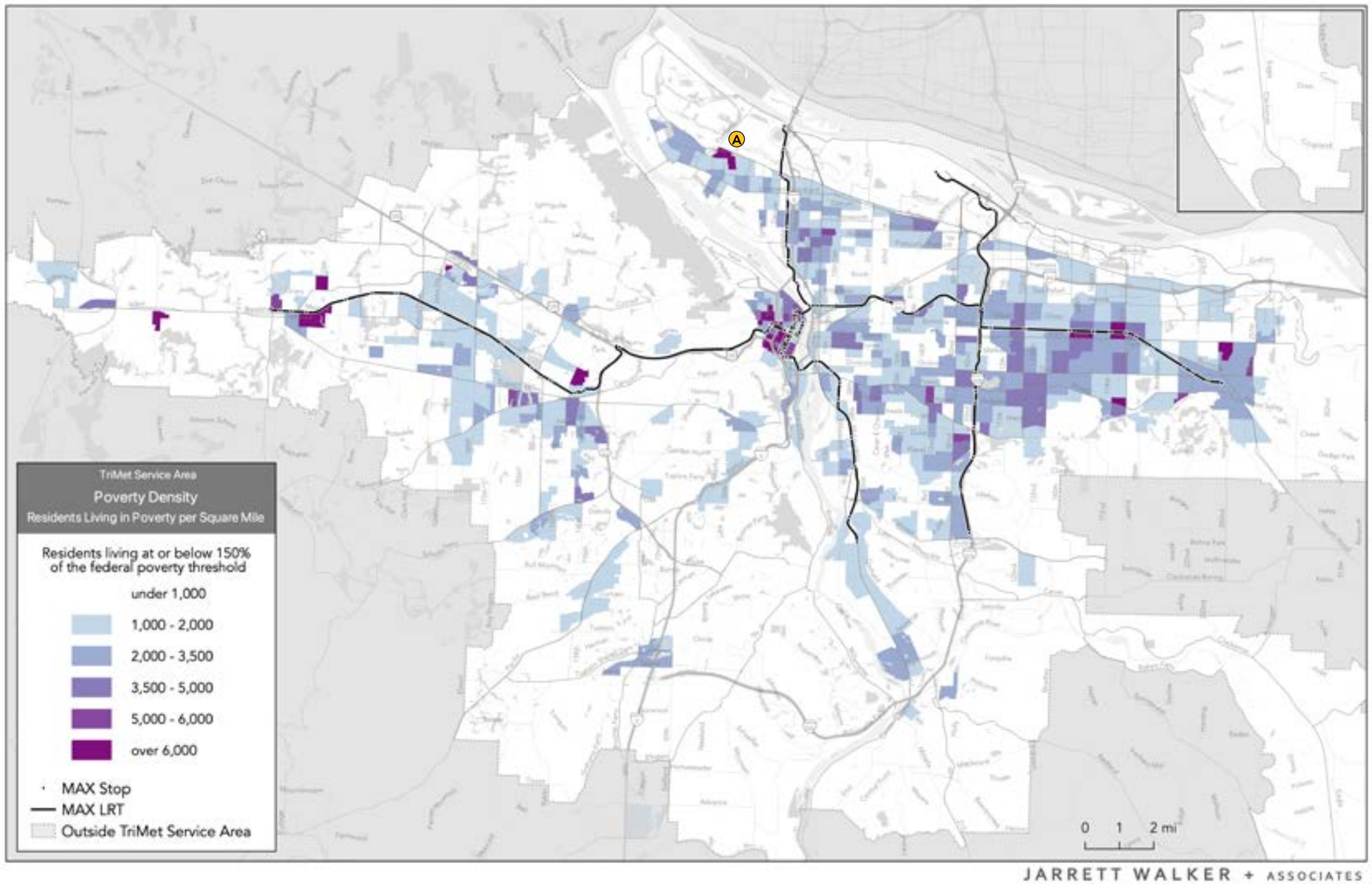


Figure 14: Density of Lower-Income People in the TriMet Service Area

ACS 5-Year Estimates, 2015-2019

Zero Vehicle households

Another factor affecting transit's competitiveness in an area is the availability of personal vehicles. **Figure 15** shows the density of households with zero vehicles.

While people who don't own cars don't use transit by default, they have fewer options than those people who do have access to personal automobiles. As a result, if transit is a useful method (fast, reliable, available when they need to travel) of reaching the places they need to go, it can be a compelling option.

If transit does not present a realistic travel option, then people without cars will find other ways of reaching the places they need to go, by getting rides from friends or family members, cycling, walking, or using taxis or ridesharing services. They will also have a strong incentive to acquire a vehicle themselves if that becomes financially possible.

Only 10% of the households in the service area don't have a vehicle. In Portland, the highest densities of zero-vehicle households are found in Downtown and Northwest Portland, inner Northeast and Southeast, and the South Waterfront. Block groups containing senior housing also stand out, as is the case near Powell and 182nd Ⓐ on the eastside, and in King City Ⓑ on the westside.

East Portland is both moderately dense and high-poverty and displays a moderate density of zero-vehicle households. However, due to the moderate density of areas like Gateway or Powellhurst-Gilbert, this map doesn't tell the whole story. In areas like these, a zero-vehicle household density of 300-1000 households per square mile makes up a greater proportion of the total number, and in some East Portland block groups may represent over 20% of households in a given area.

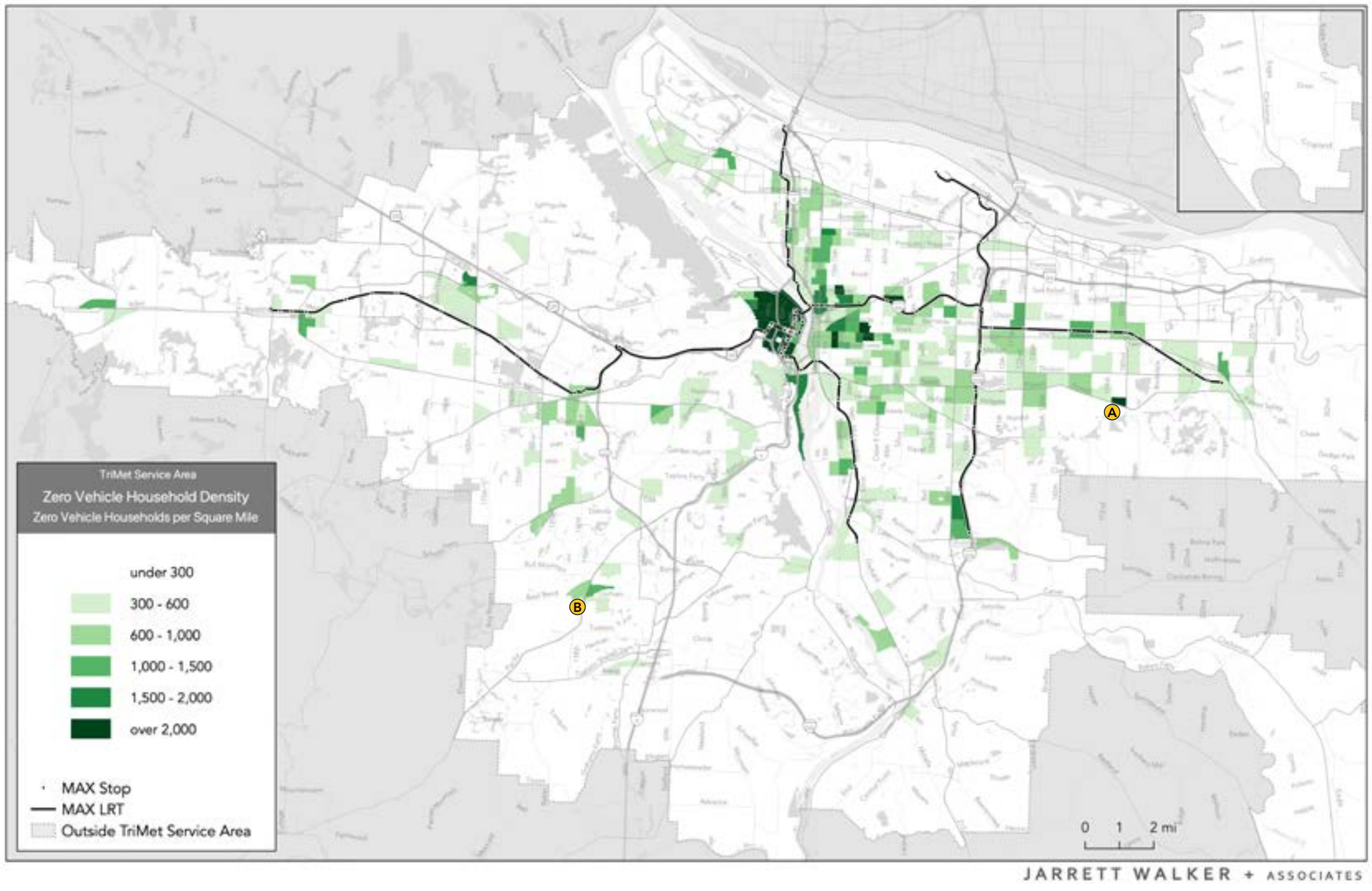


Figure 15: Density of Zero-Vehicle Households in the TriMet Service Area

ACS 5-Year Estimates, 2015-2019

Land Use & Demographics

The demographics of a transit service area are important, because transit agencies are required by law and often asked by the public to protect people of color from the adverse impact of planning decisions, and to pursue service improvement policies designed to improve travel outcomes for members of disadvantaged groups.

Figure 16 shows where people of different races and ethnicities live in the TriMet service area. Each dot represents 25 residents. Where many dots are very close together, the overall density of residents is higher. Where dots of a single color predominate, people of a particular race or ethnicity make up most of that area's residents.

Approximately 30% of the population in the service area identified as people of color. The largest group are Hispanic or Latino residents, who account for 13% of the population, followed by Asian (8%) and Black (4%) residents.

The most diverse part of the service area is East Portland (A), which has a relatively high density of Black, Asian and Hispanic residents. North and Northeast Portland (B) are home to the greatest density of Black residents in the region, although these neighborhoods have been severly impacted by gentrification and displacement. On the west side, high densities of Asian and Hispanic residents are present throughout the area west of Highway 217, including central Hillsboro (C), Tanasbourne (D), Bethany (E), and Beaverton (F).

Portland's dense, walkable center city (between the West Hills and I-205) is also notably lacking in diversity. In the places where transit is most useful and the frequent bus network most intensive, particularly in inner SE (G) and NE Portland (H), the population is whiter than the service area as a whole.

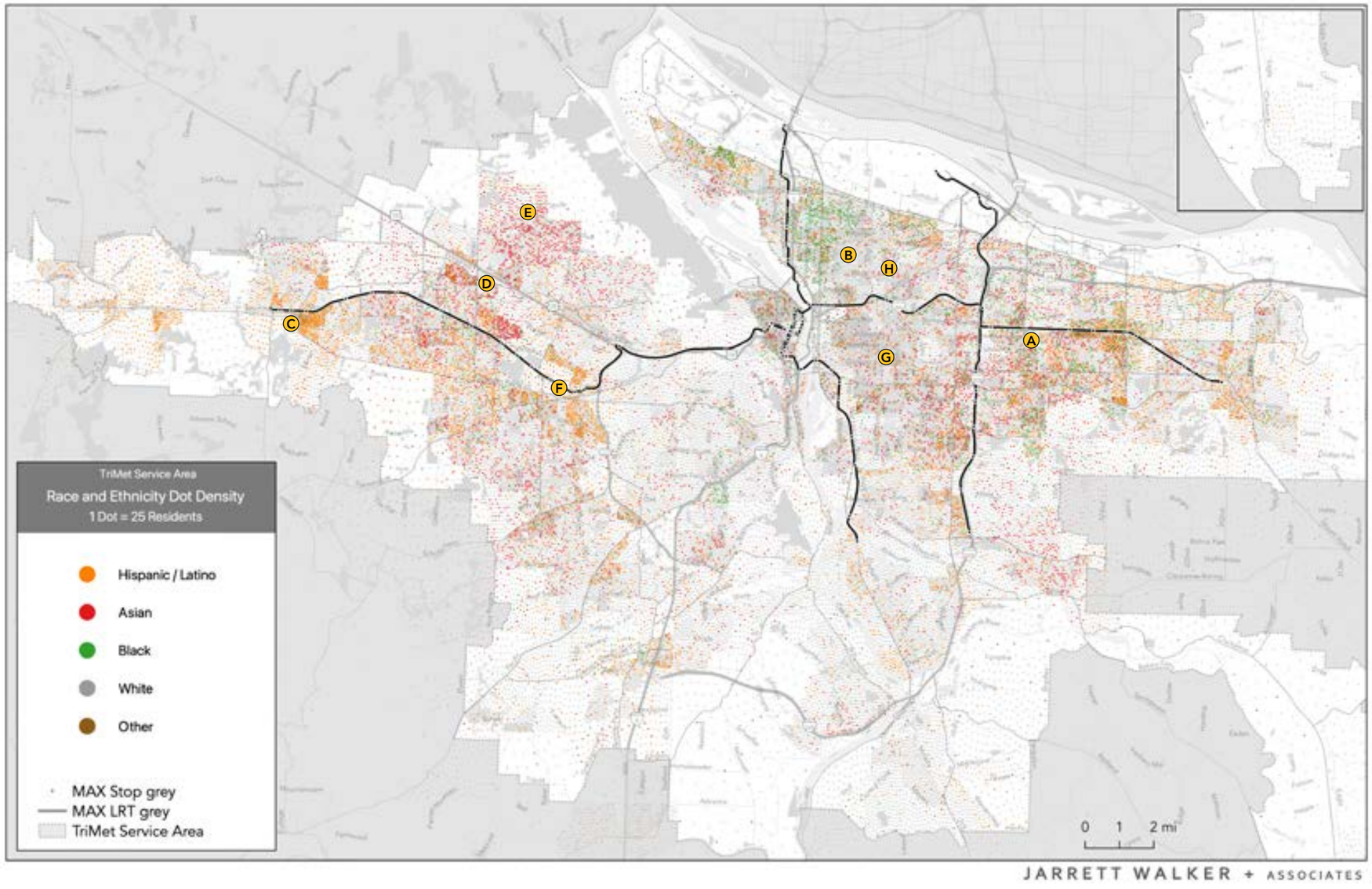


Figure 16: Race and Ethnicity Dot Density Map

ACS 5-Year Estimates, 2015-2019

Senior Density

One of the goals transit is often asked to achieve is to provide a reliable mobility option for seniors. Some seniors cannot drive and may be more likely to use transit. As a group, senior-headed households are less likely to own cars than the general population, an advantage for transit in places where other characteristics for high ridership (such as density and walkability) are present. **Figure 17** maps the density of seniors throughout the service area.

Seniors constitute around 13% of the total population of the TriMet service area. This demographic group tends to be spread out among the general population, and so senior density is similar in many places to overall population density. For example, senior density is high in Downtown and the Pearl District, similar to overall population.

There are some places where the density of seniors is higher than that of the population in general. The largest of these is King City Ⓐ south of Tualatin, which was originally developed as an age-restricted community for older adults. Other locations that stand out include places with senior housing developments, including the Village Retirement Center west of 182nd and Powell in East Portland Ⓑ, and the Summerplace senior housing development in the Wilkes neighborhood Ⓒ.

While serving seniors is an important mission for any transit agency, the travel needs and behavior of older adults differs in some important ways with those of people of other ages, in terms of their willingness to walk or wait for service, the hours of the day during which they are likely to be traveling, and other factors. As a result, the amount of focus that transit agencies place on meeting the needs of seniors should be carefully balanced with the needs and desires of the broader community.

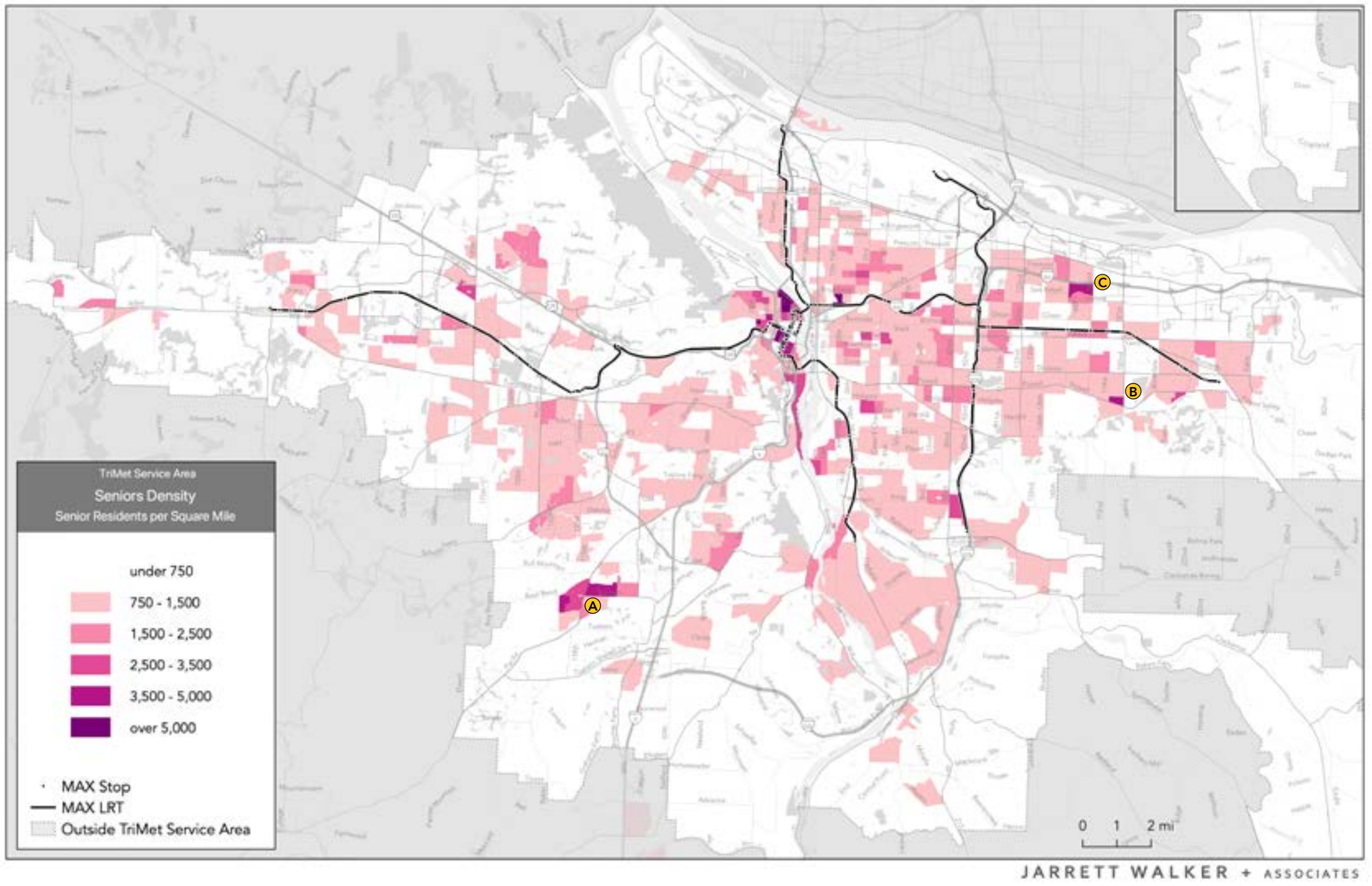


Figure 17: Density of Seniors in the TriMet Service Area

ACS 5-Year Estimates, 2015-2019

TriMet's Equity Index

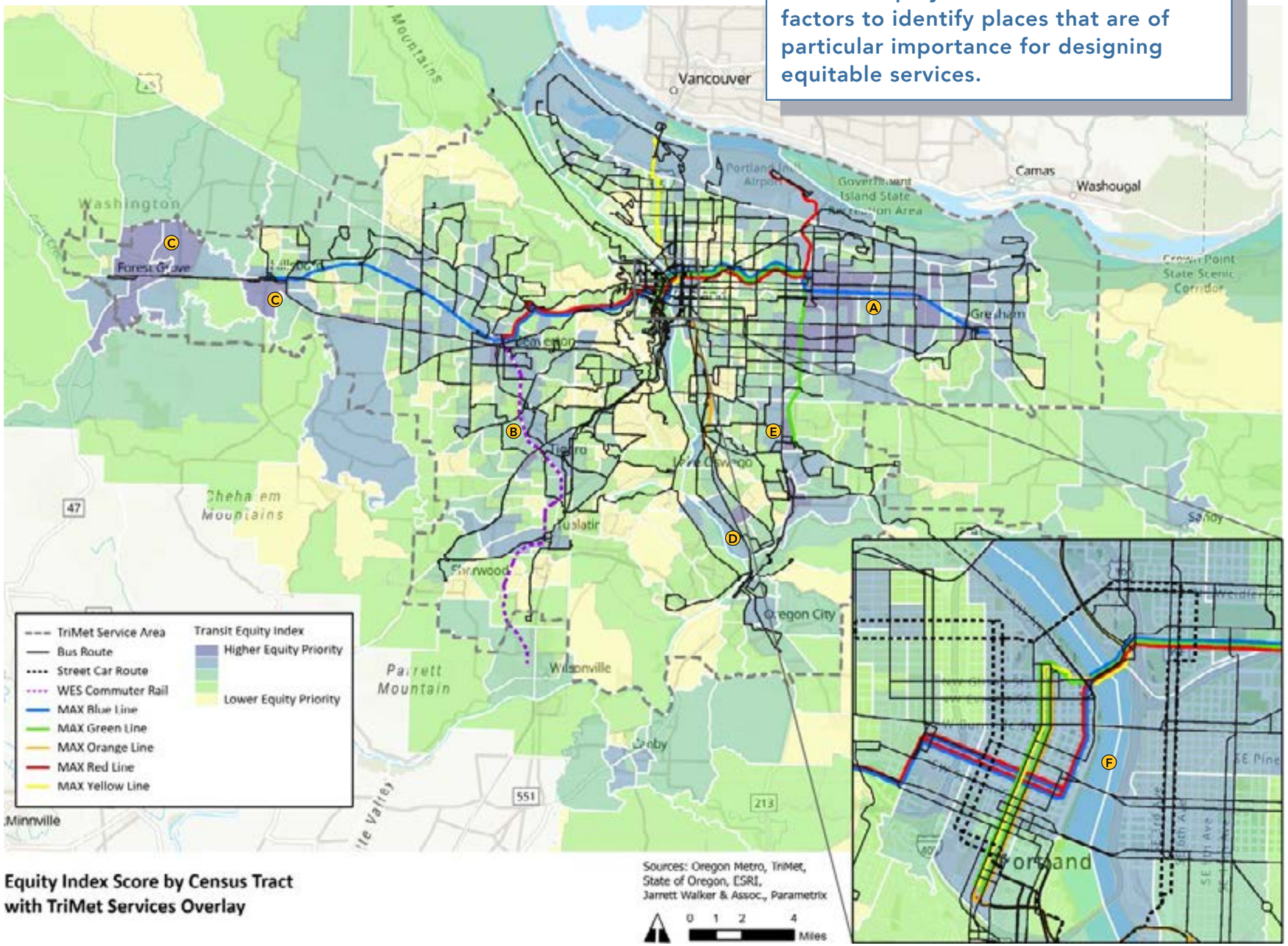
TriMet brings these factors and others together in its Equity Index, a planning tool that identifies areas of high and low equity priority for service development.

This index is used to evaluate potential investments and evaluates ten measures:

- Minority population
- Low-income population
- Limited English Proficiency (LEP) population
- Senior population
- Youth population
- People with disabilities
- Limited vehicle access households
- Low and medium wage jobs
- Affordable housing units
- Key retail/human/social services

Together, these measures identify places that, by virtue of demographics, employment, wealth, income, and vehicle access, are of particular importance in TriMet's approach to designing equitable services. Areas that score high on the equity index include most of East Portland and Gresham Ⓐ; the Highway 217 corridor in Washington County Ⓑ; parts of Hillsboro and Forest Grove Ⓒ; the McLoughlin corridor between Milwaukie and Oregon City Ⓓ; the southern end of the 82nd Ave corridor in Clackamas Ⓔ; and, the center city of Downtown Portland, the Lloyd District and the Central Eastside Ⓕ.

TriMet's Equity Index combines 10 factors to identify places that are of particular importance for designing equitable services.



Equity Index Score by Census Tract with TriMet Services Overlay

Figure 18: TriMet 10-Factor Equity Index

3 TriMet's Existing Network

TriMet's network today

Ridership and service in the pandemic

TriMet's network is the product of decades of evolution, but the past two years have brought some of the most rapid changes the agency has every experienced.

Figure 19 shows the trend of TriMet's ridership and service level since the pandemic began. The dashed line shows the change in the number of passenger trips each month, compared to January 2020, while the solid line shows the amount of service TriMet operated in that month.

As of Feburary 2021, TriMet ridership was still more than 50% below the levels of the months immediately prior to the pandemic, but ridership had increased from the lowest points in April 2020 and February 2022, beginning an upward trend in Spring 2021 as vaccination began in earnest.

TriMet reduced its overall service level in April 2021, due to the collapse in ridership and uncertainty about the stability of the agency's funding sources. Some services were restored by Fall 2020, but after that, TriMet's bus service level hovered around 10% below what it operated in January 2020, until early 2022 when the impacts of the labor shortage required further reductions.

Across this timeframe, two major weather events also impacted service and ridership: a winter storm in February 2021Ⓐ , and an extreme heat wave in June and July 2021 Ⓑ that particularly limited TriMet's ability to deliver MAX light rail service.

In late 2021, as vaccination rates were increasing, ridership began to tick upward, but service restoration proved slow due to a lack of bus operators. By the end of 2021, the shortage of operators had become so severe that TriMet was again forced to reduce service.

About this chapter

The changes illustrated by **Figure 19** represent enormous shifts in the quantity of people riding service, and in the amount of service TriMet operates. The simple line graph only tells part of the story, however. The pandemic has created new challenges for service, but there are many transit needs that have long been present even before the pandemic that are still relevant, some even more so than before.

This chapter provides an analysis of the current state of TriMet's network, focused on the strengths, weaknesses, and possibilities for future change if planning were focused on different goals. This chapter includes material explaining:

- The history and design principles behind the network's structure.
- How the network changed from 2010-2019, as TriMet restored service cut during the 2000s recession.
- How the network, ridership, and key performance indicators have changed since 2019.
- An analysis of the availability of service in different places, and for different people.
- An analysis of the usefulness of the service in different places, and for different people.
- A detailed look at the network by subarea, including a summary of the most important improvement projects in TriMet's Service Enhancement Plans.

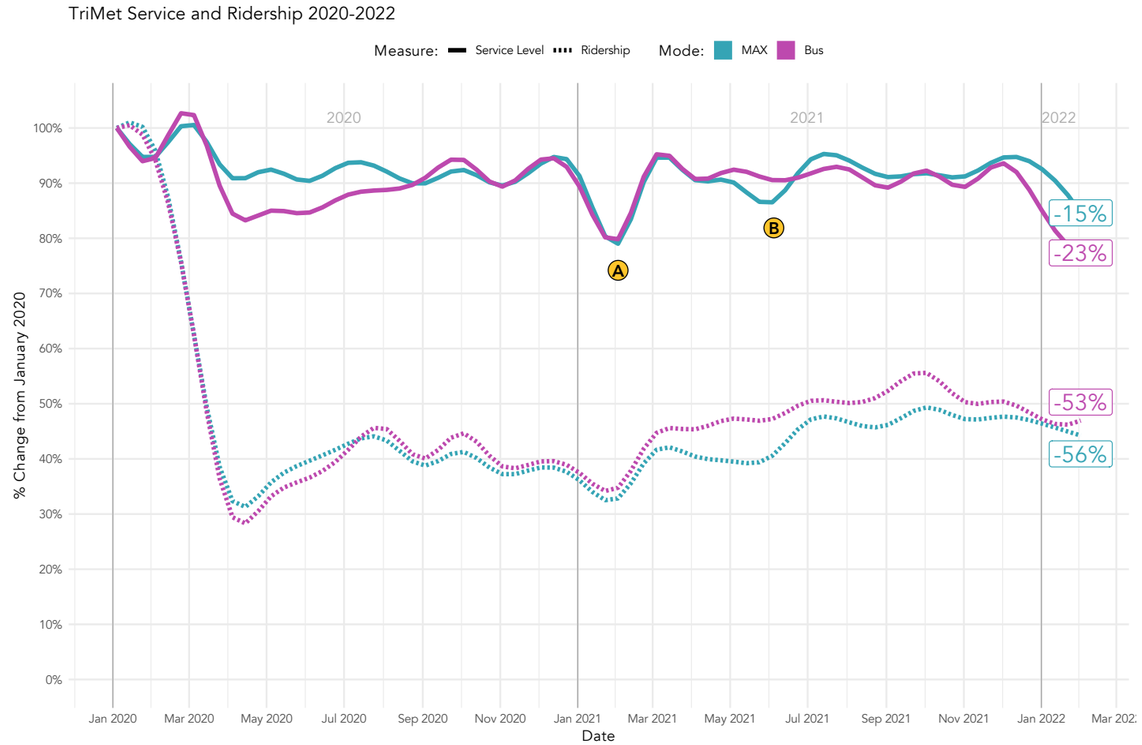


Figure 19: TriMet Service Level and Ridership, 2020-2022
National Transit Database

TriMet's ridership dropped dramatically with the begining of public health "lockdown" efforts introduced in response to the COVID-19 pandemic in March 2020.

Ridership has increased since that time, but as of the end of January 2022 was still about 50% below pre-COVID levels.

Why does TriMet's network look as it does?

Many US transit agencies run route networks that are decades old, sometimes matching the original streetcar lines, even as their cities have grown and changed. Only in the last decade have many agencies replaced these old networks with new designs that reflect the needs of today.

TriMet was one of the first US agencies to do this kind of redesign, 40 years ago. In a set of network changes from 1979 through 1984, TriMet redesigned all its service, sweeping away the old bus routes based on the streetcar network, to create the basic structure that still operates today: a grid pattern across much of Portland and a system of transit centers that organize suburban service.

The network has continued to grow and change with the region, but the basic idea of the 1980s design is still in place, because it is still an efficient way to deploy a limited operating budget to create the most access for the most people. For this reason, it is unlikely that Forward Together will contemplate massive redesigns affecting most of the service in the region, or most current riders. The contrasting alternatives will certainly show some differences, but the vast majority of the service will probably be the same in all of them.

This does not mean that the network is adequate to the region's needs today. The network has always been financially constrained, and TriMet has gone through several crisis periods when service had to be reduced, including the financial crisis of 2009-10 and the pandemic-related workforce shortages of 2020-22. In the future, if there were funding for more service, TriMet would be able to meet more of the region's needs. But as long as there is any budget constraint, TriMet will need to serve the region's goals cost-effectively, which means that these principles of efficient

TriMet's network map is a *frequency map*. The dark blue lines show which bus routes run every 15 minutes.

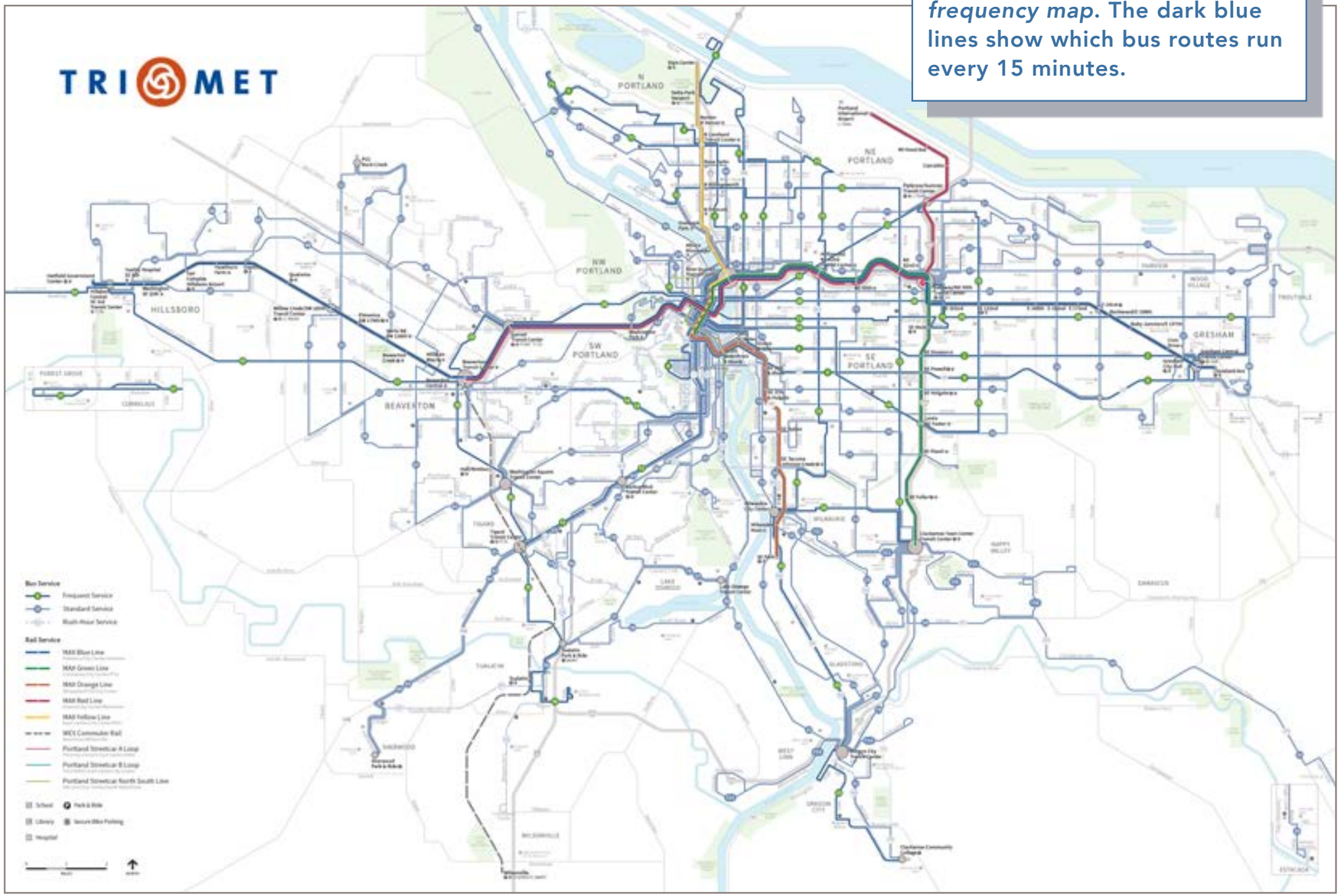


Figure 20: TriMet System Map, Fall 2021

design will still matter.

Here are the key design principles of the existing network, and why they provide access so effectively.

Identify areas where many people can be served efficiently, and focus on them.

TriMet's highest ridership services tend to be those that focus good service on areas that have the geometric features shown in **Figure 21.** There are many other factors that affect ridership, such as income, vehicle ownership and demographics, but it is important to recognize these purely geometric aspects of efficient design because they continue to be true even as neighborhoods change demographically.

Creating a transit network capable of generating high ridership isn't just about faster or more frequent service. To be useful to many people, fast, frequent service must be available in places where the development pattern supports its use.

A. **Density.** Where there are many residents, jobs and activities in an area, there are many places people might want to go, and many people who might choose to use transit.

B. **Walkability.** An area only becomes accessible by transit if most people can safely and comfortably walk to and from nearby transit stops.

C. **Linearity.** Direct paths between many destinations are faster and cheaper to operate. Straight lines are also easier to communicate and more appealing to most potential riders.

D. **Proximity.** The longer the distance between two places to serve, the more expensive they are to connect, because transit vehicles must spend more time driving between them. Areas with continuous development are more cost-effective to serve than areas with big gaps.

E. **Mix of Uses.** When there is a mix of land-uses along a direct path, transit can provide direct access to a broad range of destinations. Mixed-use transit corridors also tend to be very productive because people ride in both directions at many times of the day.

Regardless of the intricacies of local geography, these five elements of the development pattern are important determining factors of where transit can be useful for many people, at a relatively low cost.

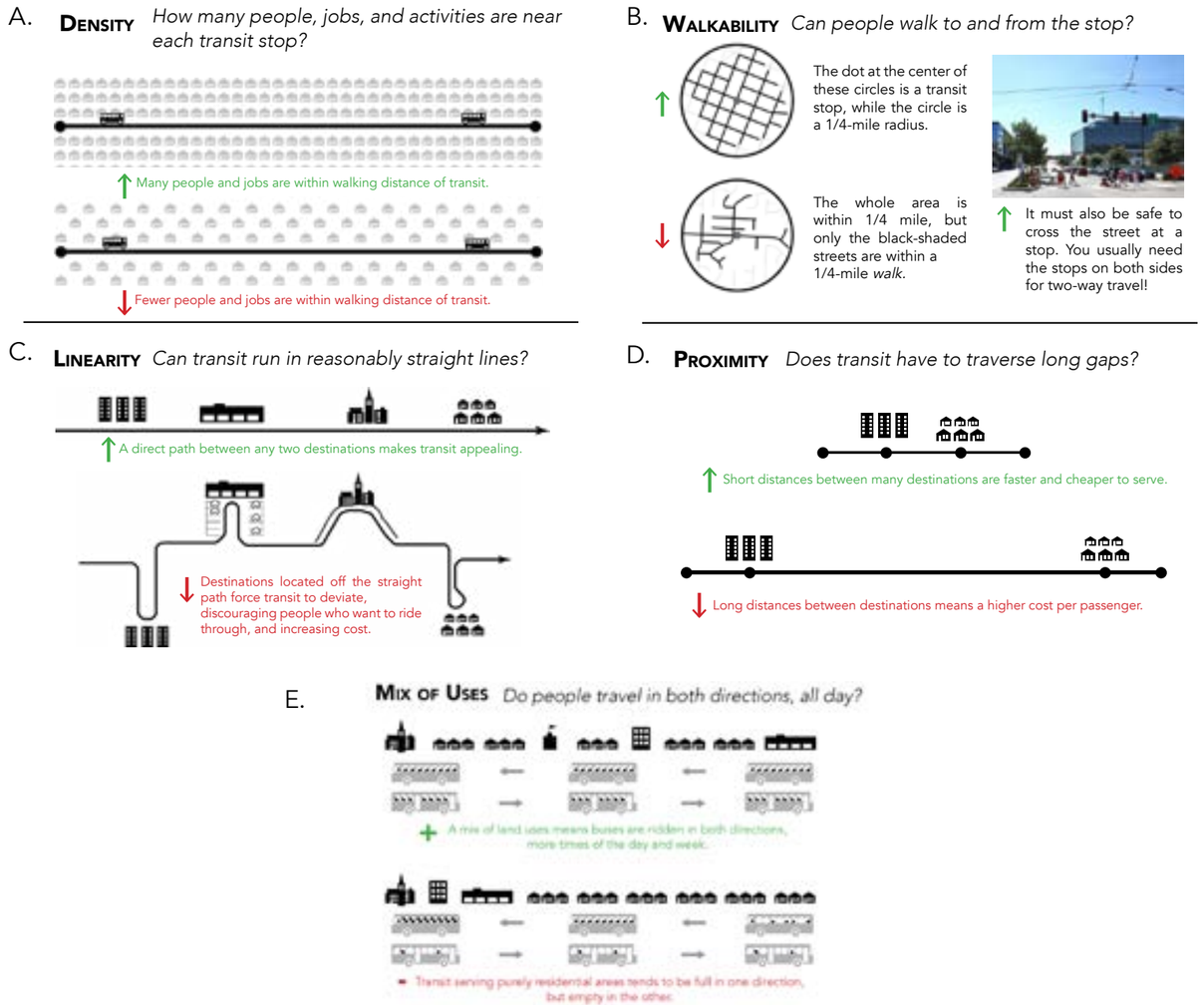


Figure 21: The Transit Ridership Recipe.

Connect people and destinations all over the region, rather than just focusing on downtown.

Prior to the 1980s redesign, almost all TriMet lines went downtown, and trips anywhere else required changing buses there. Many trips from NE Portland to SE Portland, for example, had to go far out of direction. Low-income people are especially likely to not be going downtown, because the geography of lower-wage jobs is less centralized. The every-where-to-everywhere nature of the network is therefore critical. The network achieves this in two ways:

- In areas that where the development pattern allows TriMet to serve many people efficiently, TriMet offers a grid pattern of service. This pattern covers all of Portland east of the West Hills and extends somewhat into Gresham and Milwaukie. In the future such a structure may make sense in Washington County, something anticipated by TriMet's existing Service Enhancement Plan for that area. Grids let everyone travel from anywhere to anywhere on a simple L-shaped path with one transfer, but they work best when service runs frequently. **Figure 24** provides a simple explanation of this principle.
- In areas where the development pattern presents obstacles to efficient service and grid patterns, ridership expectations are lower and high frequencies are harder to justify. Here, TriMet offers services that converge on transit centers, where a customer can transfer to many services to go in many possible directions. Where possible, schedules are designed so that it's not necessary to wait a long time at these centers, even though the individual lines may not be frequent.

The key in both cases is that a line is only as useful as its connections. Nobody can count on their origin and destination always being in places that can be reached with a single ride on just one line, so facilitating transfers that are as fast and easy as possible is a critical element of designing a network that works for many people.

Figure 22: TriMet operates a grid service pattern in Portland and parts of Gresham and Milwaukie

Figure 23: In areas where the development pattern creates obstacles to an efficient grid, routes converge on transit centers.

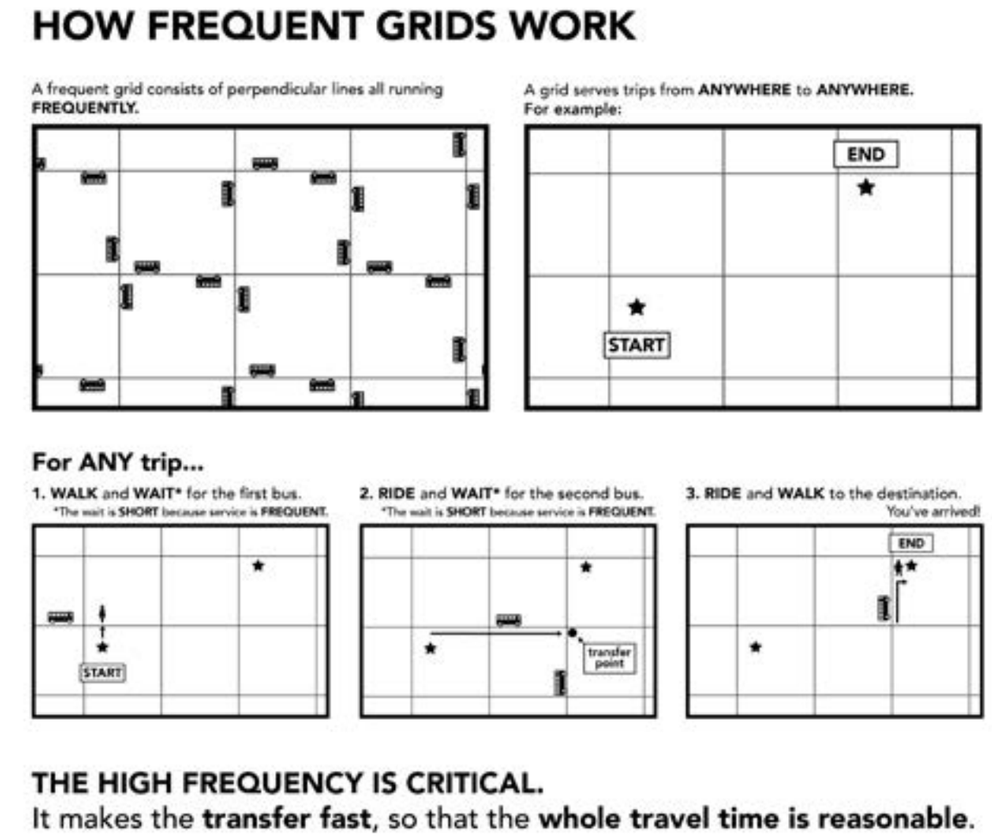


Figure 24: How frequent grids work

Maximize frequency, so that service is likely to be coming whenever people need it.

Frequency is expensive to provide, but the most frequent TriMet lines also tend to serve the most riders at the lowest operating cost. Frequency pays off exponentially as an investment, so TriMet is always trying to achieve the highest frequencies possible given its budget and its commitments all over the region. Today, a majority of people who are near transit service of any kind are near Frequent Service, running every 15-minutes or better.

To maximize frequency, run the fewest possible miles of transit that will still serve the region.

Spreading service out means spreading it thin. Frequency requires running a lot of service on a single line, so the more line-miles the agency must operate, the less frequency it can afford. Low frequency, in turn, means that the bus isn't likely to be coming when you need it.

Minimizing the number of line miles, in order to maximize frequency, leads to these principles:

- Avoid running two or more lines on the same street for any significant distance.
- Keep parallel lines about ½ mile apart but not closer than that.
- Consider whether all low-demand parts of the region should be served.

Let's look at these in turn.

Avoid running two or more lines on the same street for any significant distance.

Many people see a transit need and immediately think that it requires a new line. If a lot of people want to go from A to B, it makes sense to most people to demand a line from A to B. But if there is already a frequent line from A to C, and from B to C, then the best way to improve service from A to B may be to improve those lines. Creating a new line, overlapping those existing ones, would mean more lines on the same street, and that means lower frequency for everyone than in those resources were invested in a single route serving each corridor.

Similar thought must be given to express or limited-stop services. It's common to suggest that when demand is high, a street should have both local services making all stops and faster services that make fewer stops. But in most cases, it's best to do other things to improve travel time without creating two separate lines, because those lines would be less frequent and the long waits would often cancel out any benefit of the higher speed. So TriMet has focused instead on other ways to speed up service, such as giving transit greater priority in traffic.

Run parallel lines about ½ mile apart but not closer than that.

If parallel routes are too close together, they are competing for passengers. You may have two parallel lines that you could walk to, but if they're both infrequent, you may be better served by having just one of those lines running frequently enough that it's there whenever you need it. **Figure 25** illustrates the principle of even spacing to put the greatest area within a short walk to service.

Southeast Portland shows the ideal spacing of east-west routes. There is service on Burnside, Belmont, Hawthorne, and Division – roughly every ½ mile -- but not on the streets in between these, such as Stark and Harrison/ Lincoln. Both of those streets did have service once, but those lines were removed in 1982 to concentrate service on the four lines that remain.

Route spacing tends to be closer when average trip distances are shorter, such as in inner NW Portland or within downtown, because walking ¼ mile to a bus doesn't make sense if the whole trip is only a mile or two. But apart from that, ½ mile spacing is an efficient way to reach as many people with service as possible.

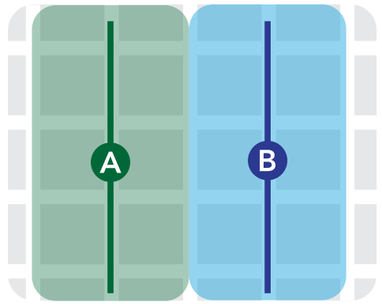
SE Portland has an unusually regular pattern of east-west streets that makes it easy to space routes ideally. In most of the region, the pattern is hard to see because the network design must work around various barriers and run on streets that aren't ideally spaced. But it is still logical to avoid running parallel routes so close together that they are competing for the same passengers.

Consider whether all low-demand parts of the region should be served.

There is a third way to run fewer line miles, which is to provide no service to some areas. Some parts of the region feature very low density and/or street patterns that prevent efficient and direct transit service. In these areas ridership will always be low because there aren't many people and it's very expensive to serve them. Demand-responsive transit is

Route Spacing

Here, routes A and B are spaced evenly, covering the entire area.



In this example, routes are spaced closer together. This creates an area of overlapping service, and an area far from service.

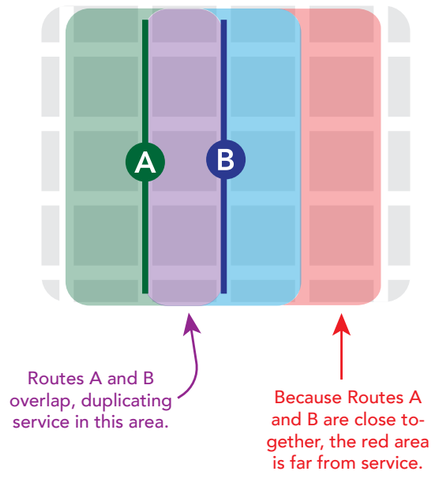


Figure 25: Regularly-spaced and overlapping service

one way to serve these areas, but its ridership potential is also very low, because it drives long distances to serve few people.

Service to low demand areas, where high ridership is impossible because there just aren't enough people there, is called coverage service, and this study will explore the question of how much coverage service to operate, and what its priorities should be.

As the study explores coverage service options, remember: coverage services have predictably low ridership, so they are not part of a high-ridership strategy. A network designed for maximum ridership wouldn't offer them. So we have to think about how to divide a fixed budget between high-ridership services and coverage services, and how to prioritize which people and places have the greatest needs for coverage.

Run service all day and all week to the extent possible, not just at rush hour.

COVID-19 caused a crash in the demand for rush hour commuting, as the knowledge workers who tend to commute then shifted to working from home. A key question for this study is how much rush hour demand can be expected to return, as some companies consider working from home permanently.

Running only at rush hour is expensive for a transit agency for three reasons:

- It requires the agency to own, store, and maintain a fleet that isn't used much.
- The bus operator must be paid more for the inconvenience of coming to work for a short shift.
- When rush hour demand is only in one direction, TriMet will pay to run the service empty in the other direction.

So, whenever resources can be shifted from a rush hour-only pattern to an all-day pattern, the result is more service overall.

Even before COVID-19 reduced the demand for rush hour commuting, TriMet was focused on trying to provide the best possible service all day and all week. TriMet does offer more service at rush hour but tries to offer all day patterns as much as possible, adding frequency as needed to handle rush hour demand.

Finally, all-day and all-week service, running as late as possible, is an important equity tool. Low income workers are especially like to need to travel very early or very late, due to the nature of the shifts in the service, retail, and entertainment sectors that provide many low-wage jobs. If transit is not present, not reliable or requires long waits during the weekend or late nights, people who need to travel during those periods will have a strong incentive to seek other ways to travel.

Design Principles in Forward Together

While Forward Together is about taking a fresh look at TriMet's network in light of new needs and priorities, these design principles are likely to be reflected in any alternatives or network plans that emerge from the process.

When ridership and access to opportunity are important goals, it will continue to be most efficient to put useful, high-frequency service in places where there are many people nearby who can walk to reach it, and to design that service to be as useful for as many types of trips as possible, including during nights and weekends.

The Frequent Network

TriMet's Frequent Network (shown in **Figure 26**) is the set of routes that run every 15-minutes or better most of the day, every day, including the MAX light rail syste.

Most of TriMet's bus ridership happens on the Frequent Bus Network; in 2019, over 60% of average daily weekday bus boardings occurred on a Frequent Service bus line, and by 2021, this number was up to 67%. Today, more people ride each weekday on the Frequent Network bus lines than on all of TriMet's MAX lines combined.

The Frequent Bus Network is made up of three distinct types of routes:

- Radial routes like Line 20, Line 6 or Line 12 that travel through Downtown Portland.
- Crosstown routes like Line 75, 72 and 73 that do not go downtown, but provide connections between radial routes.
- Frequent feeder services like Line 33 or Line 57 that connect busy suburban destinations to the regional MAX light rail network.

Across the central area of the Frequent Bus Network covering Portland between the West Hills and I-205, radial and crosstown routes form a grid of services that make travel to any point within the grid possible with a single transfer.

TriMet's network of Frequent Service bus lines run every 15 minutes or better most of the day, every day. These routes carry the majority of TriMet's bus passengers.

For instance, a trip between Eastport Plaza on SE 82nd Ave (A) and a destination near SE Powell & 52nd (B) would be made via Line 72 and Line 9. Because both routes run every 15 minutes (with an average wait time of just 7.5 minutes), the trip can be made with only 15 minutes of total waiting time on average. "Grid movements" like these enable riders to get where they are going faster, because they don't have to spend as much time waiting for the bus to arrive. However, grid mobility is less convenient when any leg of the trip is running infrequently, because the wait for that service is likely to be much longer.

On the Frequent Network, the next bus or train is always coming soon, and the average wait for service is just 7.5 minutes. High-frequency service reduces the burden on the rider when a trip is running late or early, since the next trip is coming soon. High-frequency service is also expensive, and as a result, TriMet can afford to offer it only on corridors that serve many jobs and residents.

Figure 26: TriMet Frequent Service map

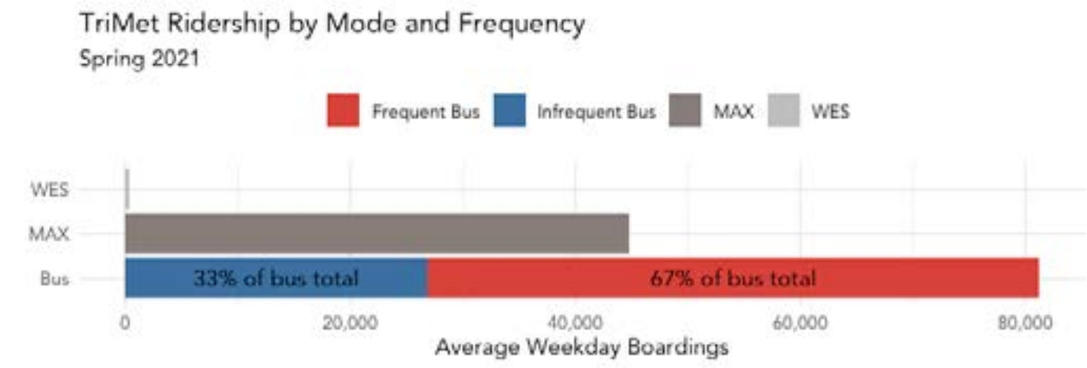


Figure 27: Average Weekday Ridership by Mode and Frequency

How frequently does the rest of the network run?

TriMet's main public system map distinguishes between the Frequent Bus Network and other services, but there is variation in frequency among the group of routes that fall into the less-frequent "Standard Service" category.

Figure 28 shows the prevailing midday headway of each route in TriMet's network; the most frequent routes are shown in red, while less-frequent routes are shown in purple (every 20 minutes), blue (every 30 minutes), and green (every 30-60 minutes). The handful of routes that operate only during rush hour or at other select times are shown in brown.

The distinction between 30 minute and 60 minute routes has important impacts on customer waiting time. Running a route every 30 minutes is about twice as expensive as running every 60 minutes, so visualizing frequency shows where the network is most useful, and where the most operating resources are being invested today.

While the majority of bus rides happen on the Frequent Bus Network, the infrequent routes are essential supporting elements to making a network that is capable of serving people that need to travel all over the region. Some infrequent lines, like those shown in purple, serve busy high-demand corridors that could make sense as frequent lines if TriMet had more resources available in the future.

Other lower-frequency routes act as feeders, tying residential areas that are less likely to generate high ridership into major transit nodes. In Washington County, East Portland, and Gresham, most of these lower-frequency feeders run approximately every 30 minutes, but in Clackamas County, the feeder network runs less frequently, particularly since the implementation of service changes brought on due to COVID-era revenue and labor shortages.

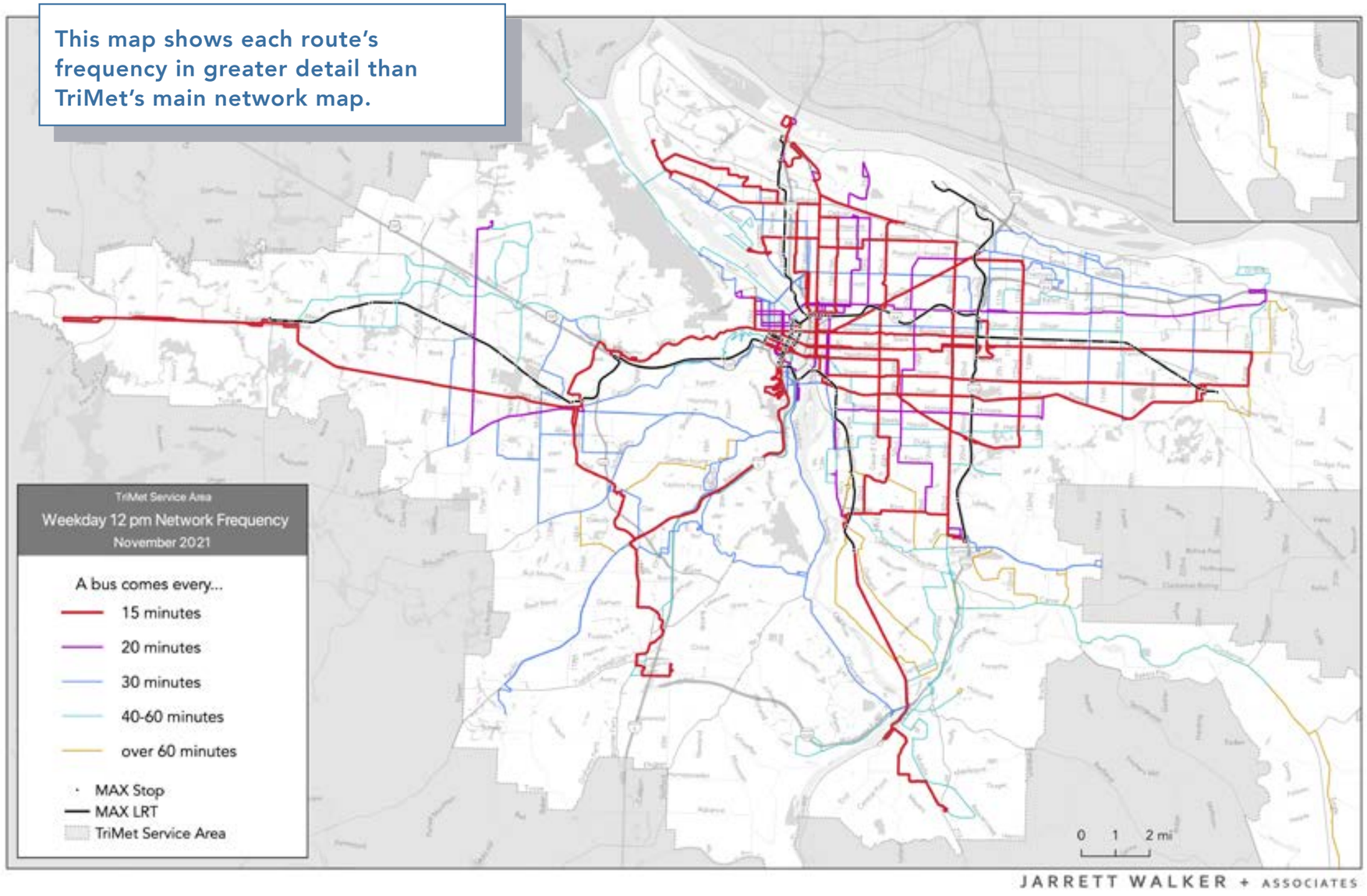


Figure 28: Weekday 12pm Network Frequency Map

Frequency and Productivity

TriMet's most frequent routes are the most expensive services to operate and carry the majority of its ridership. They are also TriMet's most efficient services, in terms of the number of riders they carry per unit cost.

Figure 29 and **Figure 30** plot the frequency and productivity of each of TriMet's bus lines in 2019 and 2021. The x-axis shows the approximate frequency each route operates at during the midday period; the y-axis shows the number of people who boarded each route for every service hour. Each line's dot is sized based on the total number of boardings on that line during the average weekday.

Before the pandemic, all TriMet routes generated more than 10 boardings per revenue hour; even in 2021, nearly all routes exceeded this standard. 10 boardings per revenue hour is a helpful benchmark, because it approximates the maximum capacity that could theoretically be delivered by an on-demand service with highly efficient dispatching and trip grouping.

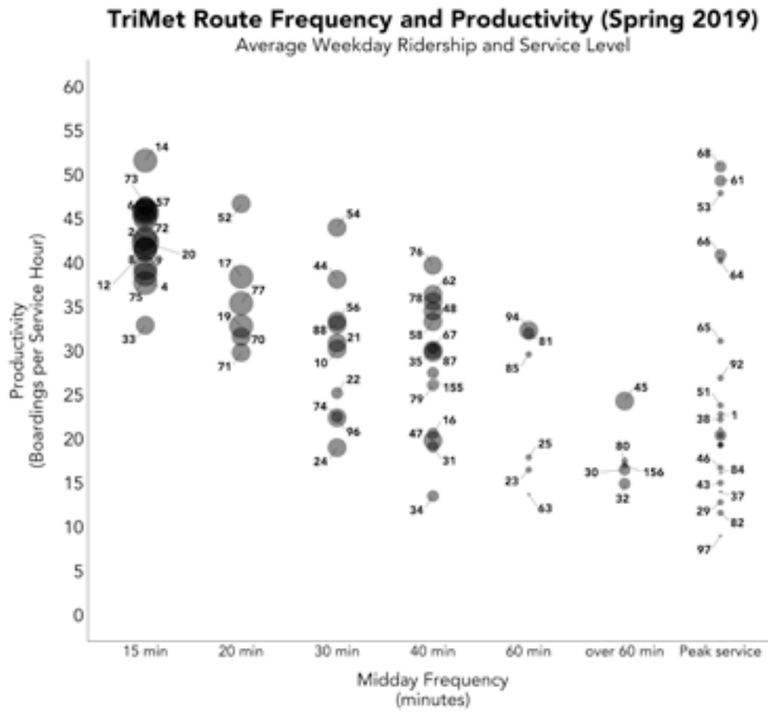


Figure 29: TriMet Weekday Frequency and Productivity by Route, 2019

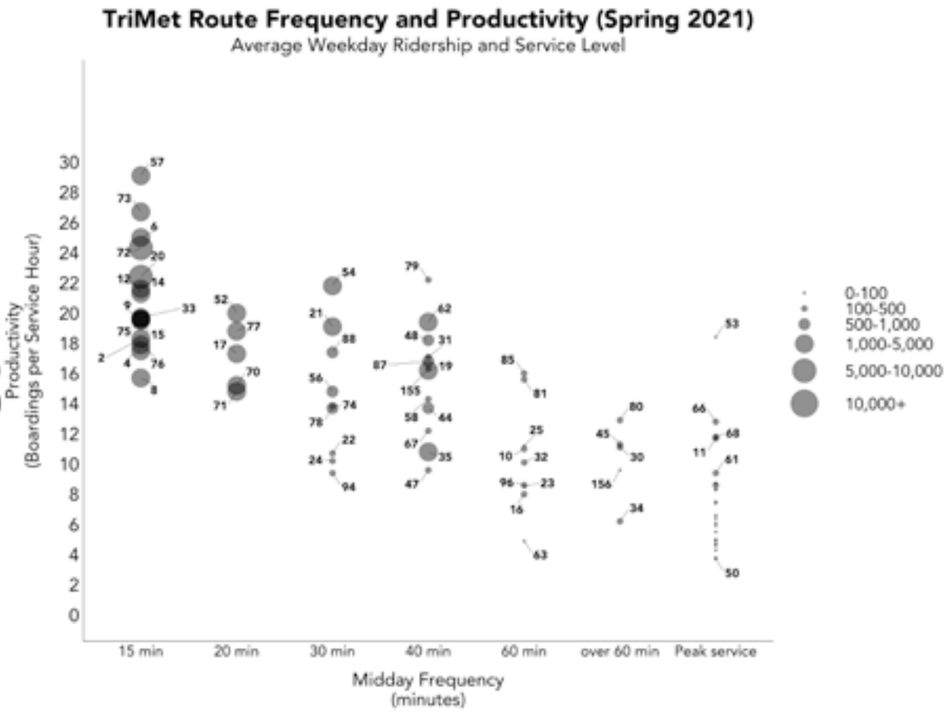


Figure 30: TriMet Weekday Frequency and Productivity by Route, 2021

Productivity before the Pandemic

Before the pandemic and in 2021, TriMet's highest-frequency services were its most productive. In 2019, the group of routes running every 15 minutes or better at midday produced an average of 42 boardings per revenue hour. The most productive single route was Line 14-Hawthorne, at over 50 boardings per revenue hour; the least productive was Line 33 at under 35 boardings per revenue hour.

The line in the 20 minute group were also strong performers, with an average productivity of 36 boardings per revenue hour. This included lines 19, 71, 77 and 17; these four are elements of the eastside grid, but the single most frequent 20-minute service was Line 52, the Farmington Rd / 185th service in Washington County.

The lower-frequency categories displayed a wider spread of productivity. Routes that ran every 30 minutes included Line 54 (which combines with Line 56 to form a Frequent Service segment), but also lines 22, 74, and 24, which saw comparatively little ridership, and low productivity.

The story was similar among the 40 minute group, a group that includes both busy, moderately-productive lines like 62-Murray Blvd and low-ridership routes running below 20 boardings per revenue hour like Line 31-Webster Rd.

Productivity in the Pandemic

The 2021 data shows the same pattern - more frequent services are more productive. With the drop in ridership, the overall level of productivity has declined, and which services are most productive has changed. The most productive Frequent Service lines are now lines 57, 73, 6, and 72, followed by Line 20 and the rest of the eastside radial grid. The strong performers in the pandemic were routes that served areas with a high concentration of lower-income people and people of color, and routes that served destinations with many retail and service sector jobs, where people were still working.

In the 20 minute group, the most productive service is still Line 52-Farmington/185th, followed by Line 77 and 17, and Line 54 is still the most productive 30-minute route.

Productivity is a measure of how many people ride a route, compared to how much that route costs to run.

Which areas are near service?

About 41% of service area residents are within a 1/4-mile walk of any service; about 61% are within a 1/2-mile walk.

Figure 31 shows where more people are close to transit service. Each dot on this map represents 25 residents; blue dots are residents within a 1/2-mile walk of service, while red dots are residents further than 1/2-mile from transit.

There are some moderately dense residential areas that are far from transit. Some examples include:

- In the far westside, residential areas south of Farmington Rd Ⓐ, Scholls Ferry Rd Ⓑ and parts of North Bethany Ⓒ.
- On the eastside of the service area, the northern portion of Happy Valley Ⓓ.
- In East Portland, the core of the area bounded by 122nd, 162nd, Powell and Stark Ⓔ.
- In the southeast, the south side of Oregon City Ⓕ.
- Residential areas off Cornelius Pass Rd in Hillsboro Ⓖ.

In most cases, TriMet doesn't serve these places because the surrounding development patterns pose a challenge for transit: large streets with few crossings, circuitous street layouts that extend walk distances, and sometimes a lack of sidewalks on major arterials that transit could run on. These are issues that make service harder to use, and thus less likely to be useful to many people.

However, if TriMet were to pursue a coverage goal more strenuously in its service planning, some of these locations would likely be high priorities for the development of new routes in the future.

Proximity is a measure of *availability* - it shows us which places are near and far from service, but not whether that service is useful.

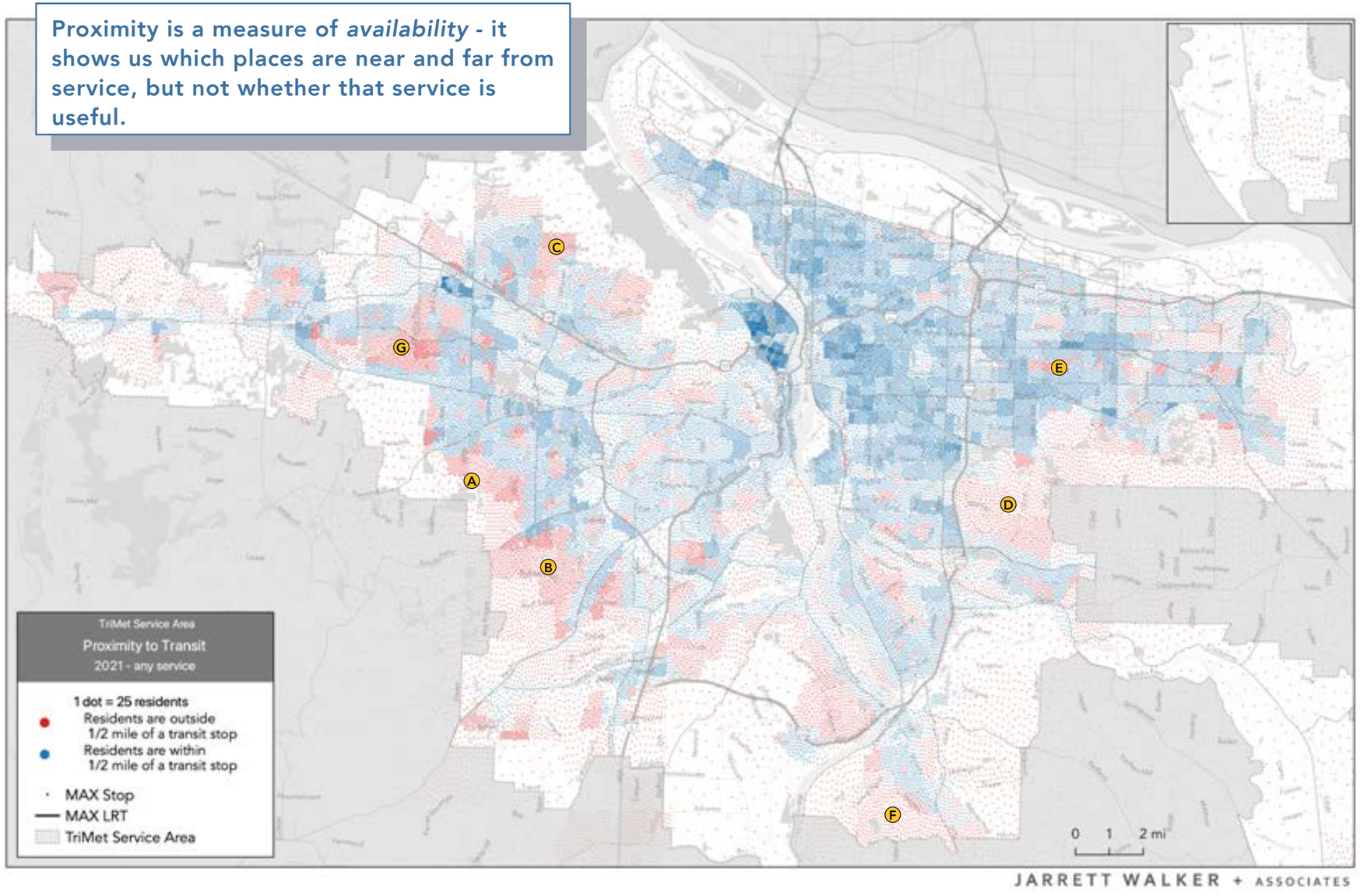


Figure 31: Residential Proximity to Transit

Who is near service?

The previous page described which areas are near and far from TriMet service. **Figure 32** shows the number of people within a 1/2-mile walk to each frequency of transit service, for all residents, people in poverty, people of color, and jobs.

The majority of people who are near transit are near Frequent Service. In TriMet's network, about 61% of residents are near some midday transit service, and about 35% of residents are near midday service that runs every 15 minutes or better.

More people of color and lower-income people are near transit service, and near Frequent Service. This is because (as we've seen in the demographic analysis), both groups' residential locations are clustered in areas that are close to service. This is truer for lower-income people, who are more likely to live within Portland, in areas that are well-served by high-frequency transit.

Similarly, most jobs that are served by transit are served by frequent transit. TriMet designs service to provide access to job centers and busy employment corridors, and over 2/3 of the jobs that are on transit are near high-frequency service.

Proximity's relationship to transit planning goals

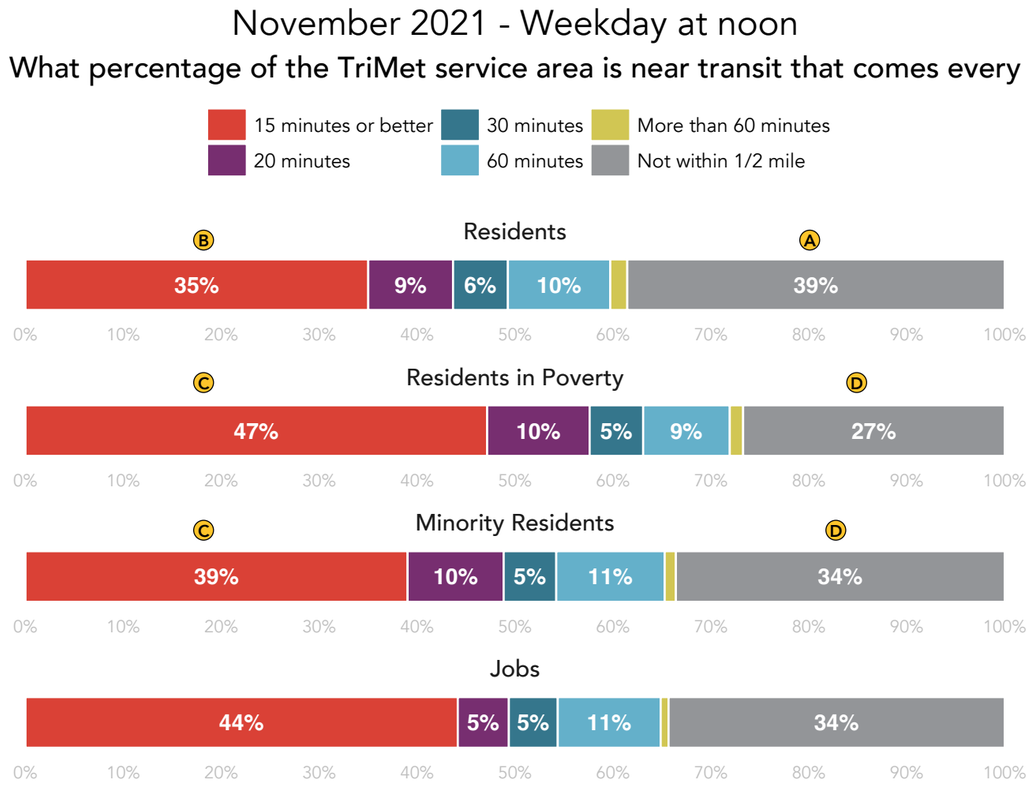
The analysis shown in **Figure 32** is an important tool to understand how a proposed network change serves different transit goals.

Network changes that seek to maximize coverage succeed when the overall size of each grey bar Ⓐ (the number of people who are far from transit) is reduced.

Network changes that seek to maximize ridership succeed by maximizing the size of the red bars Ⓑ, and putting the most people near the most useful high-frequency service.

Transit plans designed to improve the equity of transit service generally seek to expand access to both Frequent Service Ⓒ and any service Ⓓ for lower-income people and people of color. Expanding the size of the red bars for lower-income people and people of color means more people have access to service that is useful, expanding the range of destinations and opportunities that transit can provide. Reducing the size of the grey bars for these groups is about providing a basic, affordable transportation service to as many people who may need it as possible.

These measures only tell us about who is close to service, and how TriMet's resources are distributed. To understand who the mobility benefits of transit are distributed to and how useful service is for different people, we must use a different type of analysis, called an *access analysis*. This analysis is discussed later in this chapter.



Note: Proximity is measured as being located within 1/2 mile of a bus stop.

Figure 32: Proximity to Transit Service - 12 p.m. weekday

About 61% of residents of the TriMet service area live within 1/2 mile of service.

About 35% of residents live within 1/2 mile of a bus or MAX line that runs every 15 minutes or better.

How did service change before the pandemic?

Like all US transit agencies, TriMet service planning over the decade leading into the onset of the COVID-19 pandemic was primarily concerned with restoring the major cuts implemented at the time of the Great Recession. During this period, the contraction of the US and local economy resulted in severe impacts on the agency's major funding sources during the 2009-2010 period. From 2010 onward, TriMet began restoring service using its Service Enhancement Plans as a guide, and by 2019, after the addition of new funding through the HB 2017 legislation total annual revenue hours had finally surpassed the level operated in 2008.

This trend is hardly unique to TriMet. Most transit agencies faced funding challenges during the recession, and most took years to bring service back to where it had been. **Figure 33** shows TriMet and a group of peer agencies' service level reporting in the National Transit Database[7] (NTD) (in terms of total annual revenue hours) from 2003 until 2018. The black line represents TriMet's service level, showing a deep dip from 2009 to 2011, and then a gradual climb in the years following. TriMet's trajectory is very similar to peer agencies in Oakland, San Diego, San Jose, and Denver.

While service recovered over the past decade, ridership did not. With some year-to-year fluctuation, ridership declined over the past decade. **Figure 34** shows the total number of annual "unlinked" passenger trips carried by TriMet and peer agencies in each year from 2003 to 2018.

The causes of this industry-wide trend were much debated in mainstream media[8][9] prior to the pandemic, with more rigorous analyses suggesting the compound impacts of recession-era service cuts[10] and the proliferation of investor-subsidized ridehailing services as two of the most important factors[11].

Running more service to generate more ridership means that ridership is being generated less efficiently. **Figure 35** shows the productivity of TriMet and the peer agencies - the number of rides carried for each hour of service operated. All peer agencies experienced a decline in productivity from the post-recession period onward.

TriMet's service was not static during this period. As the agency restored service cut during the recession, it addressed new challenges and needs that emerged in the 2010s.

The next page describes how TriMet's service developed over the past decade, as the agency responded to emerging needs by:

- Bolstering service in areas of high equity concern, especially when those places are likely to generate high ridership. Examples of this include the service enhancements along Powell, 122nd Ave, King and TV Highway.
- Maintaining the service level in high-ridership markets like inner NE or SE Portland.
- Expanding service to reach new needs at the edges of the service area. The primary example of this is the is North Hillsboro and Bethany, responding to the growth of residential areas and employment concentrated along Evergreen Parkway.

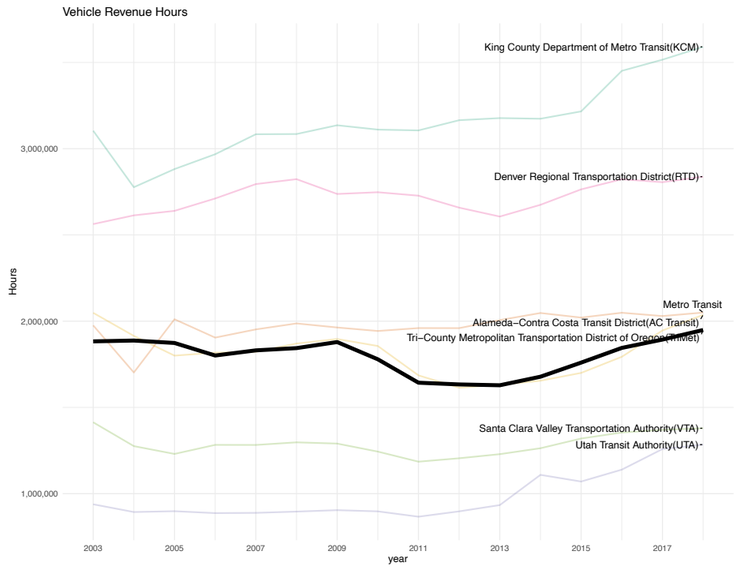


Figure 33: TriMet and Peer Agency Annual Vehicle Revenue Hours, 2003 - 2018

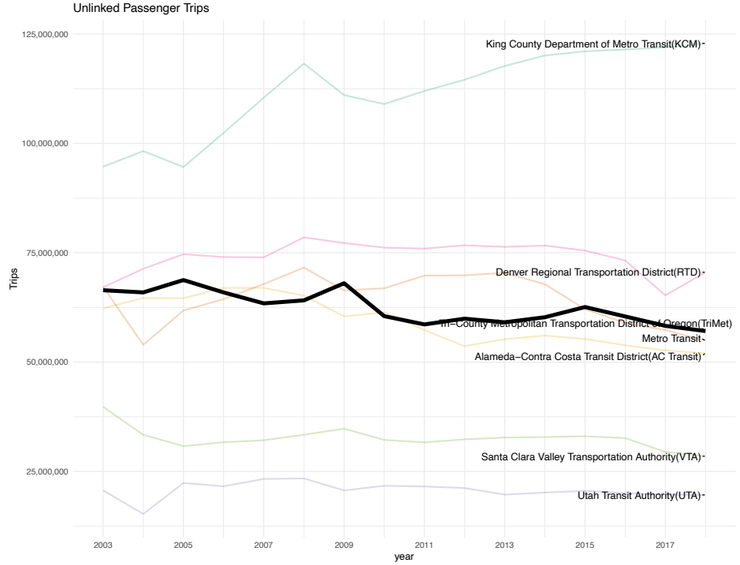


Figure 34: TriMet and Peer Agency Annual Unlinked Passenger Trips (Boardings), 2003 - 2018

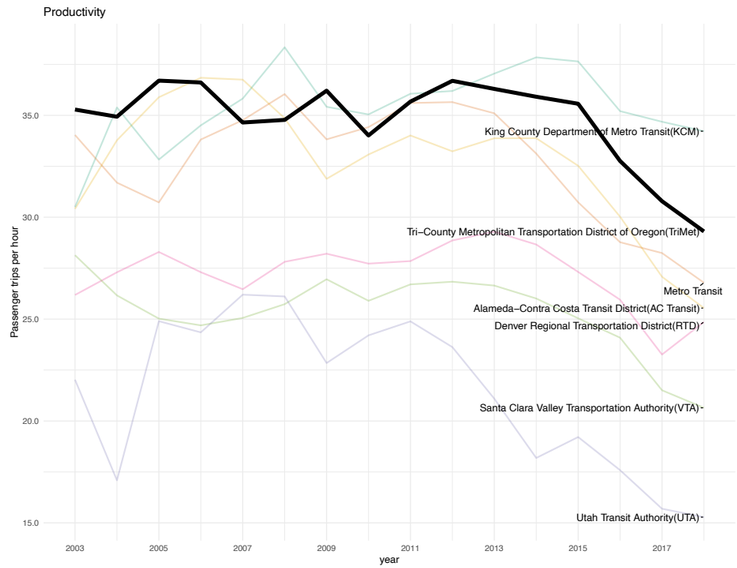


Figure 35: TriMet and Peer Agency Annual Productivity (Unlinked Passenger Trips per Revenue Hour), 2003 - 2018

Where did service change before the pandemic?

Figure 36 maps how the quantity of bus trips changed across the service area from 2008 to 2019. Each hexagon on this map is shaded based on the number of weekly bus trips passing within 1 mile in 2019, compared to 2008. Places that had more service added by 2019 are shaded blue, while places with less service in 2019 are shaded red.

This map shows how over this span, TriMet increased service substantially in response to needs emerging at the edges of the service area. On the eastside, new service was implemented on 162nd Ave Ⓐ, 122nd Ave was upgraded to Frequent Service Ⓑ, and 15-minute service was extended east on Line 9-Powell to Gresham Ⓒ.

On the westside, TriMet added service along Line 57-TV Highway Ⓓ, and in Bethany Ⓔ and North Hillsboro Ⓕ. Service was added in Sherwood, with the replacement of the end of Line 12 Ⓖ with standard service lines 93 and 94. In Oregon City, high-frequency service on Line 33 was extended to serve Clackamas Community College Ⓗ.

Over the same span, TriMet reduced service in low-ridership areas, including low-density, wealthy residential areas of the West Hills Ⓘ and Lake Oswego Ⓙ (where span and frequency were reduced on Line 36 and 37). In the dense, high-ridership areas of central Portland, including inner Southeast and Northeast, the service level was largely held constant Ⓚ.

The main part of the central area between the West Hills and I-205 where service increased was between Clackamas TC and Milwaukie Ⓛ . With the opening of the MAX Orange Line, Frequent Service Line 33 was extended along King to a new terminus at Clackamas TC.

As TriMet restored service after the Great Recession, it prioritized service improvements in equity areas and newly developed neighborhoods.

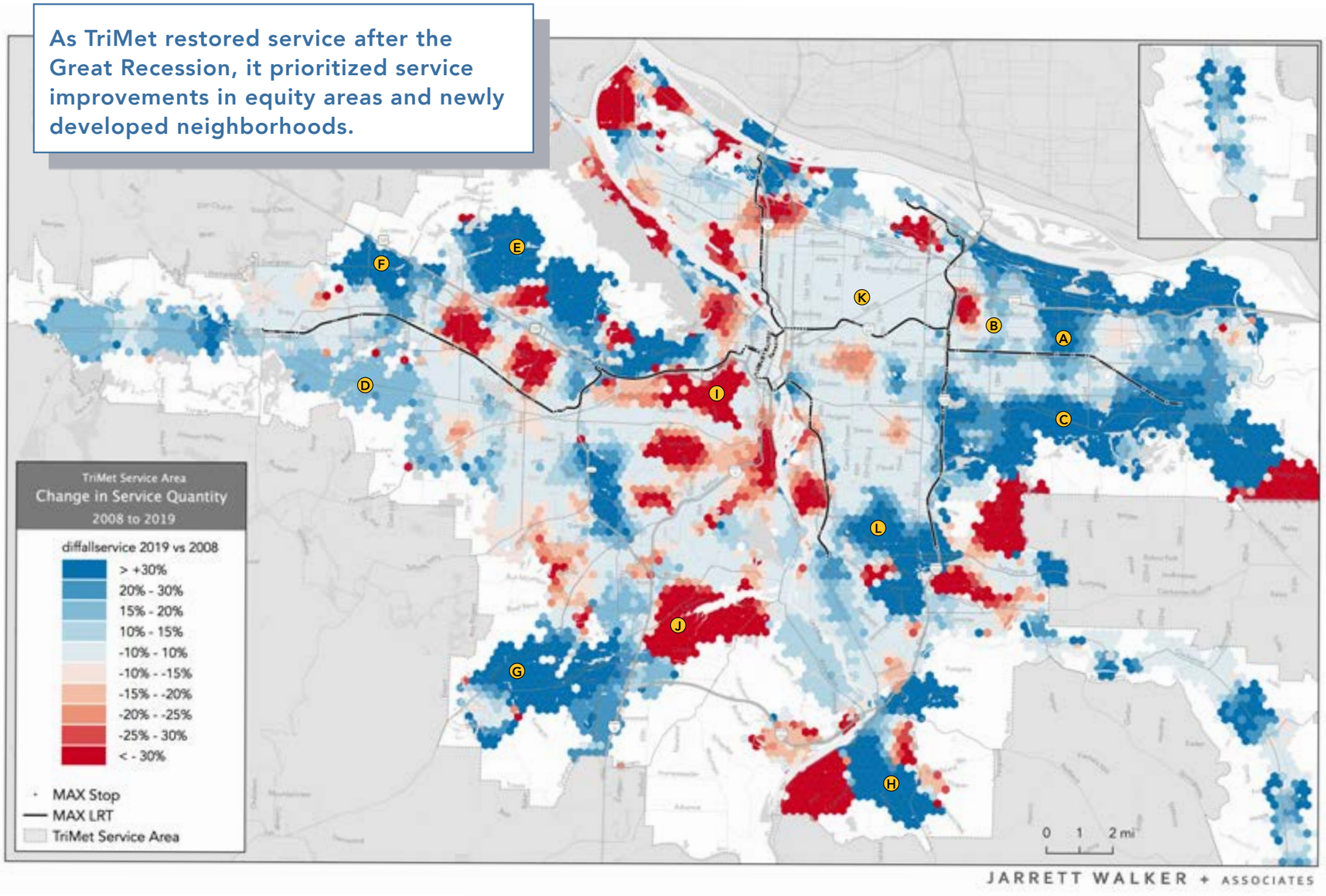


Figure 36: TriMet Change in Bus Service, 2008 - 2019

Ridership in 2019

Figure 37 shows the weekday average number of people who boarded the bus at each stop in Fall 2019. Boardings on buses are shown in blue and boardings on light rail trains are shown in red. Ridership on the Portland Streetcar is shown in green. When a stop is served by multiple routes, the boardings for all routes are summed for that stop.

TriMet's ridership followed the pattern shown on this map for many years prior to the pandemic. The busiest stops were MAX rail stations; ridership was high along the dense central city Frequent Bus Network corridors like Line 6 or 15 Ⓐ, as well as the frequent crosstown services like Line 72, 73 or 75. Major transfer points like Tigard TC Ⓑ or Beaverton TC Ⓒ stood out, as did key employment and educational destinations like Clackamas Community College Ⓓ, Clackamas Town Center Ⓔ , and OHSU Ⓕ.

The pre-pandemic ridership pattern was strongly oriented towards the radial corridors feeding into Downtown Portland. While ridership on the frequent radial services was high in both directions, it was always highest toward downtown, representing the major influence on travel demand of the regional job center.

It is important to note that the level of service varies widely across the network, as does the number of people and quality of pedestrian infrastructure near each stop. Many low-ridership stops are in lower-density places with fewer people nearby who could choose to ride, often served at lower frequencies.

In 2020, this existing condition was completely altered, as ridership declined across the entire region. The lockdown period that resulted in the layoff of many nonessential workers and shift to work-from-home for professional workers was brief, but the change in regional travel demand was much more durable.

Before the pandemic, TriMet's highest-ridership bus lines were corridors that served Downtown Portland like Line 15-Belmont, and frequent crosstown services that didn't go downtown like Line 72-82nd Ave.

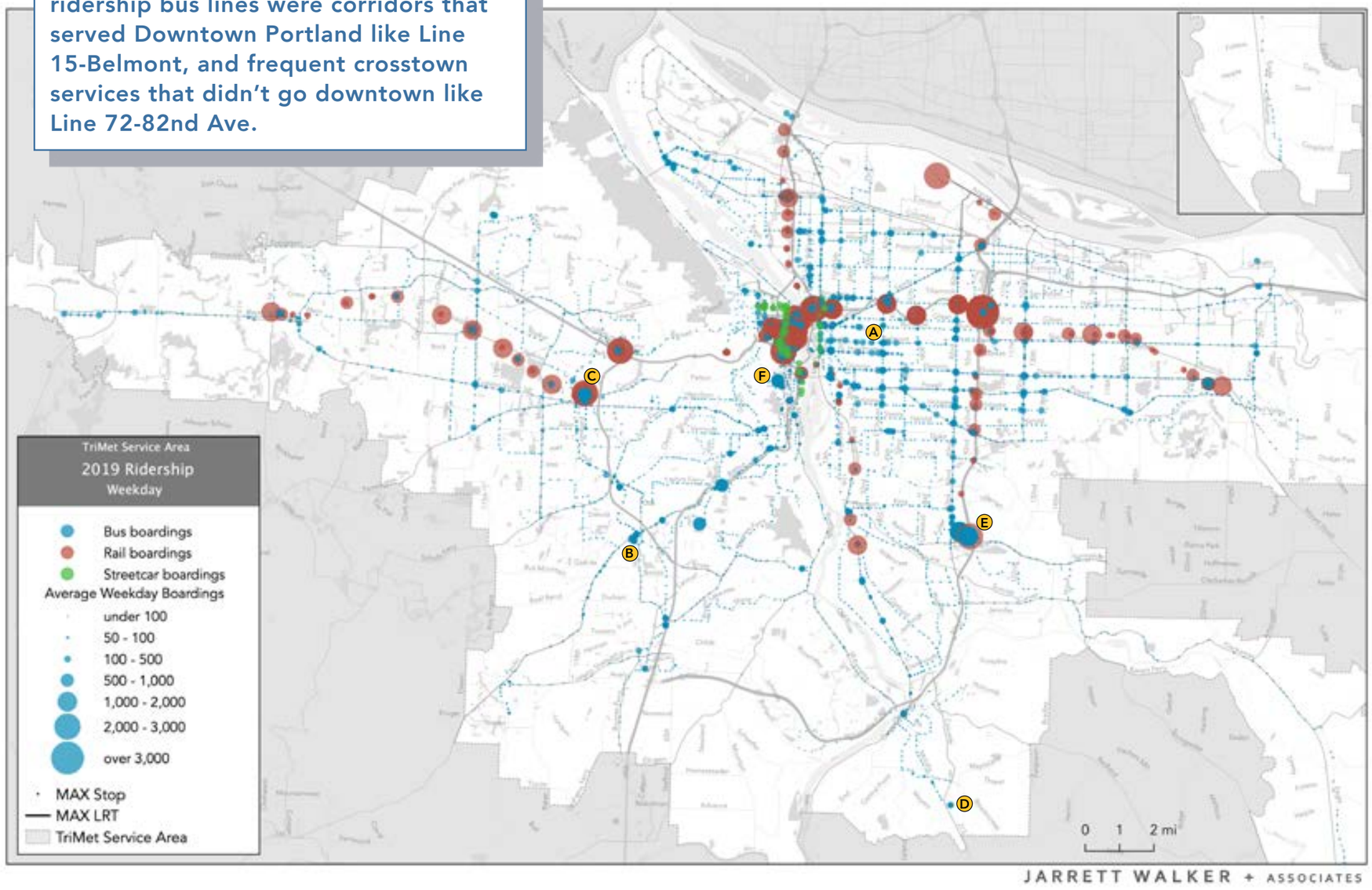


Figure 37: TriMet Average Weekday Boardings by Stop, Fall 2019

Ridership in 2021

Figure 38 shows the weekday average number of people who boarded the bus at each stop in Fall 2021. Boardings on buses are shown in blue and boardings on light rail trains are shown in red. When a stop is served by multiple routes, the boardings for all routes are summed for that stop.

This map shows a radically different picture than the map of 2019 ridership. Ridership overall is much lower; very few stops that are not transfer points show ridership above the lowest "under 50 boardings per day" category. The volume of ridership at MAX stations is still high, but some stations, like those along the Blue Line west of Beaverton Ⓐ, have collapsed more dramatically than those on the eastside Ⓑ.

By Fall 2021, lockdowns were long over, many businesses had reopened, and the statewide vaccination rate had exceeded 70%. This map is not showing a picture of ridership during a period of lockdown or widespread closure - it represents the state of ridership during the period immediately preceding the Omicron surge in December 2021 and January 2022.

Since 2020, ridership has dropped throughout the network. The busiest stops are now at major transfer points and places near places where many people are working in-person.

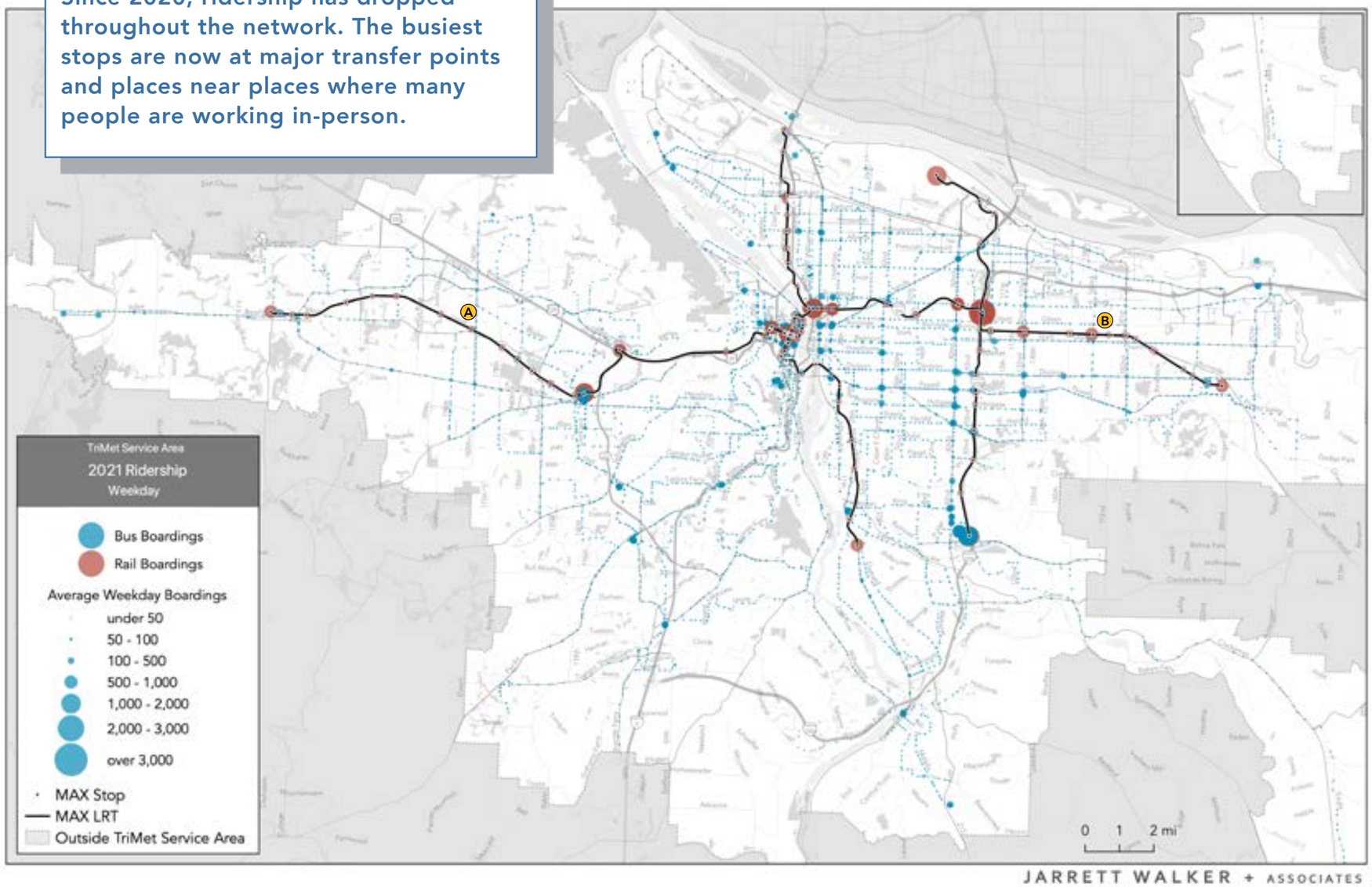


Figure 38: TriMet Average Weekday Boardings by Stop, Fall 2021

Where has ridership changed since 2019?

While ridership has declined systemwide since the beginning of the COVID-19 pandemic, it has not declined at the same rate in all parts of the network.

Figure 39 shows the change in daily ridership by stop, compared to the network as a whole. Stops that lost more ridership than the network average are shown in shades of brown, while stops that retained more of their 2019 ridership are shown in green. Each stop is sized based on 2019 average daily weekday boarding- the larger the bubble, the more people were boarding at that stop before the pandemic.

Ridership declined across most of TriMet's historic strong ridership markets. Most stops in downtown Ⓐ and along the eastside frequent grid corridors Ⓑ are shown in brown, indicating a greater drop in ridership than the network as a whole. The same thing is true across most of Southwest Portland Ⓒ, and most westside Blue Line stops between Beaverton and Hillsboro.

More pre-pandemic ridership was retained in places where more essential jobs are located, and more broadly where service and retail employment is higher, as in Clackamas Ⓓ, the airport Ⓔ, and Cascade Station Ⓕ.

More ridership was also retained in places with a higher concentration of lower-income people and people of color, especially throughout East Portland, Gresham, and the TV Highway corridor spanning the distance between Beaverton and Hillsboro. This was particularly the case on frequent corridors not oriented towards downtown, including Line 72-82nd Ave Ⓖ, Line 73-122nd Ave Ⓗ, Line 75-Cesar Chavez/ Lombard Ⓘ, Line 33-McLoughlin/King Ⓙ, and Line 57-TV Highway Ⓚ.

Since 2020, ridership has declined the *least* in equity areas and places with many retail and service-sector jobs.

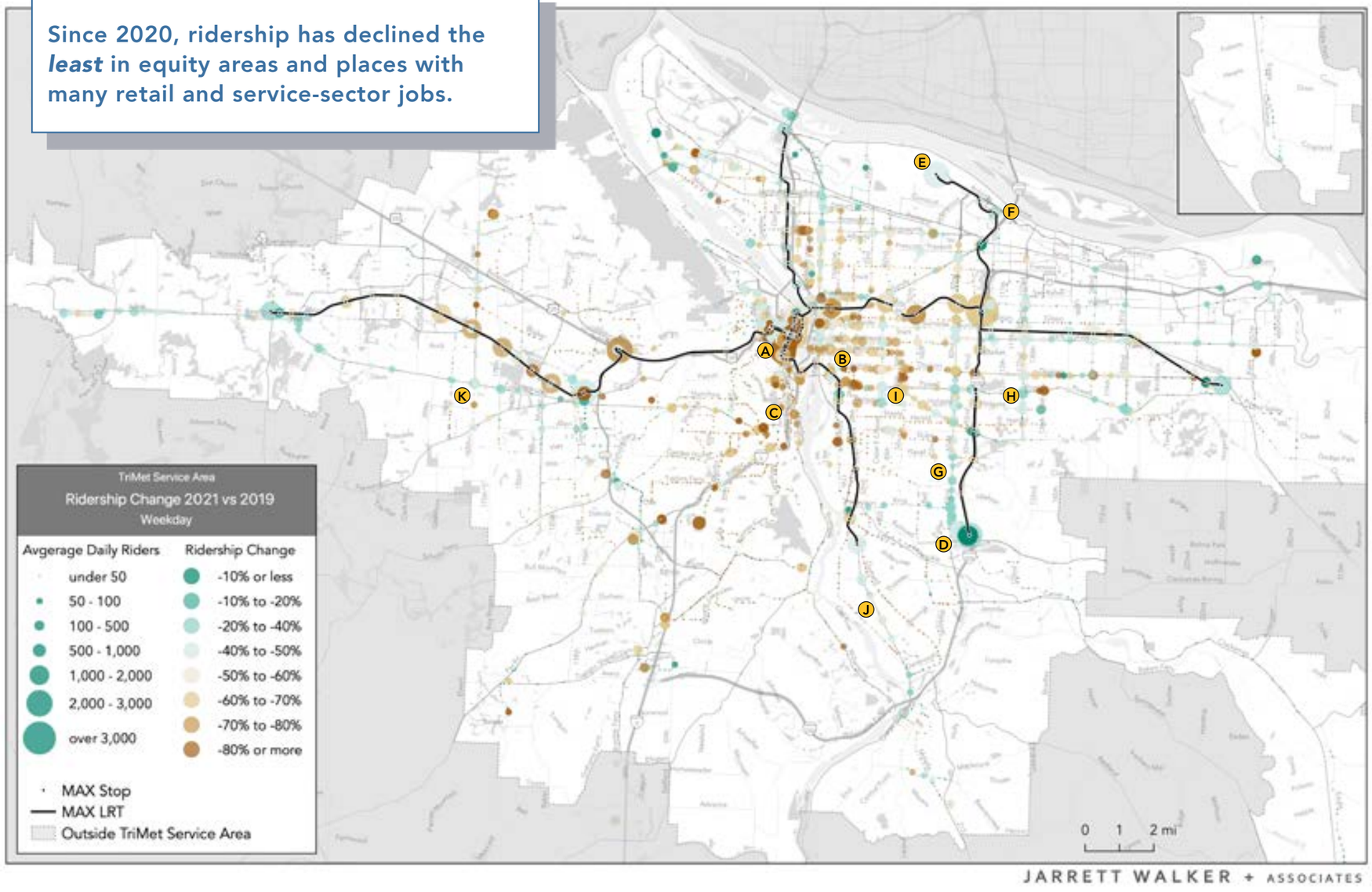


Figure 39: Change in Ridership by Stop, Fall 2019 and Fall 2021

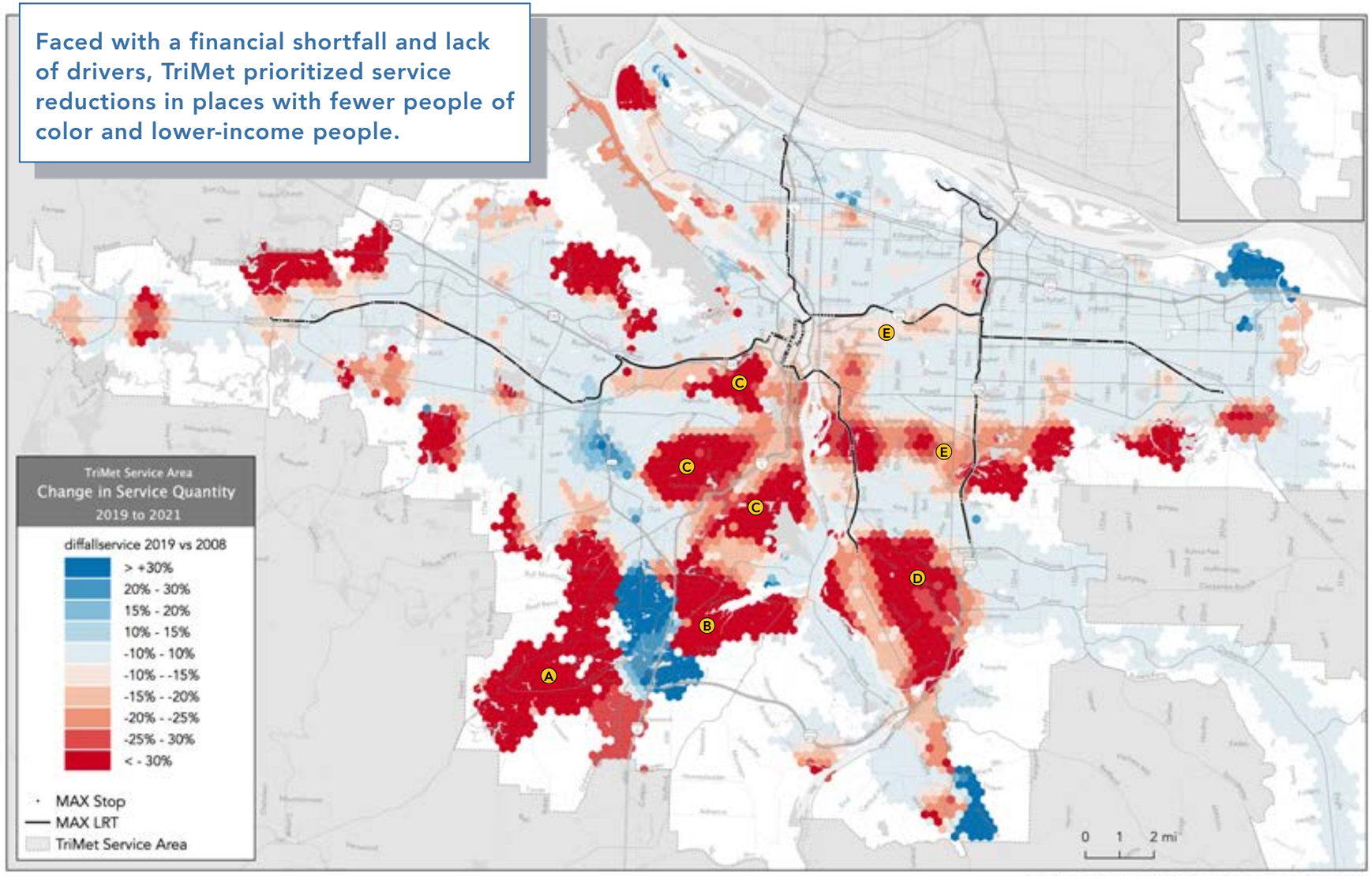
Where has service changed since 2019?

With the fate of many businesses uncertain and ridership dramatically lower, two of the agency's primary funding streams, the payroll tax and fares, were both at risk. Then, as federal relief became available, a prolonged shortage of drivers has slowed the pace of service restoration and even necessitated further service reductions.

As with the restoration of service leading up to 2019, TriMet did not implement reductions uniformly across the entire service area.

- Service was reduced the least in dense, high-ridership areas and communities with a high number of low-income people and people of color.
- Service was maintained on all Frequent Service bus lines. In 2019, about 19% of residents lived within a 1/4-mile walk of Frequent Service; this number was the same in late 2021.
- Service was reduced the most in places where ridership was low before the pandemic, including King City and Sherwood (A), Lake Oswego (B), residential areas in the West Hills and SW Portland (C), and the low-frequency feeder services in Clackamas (D). These are lower-density areas where the impact of a service reduction would be felt by fewer people.
- Service was also reduced substantially on a few of the lines in central Portland that saw the greatest drop in ridership. These include Line 10-Harold and 19-Glisan in Northeast and Southeast Portland (E).

Faced with a financial shortfall and lack of drivers, TriMet prioritized service reductions in places with fewer people of color and lower-income people.



Service and ridership by time of day

The Peak Demand Pattern

Before the pandemic, many transit agencies designed their service around a transit demand pattern that was characterized by distinctive "peaks" during the morning and afternoon rush hour. These peaks were periods during which many people traveled to and from work and the same time; in order to provide sufficient capacity to carry those trips, transit service was higher during these times, with added trips running on busy lines traveling in and out of downtown. Because TriMet does not operate higher-capacity articulated vehicles, in some cases, providing sufficient peak capacity on high-demand corridors required operating patterns that became reliably "bunched".

Figure 40 charts average daily ridership (in blue) and bus trips (in orange) for each hour of the day compared. Productivity (boardings per trip) is shown in red. Each value is expressed as a percentage of the average hour, in order to allow all three to be overlaid on the same graphic.

This image should the pre-pandemic "normal" of the transit network. Service and ridership are both highest during the peak periods, with the top of the AM peak in the 7-8 a.m. hour Ⓐ. The PM peak Ⓑ is wider because of the impact of school trips beginning at approximately 3 p.m.; ridership stays high until the 6-7 p.m. hour.

The red line on this chart shows how productive service was during each hour. When the red line is higher, it means that during that hour, more people were carried by each bus trip. Before the pandemic, even though service was higher during the peaks, productivity was higher too, indicating that there was not an oversupply of peak service across the entire bus network.

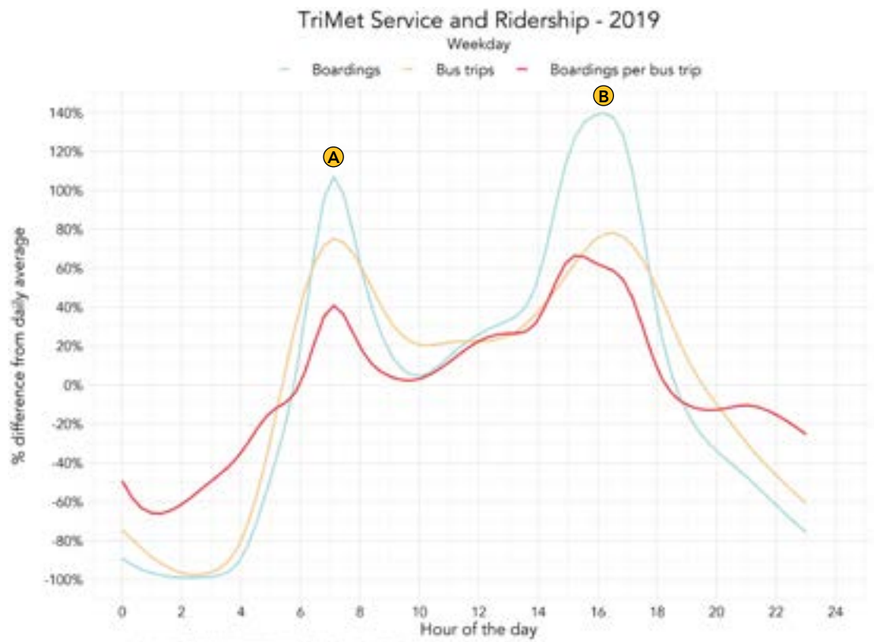


Figure 40: TriMet Service, Ridership and Productivity by Hour of Day - 2019

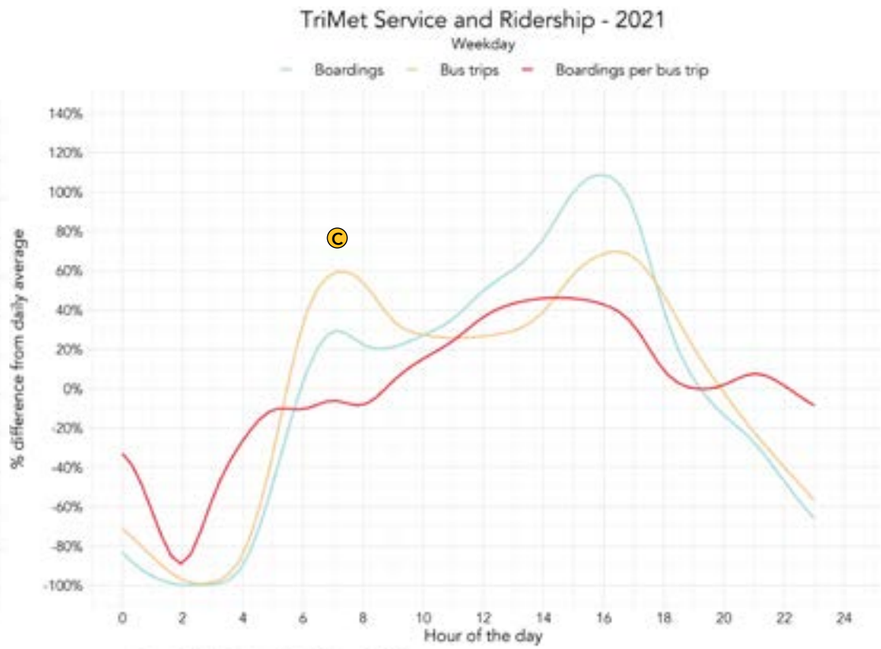


Figure 41: TriMet Service, Ridership and Productivity by Hour of Day - 2021

Changes since 2020

With the onset of the COVID-19 pandemic and subsequent lockdowns, the peak demand pattern disappeared overnight, as ridership into Downtown Portland collapsed.

Figure 41 shows the new pattern in Fall 2021. While there is still a small service peak shown by the orange line, the ridership pattern is totally different. Now, after a small 7-8 a.m. rush hour Ⓒ, ridership climbs steadily through the late morning and midday, before falling off by 6-7 p.m. hour.

This is an indication of how much less driven by 9-to-5 commuters ridership has become. As we observed earlier in the maps of ridership change since 2019 (see page 44), ridership has fallen the most in Downtown Portland and places where ridership is associated with commute trips into the job center.

With those trips making up less of total ridership, the new pattern is more driven by the schedules of people in the places where ridership has been retained, particularly retail and service sector employment. These jobs don't follow the "traditional 9-to-5"; they involve multiple shifts across the day, with employees beginning work in the early morning, midday and afternoon.

Since the onset of the COVID-19 pandemic, the "peaked" ridership pattern driven by "9-to-5" commuters has largely disappeared.

Ridership by time of day

Before the onset of the pandemic, peak ridership also had a very specific spatial pattern. Certain places had higher ridership during the peak than at midday. **Figure 42** shows ridership during the AM peak (6 a.m. to 9 a.m.) and midday (11 a.m. to 2 p.m.) periods in 2019 and 2021. Boardings on buses are shown in blue and boardings on light rail trains are shown in red.

As the chart on the previous page showed, the pandemic, boardings were higher during the peak period than during midday. The 2019 AM Peak map shows high boardings along radial corridors headed downtown, including westside frequent radial corridors like Beaverton-Hillsdale Highway Ⓐ.

By contrast, the 2019 Midday map shows some of the highest boarding locations on crosstown corridors like 82nd and 122nd Ave in Portland. Destinations where people are coming and going all day like community colleges Ⓑ showed higher ridership at midday than during the peak. Retail and service employment areas like Clackamas Town Center Ⓒ and the inner eastside commercial streets continued to see high ridership through the midday.

Ridership has decreased significantly during the pandemic, especially in the peak hour due to the service cuts. One of the biggest changes is the disappearance of the distinctive peaking pattern. Comparing the 2021 AM Peak and Midday maps, the pattern is now very similar throughout the day, with the highest ridership stops at key transfer points and employment areas with a lot of in-person jobs.

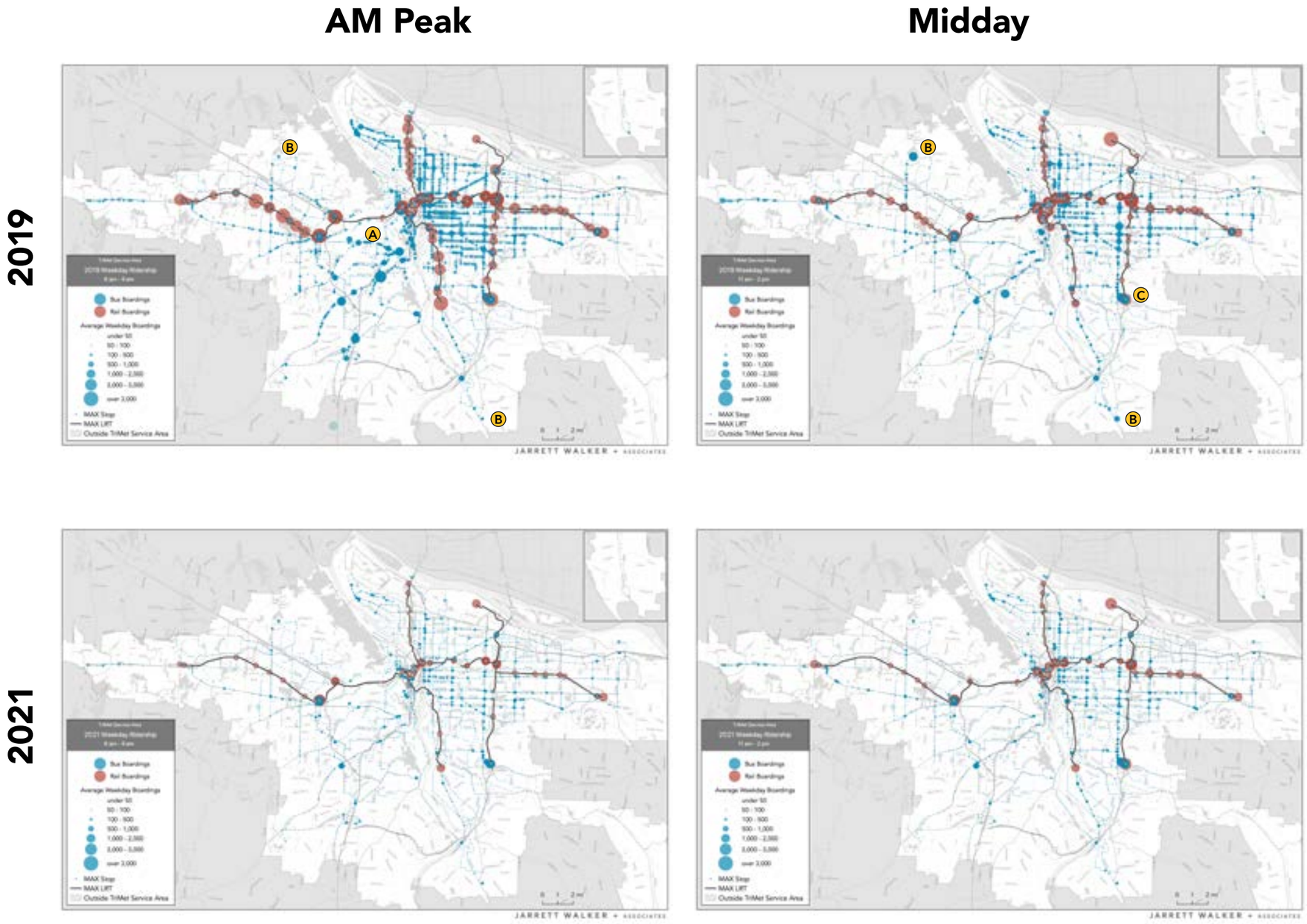


Figure 42: TriMet Peak and Midday Ridership, 2019 and 2021

Future peak service design

One of the most important questions for TriMet's future service design is about whether the pre-pandemic peaking pattern returns. Before the pandemic, the peak in demand during rush hour required TriMet to deliver a certain level of capacity, sometimes in inefficient ways. Peaked service design has been a constant in TriMet's network; as **Figure 43** shows, the number of trips operated in each hour of the day was similar in 2019 and 2008.

The "peak-to-base ratio" is a measure that compares the maximum level of service to the midday "base" level. In 2008, TriMet's operated about 48% more trips during the peak hour than during the 12 - 1 p.m. hour; in 2019, this number was down to 43%.

By Fall 2021, TriMet's service was less peaked than at any time since at least 2008. In the orange line in **Figure 43**, the peak hour represents about 33% more service than the midday base.

As TriMet restores service, one of the most important questions is whether a return to a higher level of peak service is necessary or desirable. If rush hour transit demand is lower over the long term, resources that have previously been invested in serving peak demand could be used in other ways.

Because TriMet does yet not operate high-capacity articulated buses, the main tool it has to add peak capacity are added trips.

As the declining peak-base ratio shows, during the pandemic, TriMet has already prioritized service reductions on heavily peaked routes, since ridership on those routes has dropped further than that of routes that service places where demand is more consistent throughout the day. Whether the reduction in peak period travel demand continues remains to be seen and will continue to be evaluated throughout the Forward Together process.

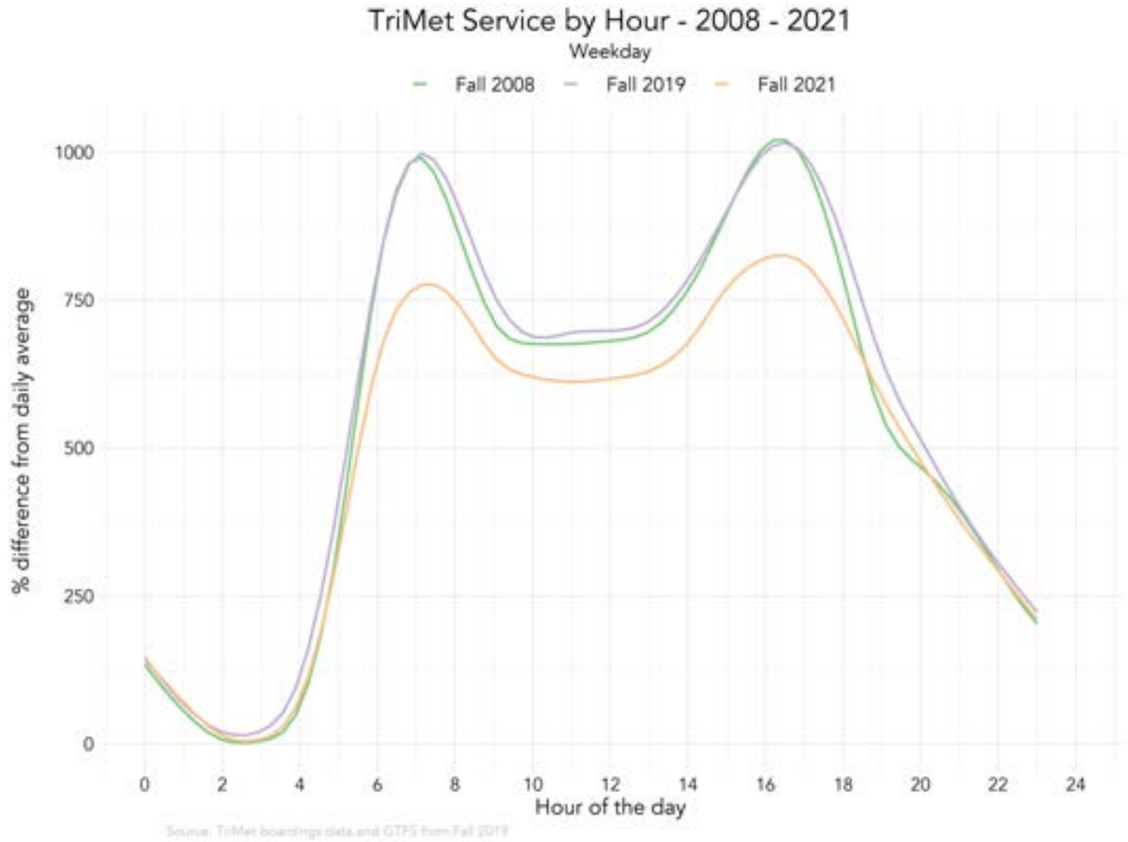


Figure 43: TriMet Service by Hour of Day - 2008, 2019 and 2021

TriMet's service throughout the day is now less concentrated in the rush hours than at any time since at least 2008.

Weekend Service

TriMet operates about 40% less service on weekends than on weekdays. **Figure 44 and Figure 45** compare weekday and weekend frequency across the network at midday.

TriMet's Frequent Service lines run every 15 minutes, most of the day, every day. The biggest change on weekends at midday is that a few lines that on weekdays run every 20 minutes, like Line 70 or Line 77 (A), run about every 30 minutes. Additionally, some of the commute-oriented services that only run at rush hours, like Line 1-Vermont (B) or Line 66-Marquam Hill/Hollywood, do not run on weekends.

The major difference between weekday and weekend service starts to show up in the evenings. While the entire frequent bus network runs at 15-minute frequency on weekends, it does so for a shorter span. **Figure 46** and **Figure 47** compare weekday and weekend frequency at 7 p.m.. As **Figure 47** shows, on weekends, the frequent bus network is operating at 20-minute frequencies by 7 p.m.

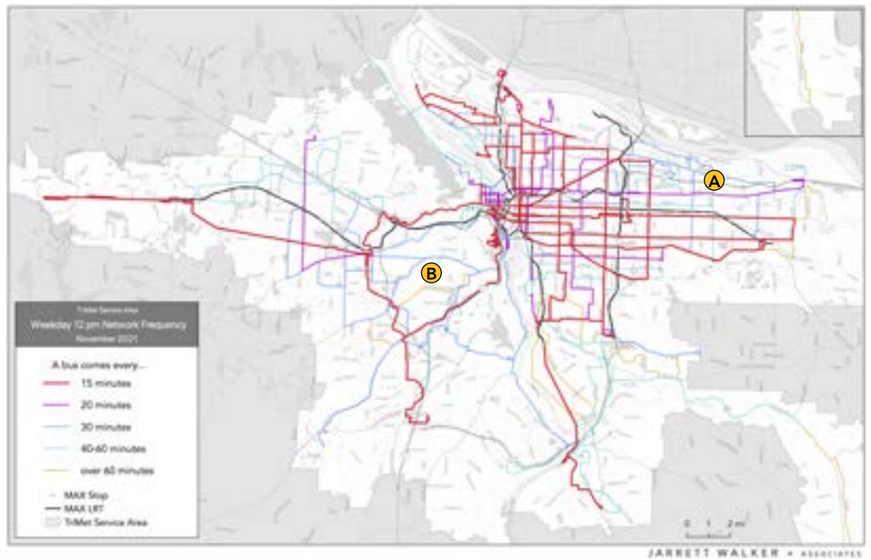


Figure 44: TriMet Frequency by Route - Weekday 12pm

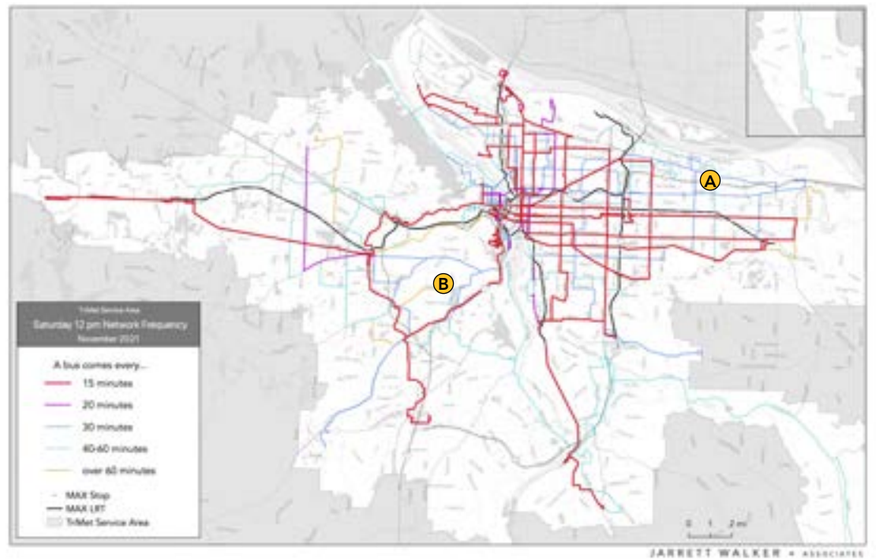


Figure 45: TriMet Frequency by Route - Saturday 12pm

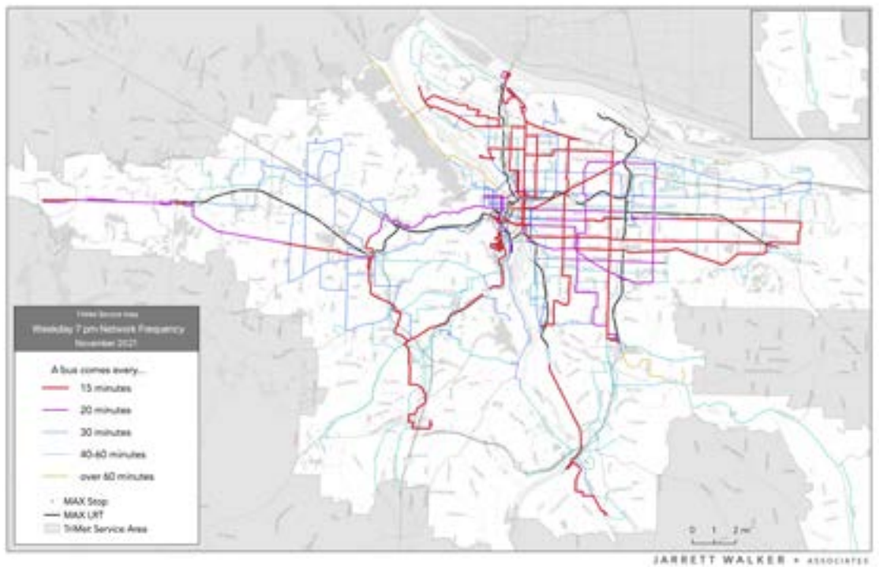


Figure 46: TriMet Frequency by Route - Weekday 7pm

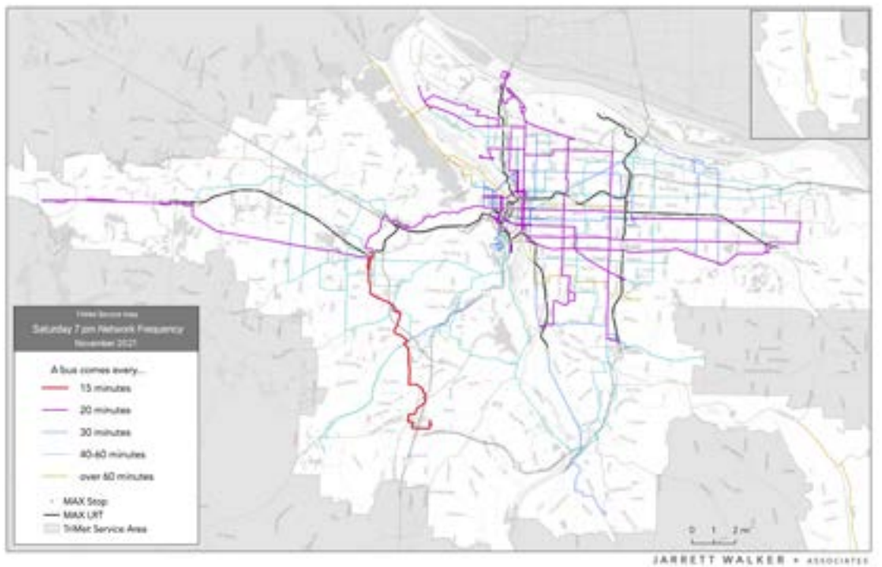


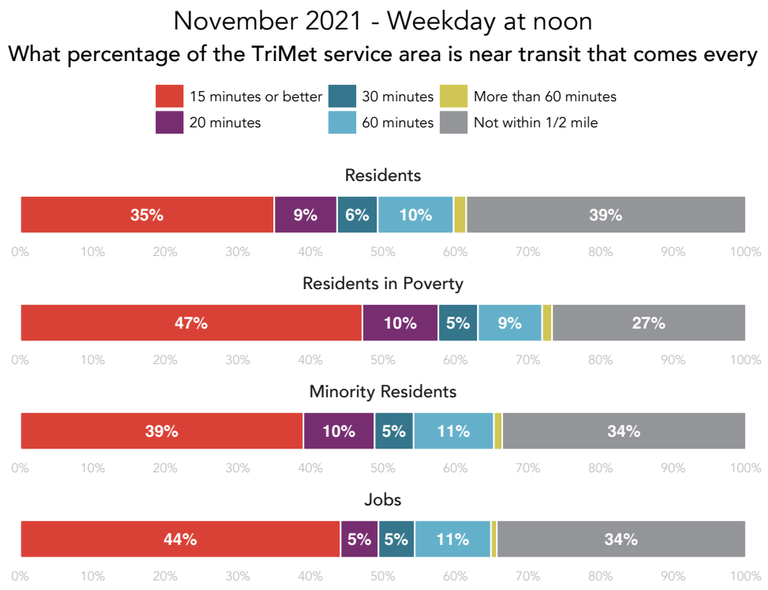
Figure 47: TriMet Frequency by Route - Saturday 7pm

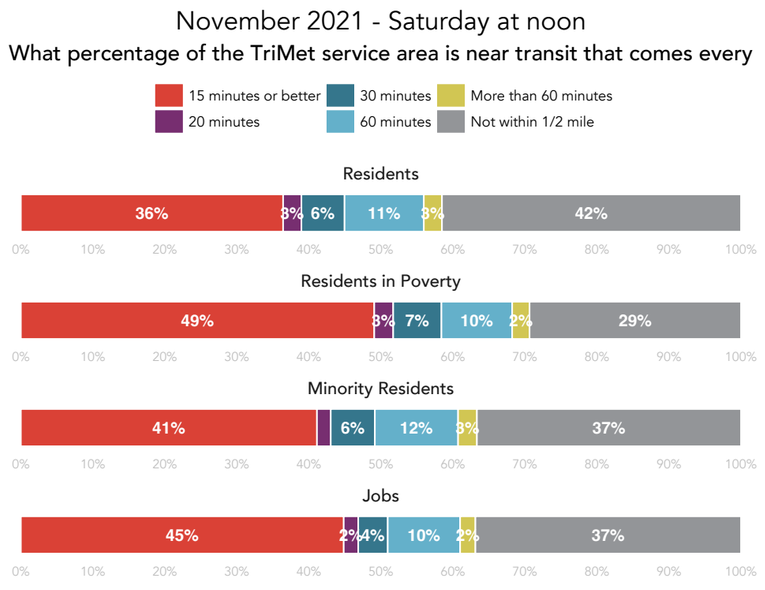
Weekend Service

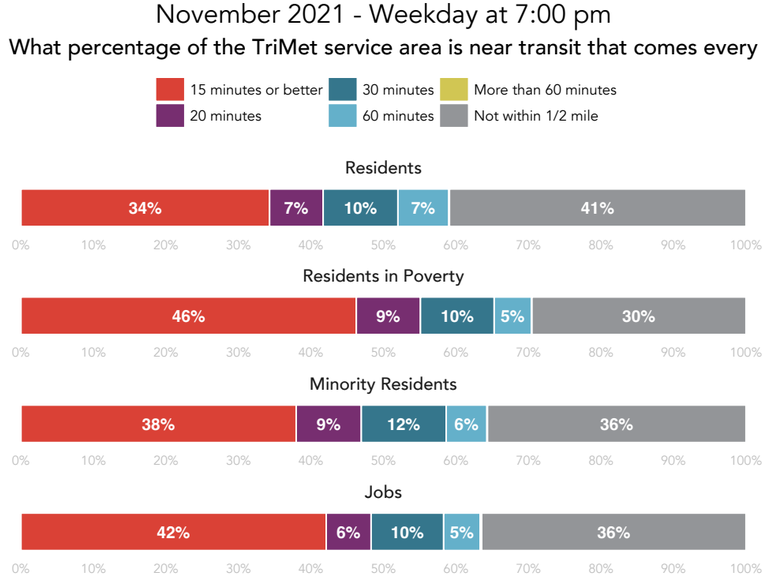
Figure 48 shows four charts comparing the proximity of residents and jobs to service at noon and 7 p.m. for both weekdays and Saturdays. Weekend transit coverage at noon is almost identical to weekdays - about 35% of residents are within a 1/2-mile walk of a Frequent Service line, and about 40% are not near any transit service at all.

On weekdays, coverage at 7:00 p.m. is similar, but on weekends, the reach of the network (and particularly the frequent bus network) begins to erode by this point. Most people that were near 15-minute service at 7 p.m. on a weekday have only 20-minute service on weekend evenings. By 10 p.m., most of these routes are running only every 30 or 60 minutes. On weekdays, most Frequent Service lines run every 15 minutes until 9-10 p.m.

Compared to many of its peers, TriMet already operates a far more consistent schedule across the weekend. However, service that comes less often in the evening is less convenient for people who do need to travel during those periods, particularly retail, service, and industrial workers who are more likely to work shifts that do not align with window during which the frequent bus network is in full service.







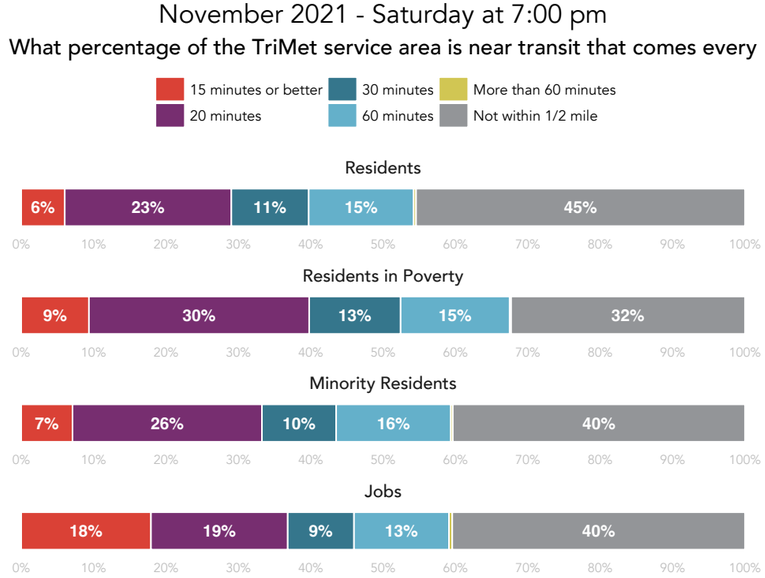


Figure 48: Proximity to Service at 12:00 p.m. and 7:00 p.m., weekdays and Saturdays

Where can transit take me?

So far, we've examined transit from the perspective of the agency that operates it. Where is service available, how often does it come, how much ridership does it generate?

For customers, the decision to take transit revolves around one key question: where can it take me? If transit can't get you where you need to go in a reasonable amount of time, by the time you need to arrive, its unlikely to be an option that you consider if you have another more convenient alternatives.

The "travel time isochrone" is a useful concept to evaluate transit's potential usefulness. An isochrone is a shape on a map that covers all the places reachable in a fixed amount of time from a particular starting point.

Figure 49 shows an example of an isochrone, for trips starting at Clackamas Town Center at noon on a weekday. The dashed line shows the area you could reach with a short 20 minute walk; each blue area shows where you could travel on transit in 30, 45 and 60 minutes. The table at the bottom shows how many jobs and residents are reachable at each travel time.

These isochrones include walking, waiting, and riding time up to 60 minutes of total travel time, along all nearby routes. From Clackamas, we can see the isochrone includes King Rd and McLoughlin Boulevard Ⓐ (Line 33), 82nd Ave Ⓑ (Line 72), and 52nd Ave Ⓒ (Line 71), three of the services that end at Clackamas TC. Because Line 33 and 72 come more often, requiring a shorter wait, it is possible to travel further along them with a 45 minute trip than along less-frequent routes like Lines 155 Ⓓ and 156 Ⓔ to the east.

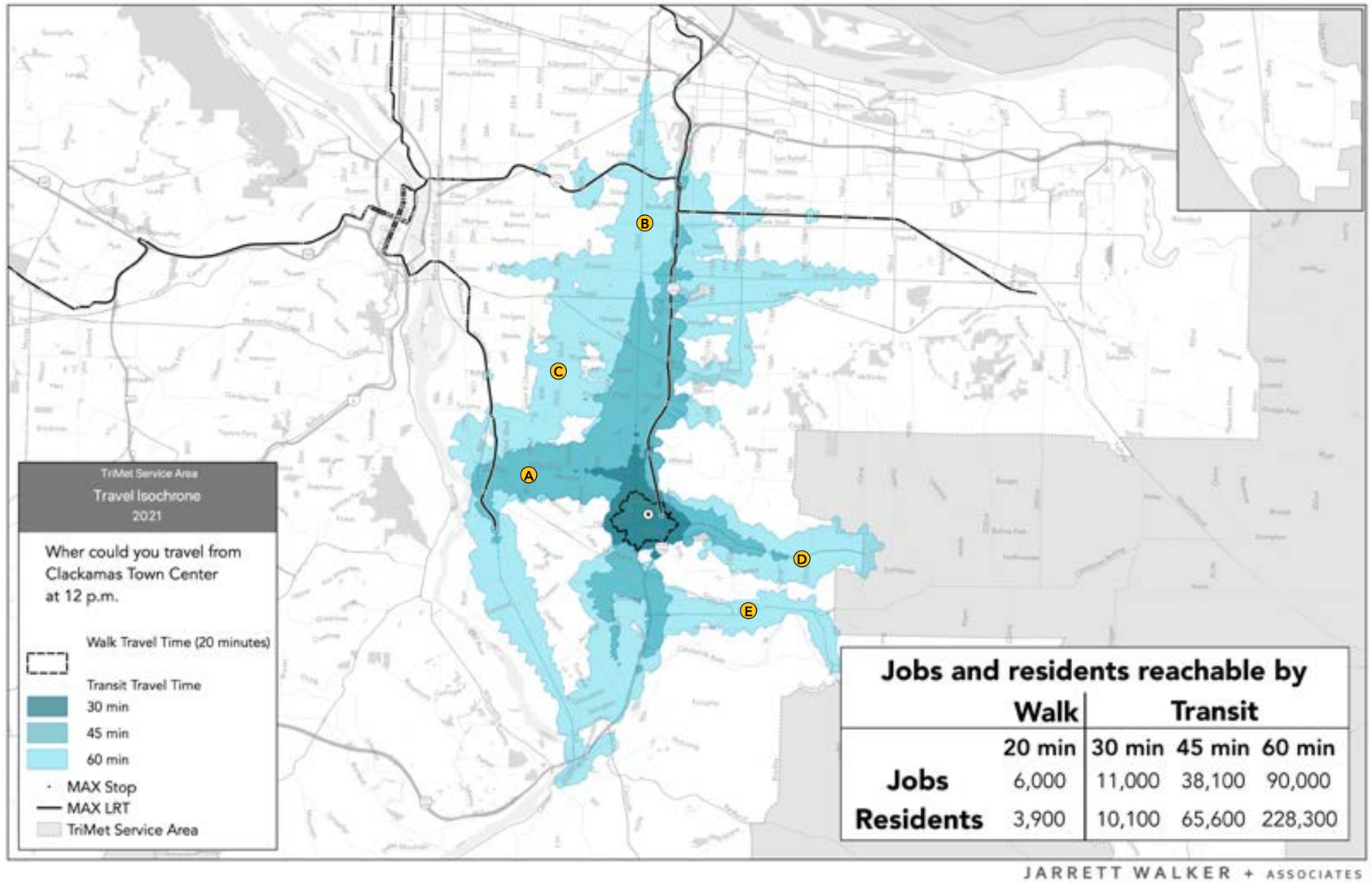


Figure 49: Travel Time Isochrone - Clackamas Town Center

This image is called an "isochrone". The blue area shows where you could get to on transit from Clackamas Town Center in 30, 45 and 60 minutes. Places outside of the isochrone would take longer to reach.

Where can transit take me?

What you can reach on transit varies from place to place. From Clackamas Town Center, about 38,100 jobs and 65,600 residents were reachable with a 45 minute transit trip. Compare that with a trip starting at Downtown Hillsboro (**Figure 50**), where over 60,000 jobs and 104,000 residents are reachable in the same 45 minute travel time.

Transit service runs all over the region, and examining a few important destinations like Downtown Hillsboro or Clackamas Town Center isn't enough to provide a comprehensive view of how useful transit is throughout the service area. For that, we use a tool called "access analysis".

Access Analysis

When we talk about access, we are talking about where transit can take you. If there are more potential jobs or destinations within reach, it is more likely that the ones you want to travel to are going to be included. One way transit becomes more useful is by expanding the range of possible places you can use it to travel to in a reasonable amount of time.

The table in the bottom of the isochrone on this page is an example of access. From Downtown Hillsboro, a person has access to about 100,000 jobs and 178,500 residents with a 60 minute trip. Access to residents is the number of people who could potentially reach their homes from a destination (like a workplace or community center) near this location.

In the access analysis, we generate the same type of isochrone, but for starting points spaced every 400 meters, covering the entire service area. This provides a view of the transit network's usefulness everywhere, and not just at a few places. The results of this analysis are examined on the following pages.

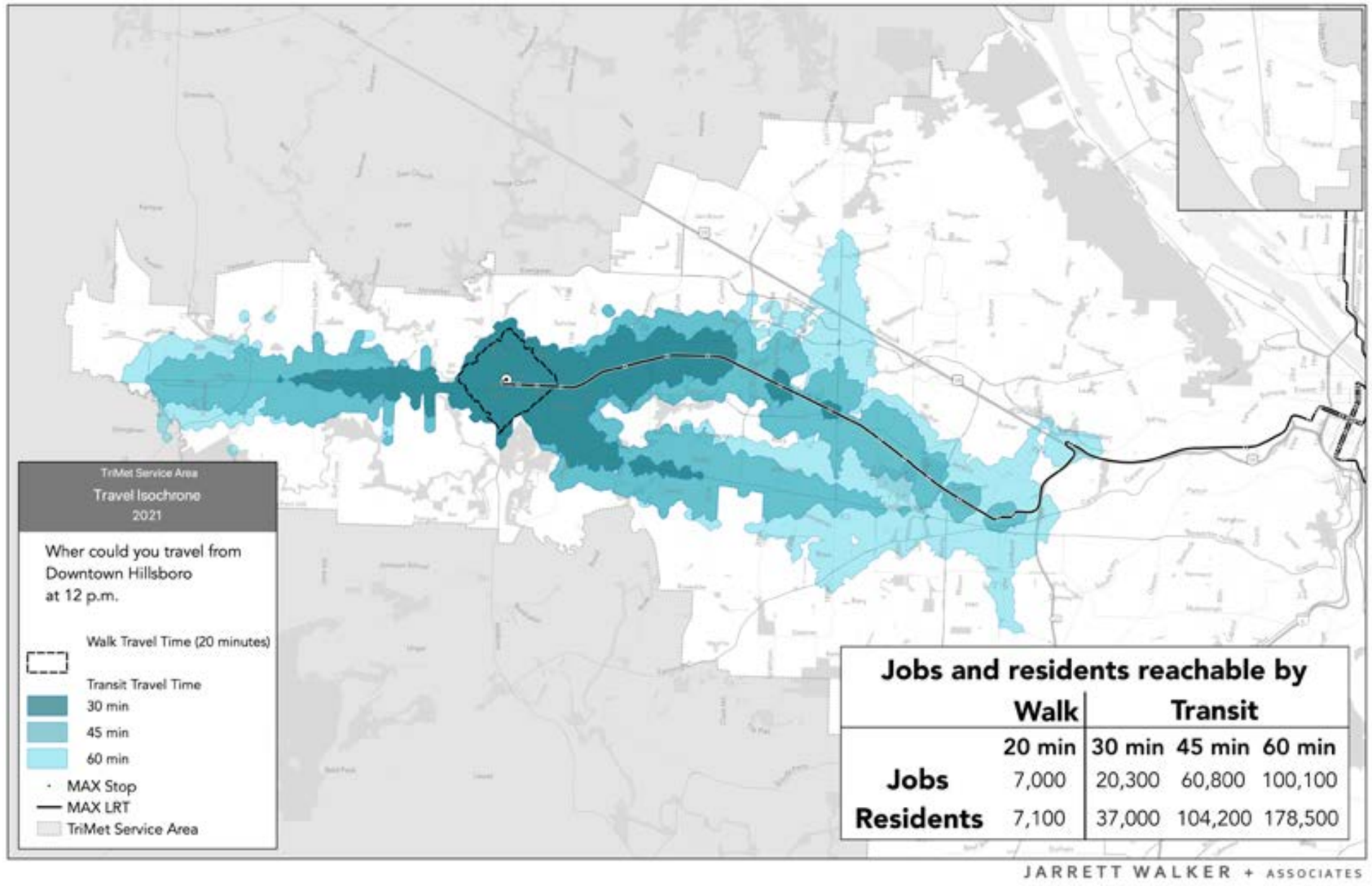


Figure 50: Travel Time Isochrone - Downtown Hillsboro

Access Analysis

The map shown in **Figure 51** shows the number of jobs reachable from all locations in the TriMet service area.

Darker-colored places are places where residents can reach more jobs in 45 minutes; lighter-colored places are where fewer jobs are reachable. Each dot represents 25 residents who live in that area. More people live where there are more dots closer together.

Figure 51 shows where TriMet's network is most useful: in Portland, along the high-frequency MAX and bus services radiating out of downtown. With 45 minutes of travel time, few places west of the West Hills or east of I-205 can reach the regional job center, although higher levels of access can be found along the MAX lines (along Burnside east of I-205 Ⓐ, or near Beaverton TC Ⓑ), and the Frequent Service lines serving southwest Portland (Lines 12Ⓒ, 54 and 56Ⓓ).

Earlier in this document, we observed that these central areas are also the places where the most jobs are located, and where the most jobs are likely to be within a short walk of residents. With another 15 minutes of travel time, more places can reach a greater number of jobs, but the same basic pattern is repeated. Almost all of Portland west of I-205 can reach over 250,000 jobs by transit in an hour. Outside of this area, the highest levels of access are limited to the immediate areas around the MAX network, and frequent bus lines like Lines 12, 20, 54, 56, and 73.

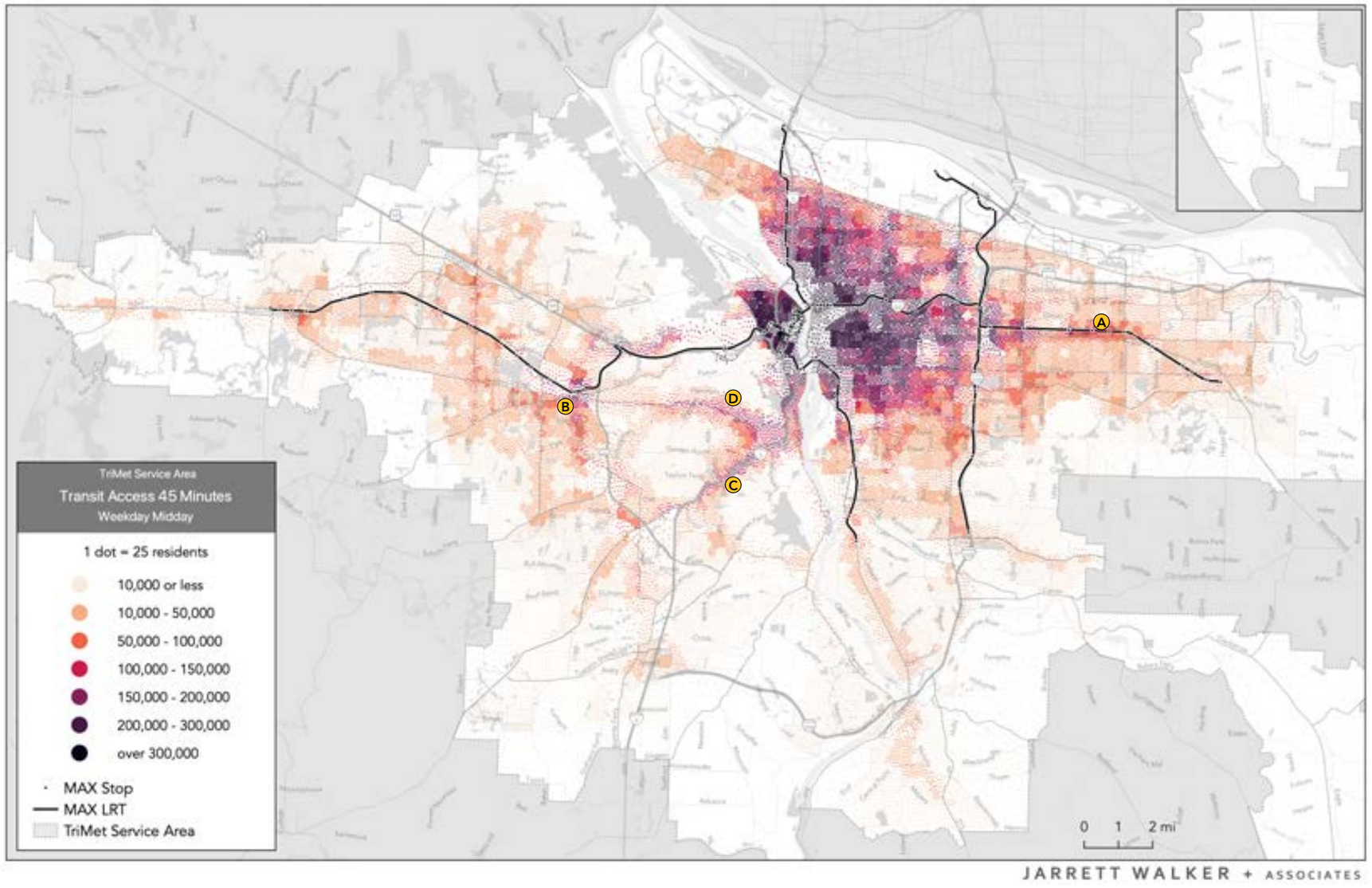


Figure 51: Job Access by Transit - 45 minutes at 12:00 p.m. on a weekday

This map shows the results of an access analysis. An access analysis measures how many jobs are reachable using transit from every part of the TriMet service area. More jobs are reachable in the darker-shaded areas.

Access Analysis

The Problem of Distance

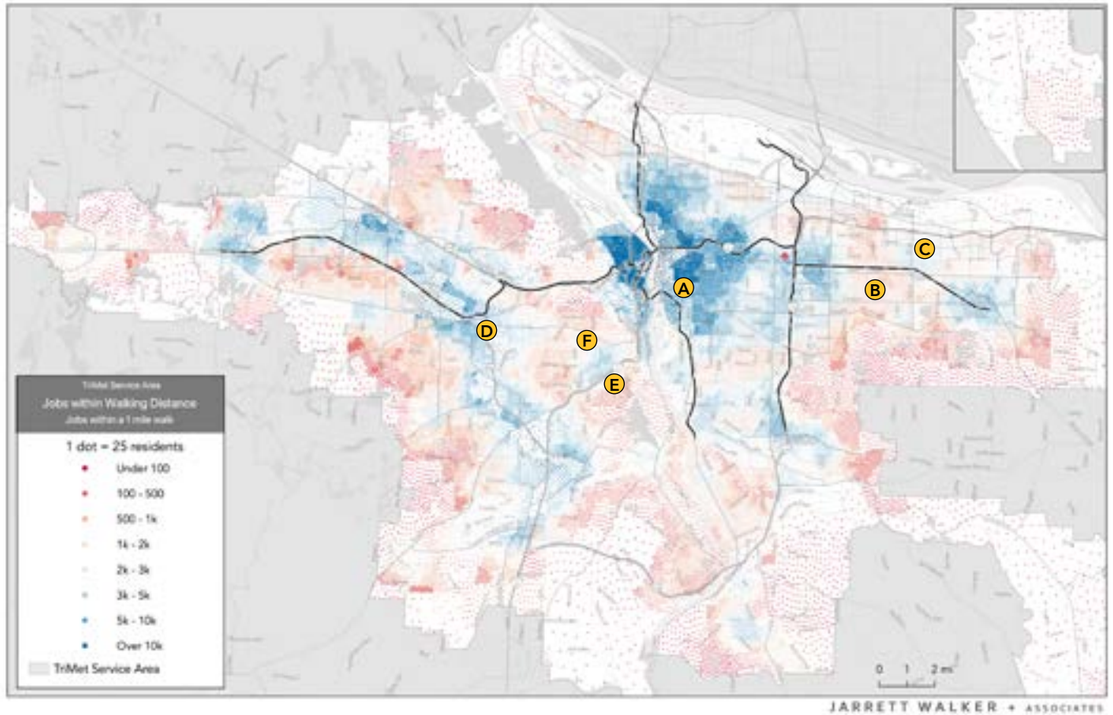
These maps look the way they do because of the combination of the design of the TriMet network and the distribution of jobs across the region. This page puts the map of jobs within a 1 mile walk side by side with the map of job access within 45 minutes.

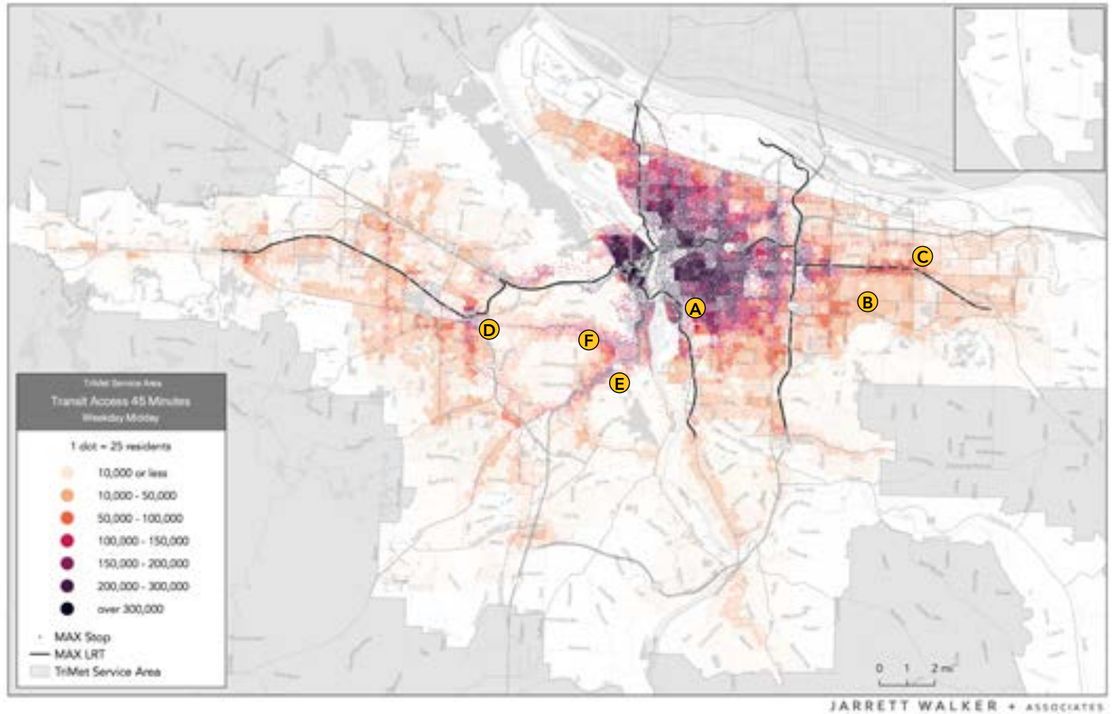
Directly comparing these maps makes it clear that transit access is highest in the places where the most jobs are nearby to begin with. In the center of Portland, many areas have over 5,000 jobs within a 1-mile walk; these are also the places with the highest job access levels.

Places where transit is less useful tend to be places where fewer jobs are nearby in the first place. Reaching 100,000 jobs in 45 minutes by transit is easy from SE 20th and Division (A); it might be as simple as a one seat ride through downtown and into NW Portland. From a starting location like SE 148th and Division (B), your trip begins far from the major job centers. Reaching downtown will take longer; it might not even get there in 45 minutes. Reaching other job centers, like Gateway or Clackamas, will require transfers to other routes.

When transit is fast, frequent and direct, it can provide higher job access even in places where there are fewer jobs nearby. In East Portland, access is high along the Blue Line, especially near Rockwood (C) where local jobs, jobs in Gresham, and jobs further west in Portland are all reachable. We can see the same elevated levels of access near Beaverton TC (D), as well as along TriMet's Frequent Service bus lines 12 (E) and 54/56 (F) in SW Portland.

Transit job access tends to be high in places where there are already many jobs close by (like central Portland), and low in places where there are fewer jobs close by.





Access Analysis

Transit-Added Access

In absolute terms, transit access tends to be highest where there are already a lot of jobs nearby. But the absolute highest level of job access isn't the only way to quantify the value of the mobility transit provides. For areas where only a few jobs are nearby (including many suburban residential areas, as well as lots of places in East Portland), a frequent transit line may not put as many total jobs in reach as it can in places that are already near a regional job center. But even a smaller total number of jobs reachable may be many times those that are available close at hand. "Transit added access" is a way of measuring the value of transit service that normalizes for the highly uneven distribution of jobs.

Figure 52 maps the number of jobs reachable in 45 minutes by transit compared to the number of nearby jobs within 1 mile. This map shows us where transit can take you to many more jobs than are nearby in the first place.

While access varies across the TriMet service area, in most places where service is present, the network provides access to many more jobs than are nearby. Places that are within reach of downtown in 45 minutes gain access to at least 10 times as many jobs as are nearby, while some areas (including along Beaverton-Hillsdale Highway Ⓐ and 82nd Ave Ⓑ) are put in reach of over 50 times more jobs.

The light green places on this map are where transit is not providing much value at the 45 minute travel time threshold. This includes all areas that are far from service, but also includes the downtown core and central eastside, where so many jobs are nearby that the added benefit of transit is proportionally smaller.

In most places, transit can be used to reach many more jobs than are close by, even in parts of the service area with few nearby jobs.

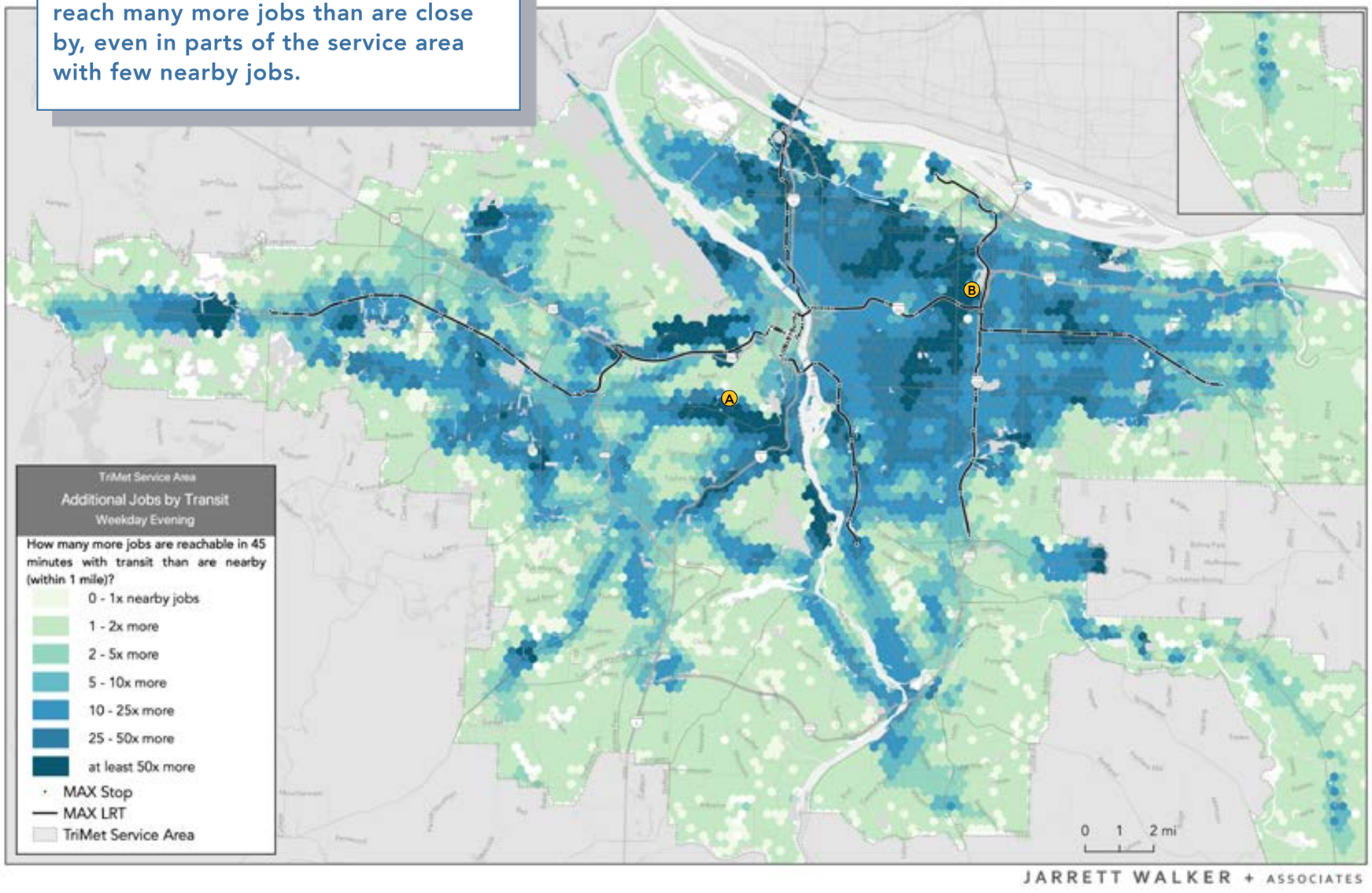


Figure 52: Transit Added Access - 45 minutes

Access Analysis

Jobs Reachable in 60 minutes

With more travel time, more jobs are reachable. **Figure 53** shows the number of jobs reachable by transit with 60 minutes of travel time.

The same basic pattern is visible with 60 minutes as with 45 minutes: job access is higher in central Portland in the areas closer to the regional job center. With 60 minutes, the additional travel time budget is enough to bring parts of East Portland and Washington County into the top access categories, shown in the darkest shades on the map.

For example, in the 45 minute analysis, the area near the Rockwood MAX Blue Line station Ⓐ could reach between 50,000 and 100,000 jobs; with another 15 minutes of travel time, job access near these stations climbs above 150,000, as parts of the Downtown Portland become reachable with transit. A similar effect is visible near the Blue Line stations in Beaverton Ⓑ.

This map shows us how transit can connect people living far from the regional Downtown Portland to a wide range of jobs and other opportunities. When we compare it to the 45 minute access map, however, we can see how reaching those opportunities will take longer, be less convenient, and ultimately present a less compelling travel option that for people living in the places where transit is most useful.

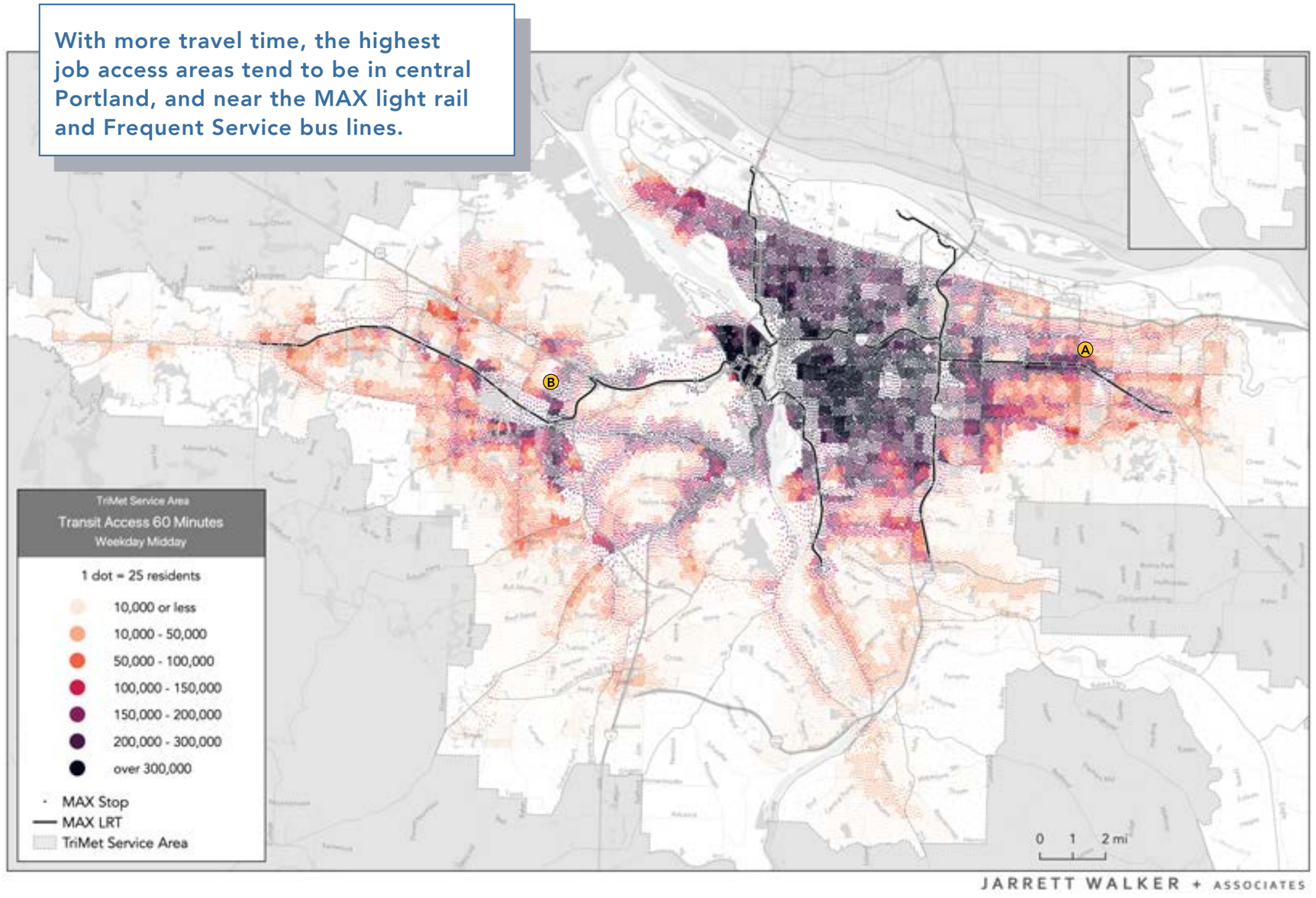


Figure 53: Job Access by Transit - 60 minutes at 12:00 p.m. on a weekday

Access Analysis

Access and the Frequent Network

The maps on the previous page show how the places with the greatest levels of job access tend to be located near TriMet's Frequent Service bus or MAX light rail lines. The Frequent Network is designed to make travel easy and convenient between places where many people need to travel, in places where the development pattern puts lots of people close to transit (within the limits of the agency's operating budget).

As a result, transit is much more useful for travel within the Frequent Network. **Figure 54** shows the median number of jobs reachable with transit and walking by residents living near Frequent Service, near infrequent service, and by residents living farther than 1/4 mile from any service. For people living close to Frequent Service, more than three times as many jobs are reachable in 45 minutes compared to someone living near infrequent service.

This table also shows the number of residents reachable **from** the location of jobs; in other words, the number of potential employees or customers within a 45 or 60 minute trip by transit. The median job located near Frequent Service is within reach of nearly five times as many people as a job located near infrequent service.

The number of jobs reachable by transit and walking for people located more than 1/4 mile from transit is much lower than for those who are near service. The farther you live from transit, the less likely it is to be useful to you, because of the time and hassle required for the walk to reach it at all. The number of jobs reachable without using a car is limited to just what is within walking distance, or by transit after a longer initial walk to service.

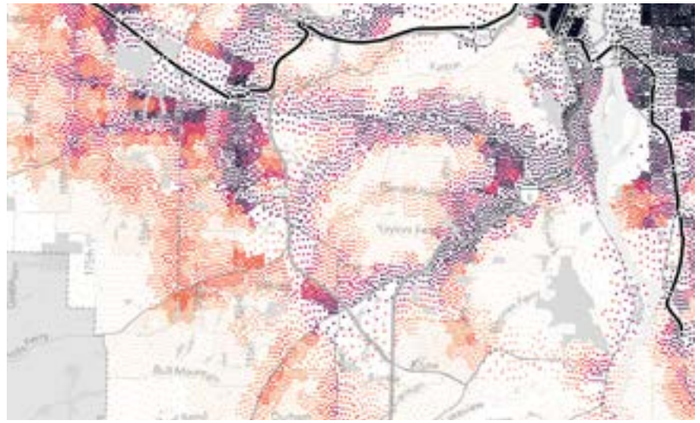
	Jobs reachable by the median resident		Residents reachable from the median jobs	
	in 45 minutes	in 60 minutes	in 45 minutes	in 60 minutes
Located near Frequent Service	138,300	284,700	238,300	337,600
Located near infrequent service	37,600	126,000	48,200	151,300
Located more than 1/4 mile from service	7,400	15,100	9,300	20,400

Figure 54: Median access by frequency of nearby service

Frequent Service is essential to making transit useful. People living near Frequent Service can reach about 4x the number of jobs as those living near infrequent service.

Example 1 - Westside

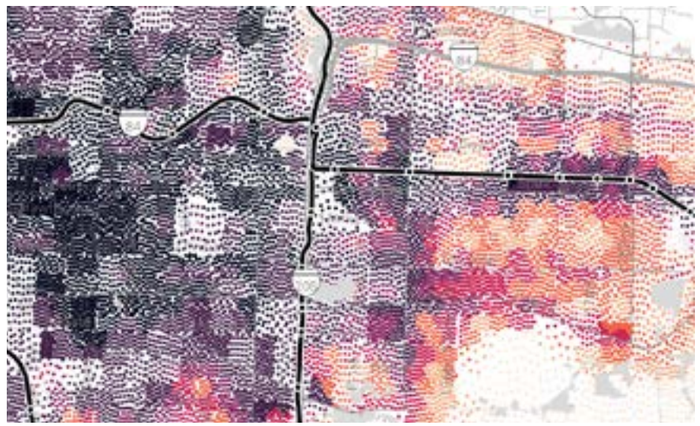
On the west side of the service area, the highest levels of access are found along MAX Blue and Red lines, and the radial bus lines that connect Beaverton and Tigard to Downtown Portland. The black high-access areas of this map are all located along the red frequent bus services of the second map.



Example 2 - Eastside

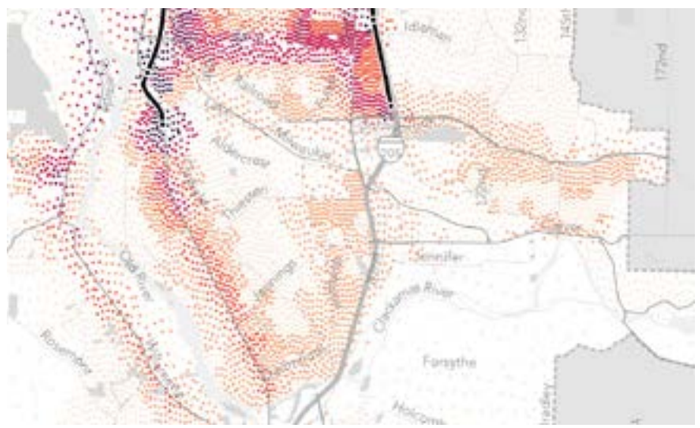
On the east side, access is greatest along the MAX Blue Line and long east-west bus corridors. The high-frequency crosstown service on 122nd Ave (Line 73) also provides north-south connectivity between these lines, and connections between the many jobs and residents on the corridor itself.

Further east, job access starts to diminish even along the frequent bus network as the distance from Downtown Portland increases, and gaps open up because of the wide spacing of service and lower frequency of the north-south routes on 162nd and 181st.



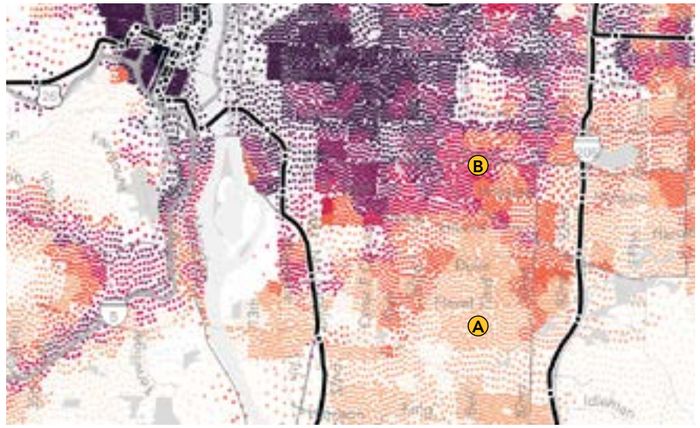
Example 3 - Clackamas

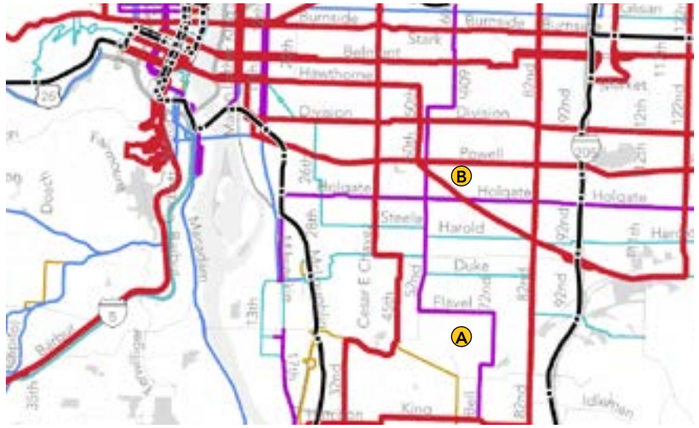
In Clackamas, access is highest near the rail stations in Milwaukie TC and Clackamas TC. Because routes in this portion of the network are designed to converge at these transit centers, journeys to points further north will often require a connection between a local feeder route like Line 31, and another service like the MAX Green Line or Line 72. Because these local routes operate infrequently, and because a transfer is required, travel times to destinations in other parts of the network are likely to be long, reducing the number of jobs reachable in 45 or 60 minutes.



Example 4 - Lower SE

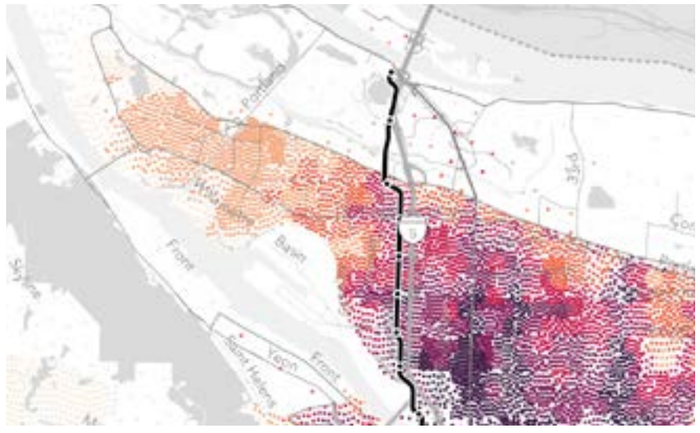
Downtown Portland, the Central Eastside and the Lloyd District make up the region's largest cluster of jobs, and access to those jobs is a key determinant of overall transit job access. In Portland, transit job access is high along the frequent corridors that radiate out from downtown like Lines 2-Division and 15-Belmont, but lower in places that lack frequent service to downtown. South of Powell Blvd and Foster Rd, there is no direct frequent bus service, and as a result job access is lower Ⓐ than in areas just a mile or two north Ⓑ.

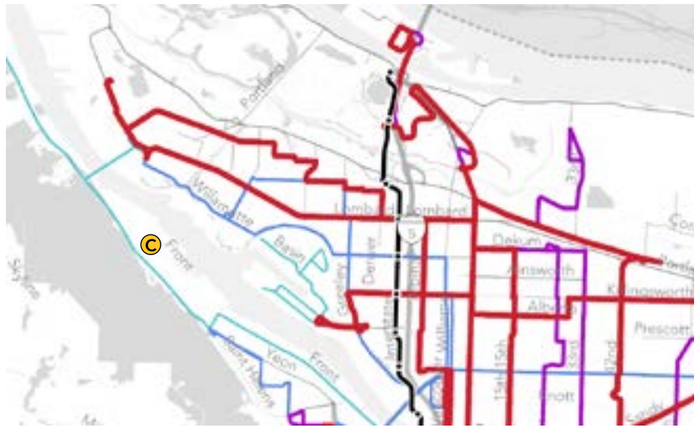




Example 5 - St. Johns

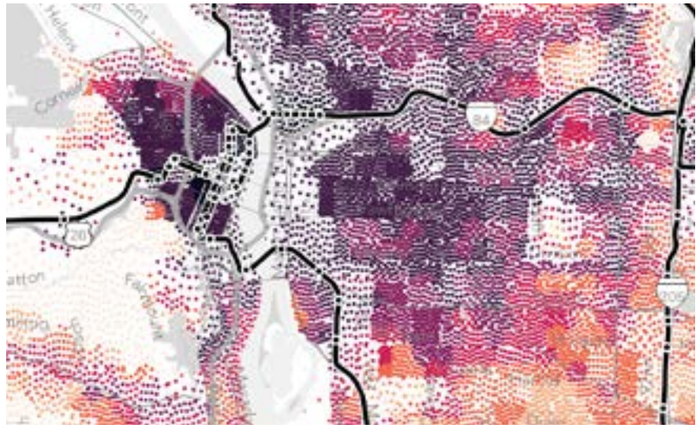
The St. Johns neighborhood of North Portland is an example of a part of the network where a high-frequency radial service does not deliver high job access. This is because its most frequent radial service, Line 4, travels north from Downtown Portland via Williams and Mississippi, and uses an indirect path along Fessenden to arrive at the St. Johns main street commercial area. The St. Johns neighborhood itself is connected to Downtown Portland more directly via Line 16 Ⓒ, but this service operates only infrequently.





Example 6 - Central Portland

Portland's east side between the Willamette River and I-205 is the part of the region where transit is most useful. The six major east-west frequent lines (9-Powell, 2-Division, 14-Hawthorne, 15-Belmont, 20-Burnside and 12-Sandy Blvd) ensure that the entirety of this area is within a short walk to a high-frequency service headed downtown. These routes also connect with multiple frequent crosstown services (75-Cesar Chavez/Lombard, 72-82nd, 73-122nd), making travel to a multitude of destinations possible with relatively short wait times to transfer.



Equity of Transit Access

So far, this section has discussed where transit is more and less useful, but it is also critical to understand who benefits from the design of the existing network and the distribution of jobs, and whose transit mobility is disadvantaged.

Figure 55 and **Figure 56** show the median number of jobs reachable in 45 minutes and 60 minutes by residents of the service area, split by race and poverty status. This is a p*erson-focused measure of usefulness* - it shows the median level of transit job access for residents across the entire service area.

On these charts, the red bar shows the median number of jobs reachable on transit; the green bar shows the median number of jobs nearby, within a 20 minute walk. Across the entire service area, the median resident can reach approximately 23,000 jobs in 45 minutes, and 66,000 jobs in 60 minutes. The median resident is within a 20 minute walk about 1,800 jobs.

Across the entire service area, the median number of jobs reachable by people of color and lower-income people is higher than for the entire population. The median access of white residents is lower than that of the entire population.

This may seem counterintuitive, given the fact that the highest access areas of central Portland tend to be heavily white, and many places in the region with a high concentration of lower-income people and people of color are in lower access areas.

The service area medians look as they do because of the impact of suburban areas where transit service is not present, or not very useful. These areas are more likely to be whiter and wealthier and lower the aggregate numbers, particularly for white residents and all residents. In TriMet's service area, People of color and lower-income people are more likely to live in places where transit is useful, but those places tend to be outside the center of the region where it is **most** useful.

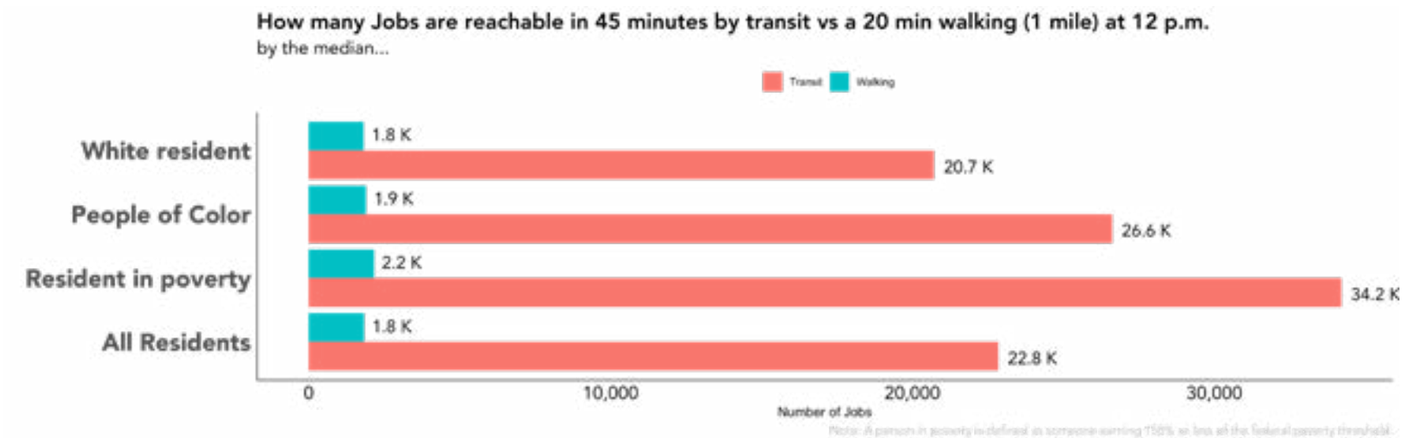


Figure 55: Median number of jobs reachable in 45 minutes by race and poverty status

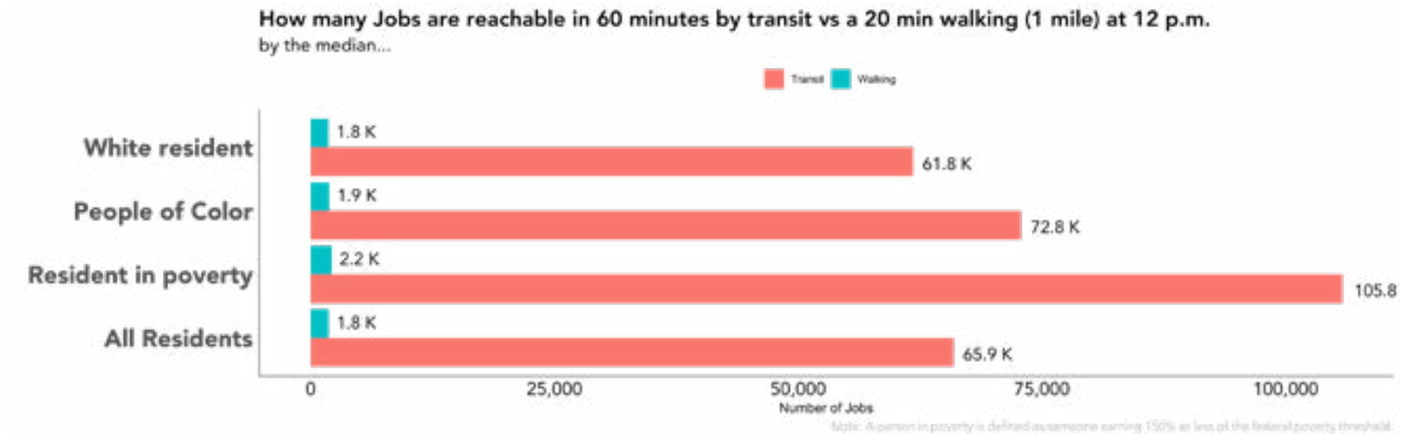


Figure 56: Median number of jobs reachable in 60 minutes by race and poverty status

Equity of Transit Access

Examining the median number of jobs reachable is only half the story. Who is transit most useful for? Who is it least useful for?

Figure 57 charts the percent of residents, people of color and lower-income people by access "deciles" - 10% segments of each population ranked by how many jobs they canr each in 45 minutes.. The solid line shows the percent of the population in each decile that is white, minority and low-income; the dashed line shows the percent of the overall service area population each group makes up.

Figure 58 provides a table showing the same information, with the number of jobs reachable in 45 minutes at each point in the distribution. Note that the columns for white people, People of Color and lower-income people add up to more than 100% because income is a separate category.

The orange line on this chart shows the percent of people at each point in the distribution who are white; the green line shows people of color, and the blue line shows lower-income people in households at up to 150% of the poverty rate.

If we follow the orange line, we can see that people in the lowest access deciles (the bottom 40%) are more likely to be white and less likely to be lower-income. People in the bottom 40% tend to live in places where transit service is not present or comes very infrequently; places that are far from major job centers; and where there are few jobs in the local area. These are generally suburban communities at the edges of the service area.

The middle of the distribution is more diverse in terms of both race/ethnicity and income, but the places with the best access, in the top 20%, are again whiter than the service area as a whole.

People in the top 20% of the distribution are living in areas in central Portland (between the West Hills and I-205), or near key transit corridors like Barbur Blvd, Beaverton-Hillsdale Highway, or MAX Blue or Red Line stations. These areas are whiter than the service area as a whole, but because of the concentration of affordable and supportive housing in the center city, the proportion of lower-income people in the highest-access areas is similar to that across the entire service area.

Examining access this way tells a different story than the regional medians. The bottom 50% of the access distribution as shown in **Figure 57** are mostly located in places where the transit network does not present a very useful travel option, because it is far away or very infrequent.

The top 50% covers a wider variety of territory, from the central city to moderately dense residential areas in East Portland or Beaverton. For people living in places where transit is relevant, service is **most** useful in places where the population is whiter; meanwhile, people of color are more likely to live in places where service is present, but is less useful. This outcome is a function of both the quality of transit service and where people and jobs are located.

A key question for future service planning oriented towards achieving more equitable outcomes is the degree to which it is possible to diversify the demographics of the people who enjoy the most useful transit service, given the whiter and wealthier demographics of the population in the parts of the region closest to major job centers.

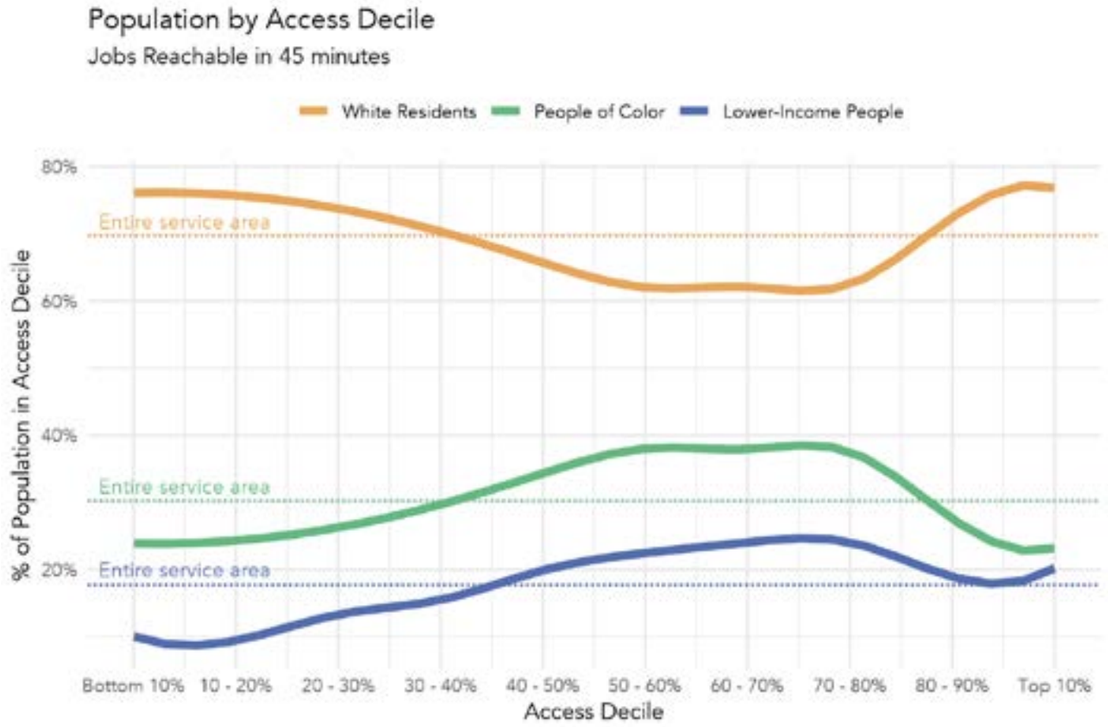


Figure 57: Population by Access Decile - 45 minutes

Percent of Residents	Jobs Reachable in 45 minutes	% White	% People of Color	% Low Income
Bottom 10%	**0 - 300**	**76%**	**24%**	**10%**
10 - 20%	**300 - 1,500**	**76%**	**24%**	**9%**
20 - 30%	**1,500 - 6,000**	**74%**	**26%**	**13%**
30 - 40%	**6,000 - 13,000**	**70%**	**30%**	**15%**
40 - 50%	**13,000 - 22,600**	**66%**	**34%**	**20%**
50 - 60%	**22,600 - 34,400**	**62%**	**38%**	**22%**
60 - 70%	**34,400 - 52,700**	**62%**	**38%**	**24%**
70 - 80%	**52,000 - 100,900**	**62%**	**38%**	**24%**
80 - 90%	**100,900 - 188,700**	**72%**	**28%**	**19%**
Top 10%	**188,700 - 340,400**	**77%**	**23%**	**20%**

Figure 58: Demographic distribution of access - 45 minutes

Transit Access by Equity Area

TriMet's 10-factor equity index identifies parts of the service area with a high concentration of people who are members of disadvantaged groups, including low-income people and people of color. **Figure 59** compares the median number of jobs reachable by people living inside and outside of the equity areas. For people living inside the equity areas, the table splits equity areas inside and outside of the Central City.

Job access is higher in the equity areas than in other areas. This may seem counterintuitive, but as with the measures of median job access throughout the entire service area, the areas out of equity areas include many low-density and suburban places where transit does not provide access to many jobs. By contrast, the equity areas are generally in places that are served by frequent transit, or at least by infrequent lines that are well-integrated into the rest of the network.

This finding should not be taken to mean that transit access is "equitable" across TriMet's service area, or in equity areas compared to other places. As the discussion of the access deciles on the preceding page makes clear, the people living in the areas where transit is ***most*** useful tend to be whiter than the demographics of the region as a whole.

TriMet does not define a parallel set of areas where the highest level of transit access or service is provided, but if it did, that area would encompass downtown, inner southeast and inner northeast Portland. Across much of that core area of the network, over 100,000 jobs are reachable in 45 minutes, more than three times the number reachable in the equity areas outside of the Central City.

Using the Equity Index to evaluate network alternatives

TriMet's Equity Index is an excellent tool for focusing attention on where disadvantaged people live, work and access services. As such, it provides a valuable guide for developing network plans designed to build a system that everyone can use to reach the places they need to go, by prioritizing the needs of the populations whose locations are identified by the index.

Throughout this project, we will track the potential access impacts of the network alternatives on the equity areas, in addition to the person-focused service-area-wide metrics, detailed mapping, and analyses of the access distribution like the one on the previous page. This will enable us to describe in detail how the usefulness of the transit system could change within the equity areas, compared to other places.

As the TransitCenter *Equity in Practice* manual lays out, place-based measures like these "show how the benefits and harms of transportation accrue to areas with many residents of color or residents with low incomes." TriMet's Equity Matrix is an essential tool in designing service plans oriented towards equity goals.

	Median jobs reachable in 45 minutes by...			
	All Residents	White Residents	People of Color	Lower-Income People
Living inside Equity Areas	35,850	35,850	36,000	38,700
Central City	257,050	257,050	257,300	268,600
Outside Central City	32,350	31,450	34,300	35,950
Living outside of Equity Areas	19,600	18,250	23,250	31,350

Figure 59: Transit job access by equity area - 45 minutes

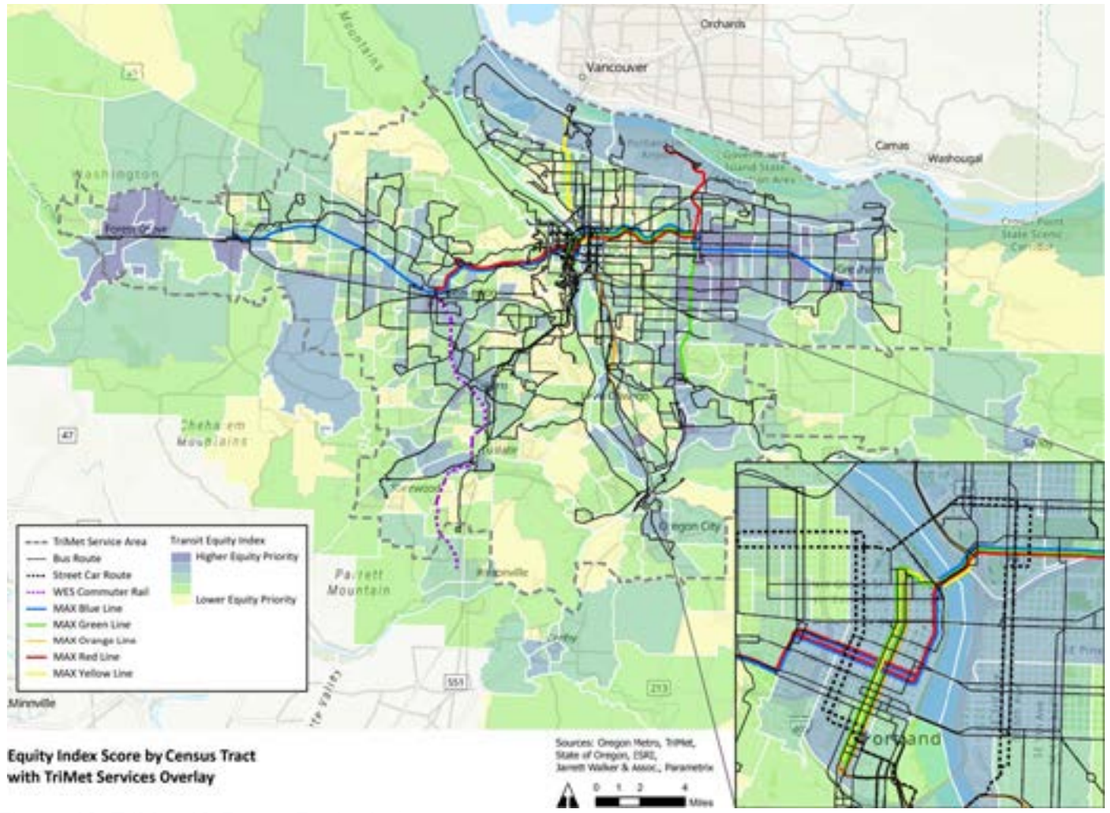


Figure 60: TriMet 10-Factor Equity Index

Access to Key Destinations

When we talk about access, we are also talking about what kinds of places and types of trips you are likely to find transit useful for. While job access gives us a general sense of this, focused on commuting, it is also helpful to understand how access to particular types of places varies across the service area. This could be your favorite grocery store what is not reachable by walking, or the hospital you need to visit for your appointment. One way transit becomes more useful is by expanding the range of activities that it can help you reach.

Figure 61 shows five types of key destinations throughout the TriMet Service Area:

- Health care (mainly hospitals and medical centers).
- High schools.
- Higher education (colleges, universities, and professional training locations).
- Key retail (full-service grocery stores, and major department retailers that include grocery sections). This measure is focused on grocery access.

The overall distribution of all of these locations is quite similar to that of jobs, because each of these types of places are employers. However, there is some variation in the distribution of each type that impacts how useful transit is for trips of different purposes.

This section examines how many of these destinations are reachable by transit from different parts of the service area. The number of different destinations is an indication of the degree of choice that transit can help provide.

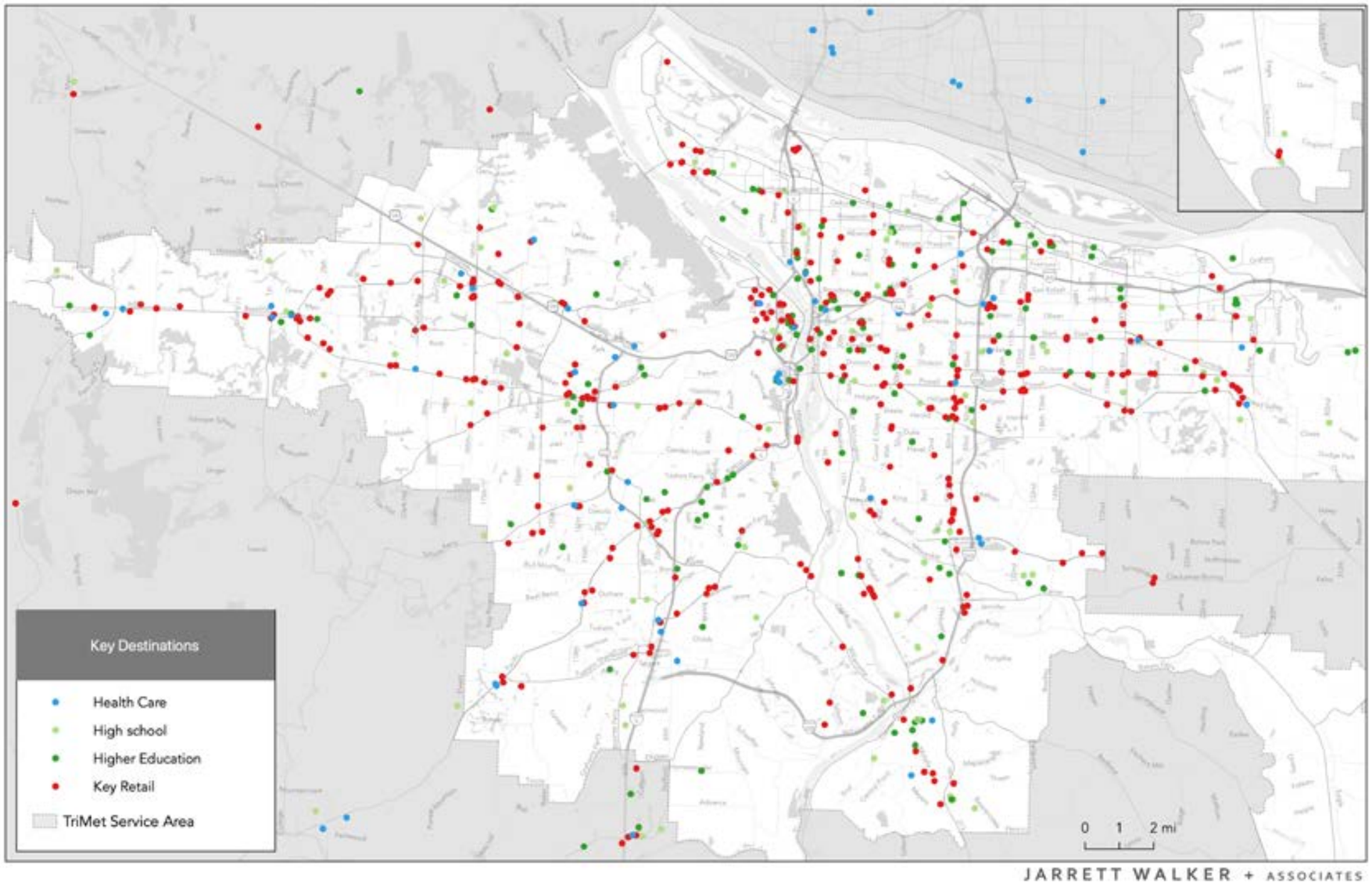


Figure 61: Key Destinations in the TriMet Service Area

Access to Key Destinations

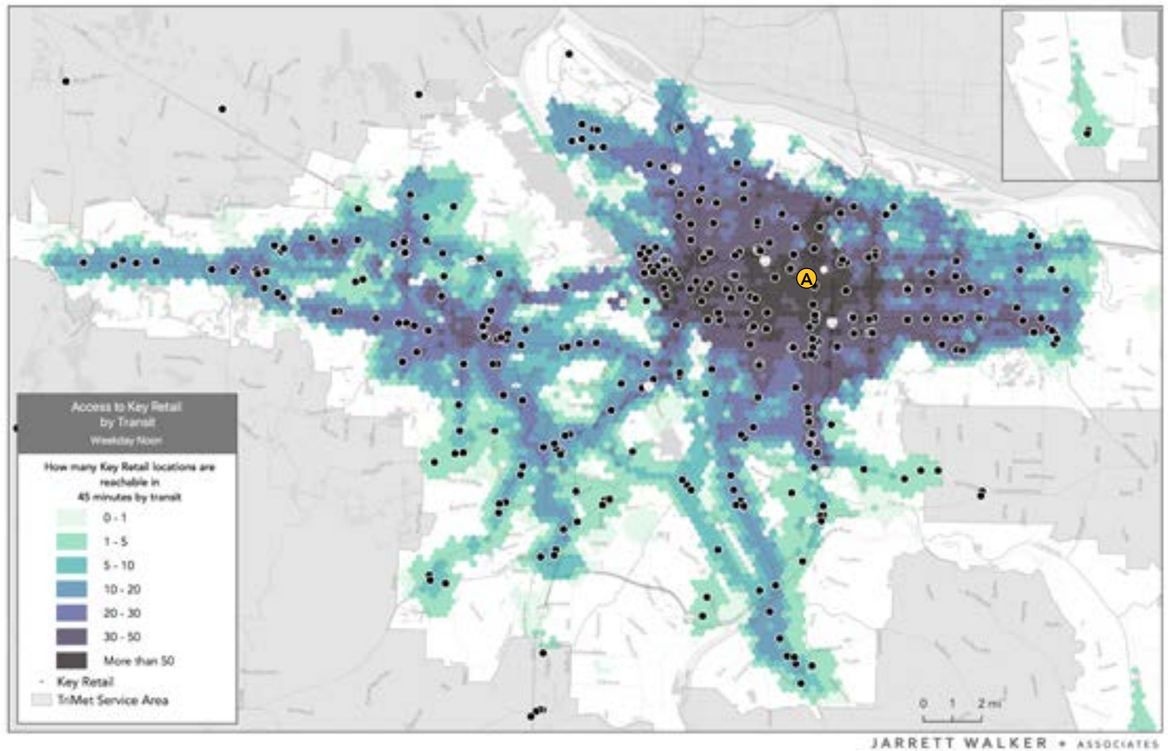


Figure 62: Access to Key Retail in 45 min by transit at noon

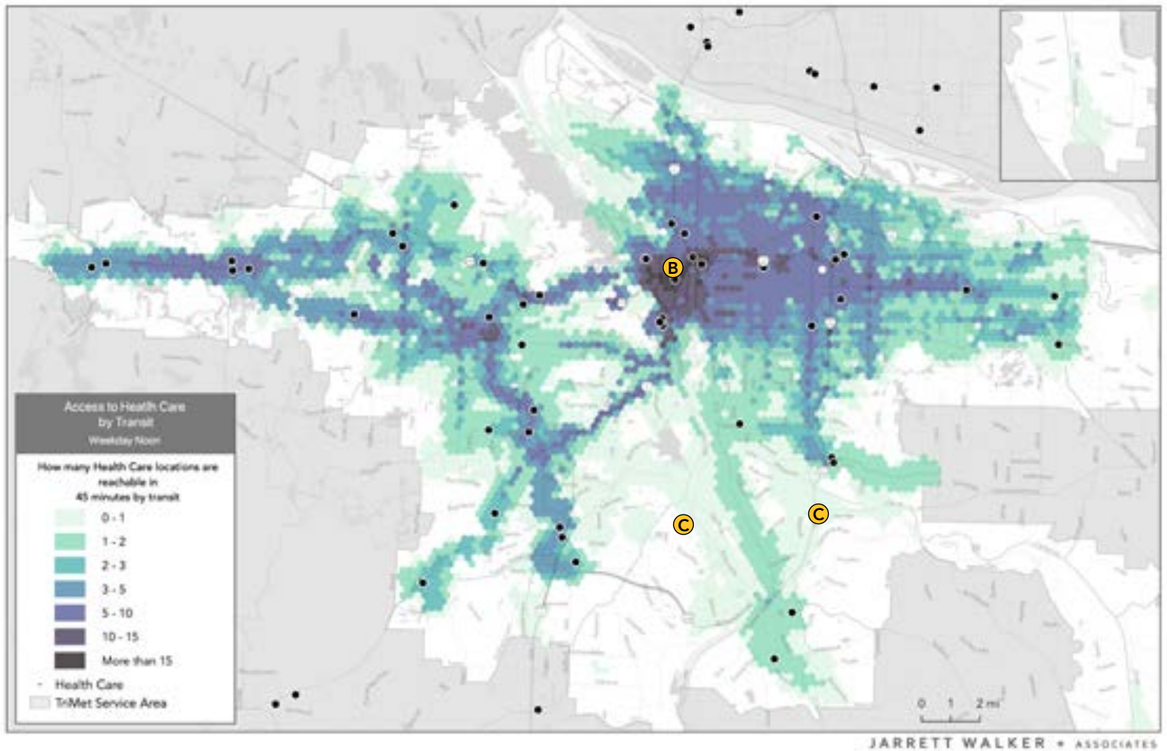


Figure 63: Access to Health Care in 45 min by transit at noon

Figure 62 shows where TriMet's network is most useful for reaching key retail destinations. Darker-colored places are places where residents can reach more of these locations in 45 minutes; lighter-colored places are where fewer locations are reachable. While most places in the service area are within reach of at least one grocery store in 45 minutes, some areas are within reach of many more. In these places, people using transit will have more options in terms of price and specialization,

The greatest degree of access to grocery stores is found in Portland, inner southeast and the east side Ⓐ, particularly in northeast and southeast Portland near 82nd Ave. This is the result of the high concentration of retail in major corridors like 82nd and throughout the central area of Portland, plus good transit connectivity by high-frequency bus and rail services to other major retail centers like Cascade Station and the Harmony area near Clackamas Town Center.

Interestingly, while East Portland and Gresham have substantially lower job access levels than inner Portland, access to key retail/grocery destinations is much more comparable, especially on frequent network corridors like Line 9-Powell or 2-Division. The access distribution on this map is quite different than overall job access because key retail store locations are not as concentrated in Downtown Portland as jobs as a whole.

Figure 63 shows the number of health care locations reachable from all locations in the TriMet service area. Again, most areas are within a 45 minute trip of at least one destination, but when fewer health care providers are reachable, there is less likelihood that those that are will be within a particular persons' insurance network.

The pattern in this map is more similar to access to jobs due to the locations of most of the hospitals in the region, around downtown and inner northeast Portland Ⓑ. Most places on the frequent bus and rail network have access to at least two or three health care providers in 45 minutes, but there are some notable gaps, mainly in places that are far from these providers or on lower-frequency services. One example includes the residential areas of Clackamas County Ⓒ (both west and east of the Willamette River) where most routes run infrequently and there are few nearby health-care providers.

Access to Key Destinations

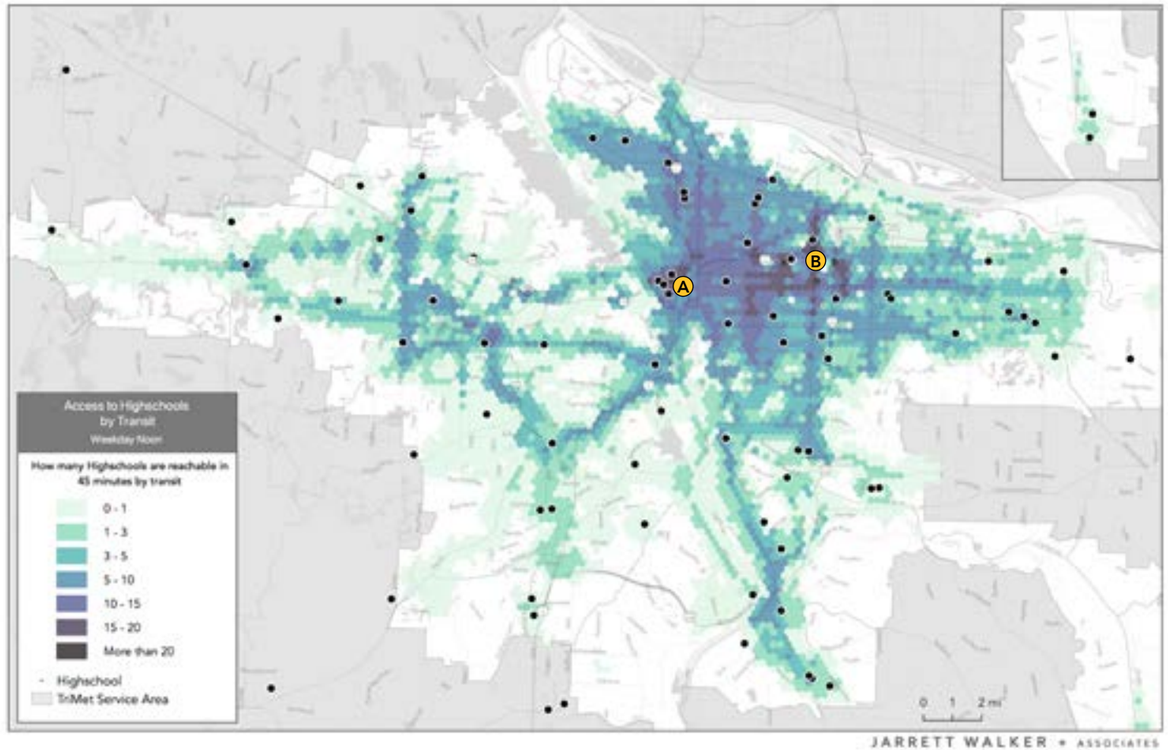


Figure 64: Access to High schools in 45 min by transit at noon

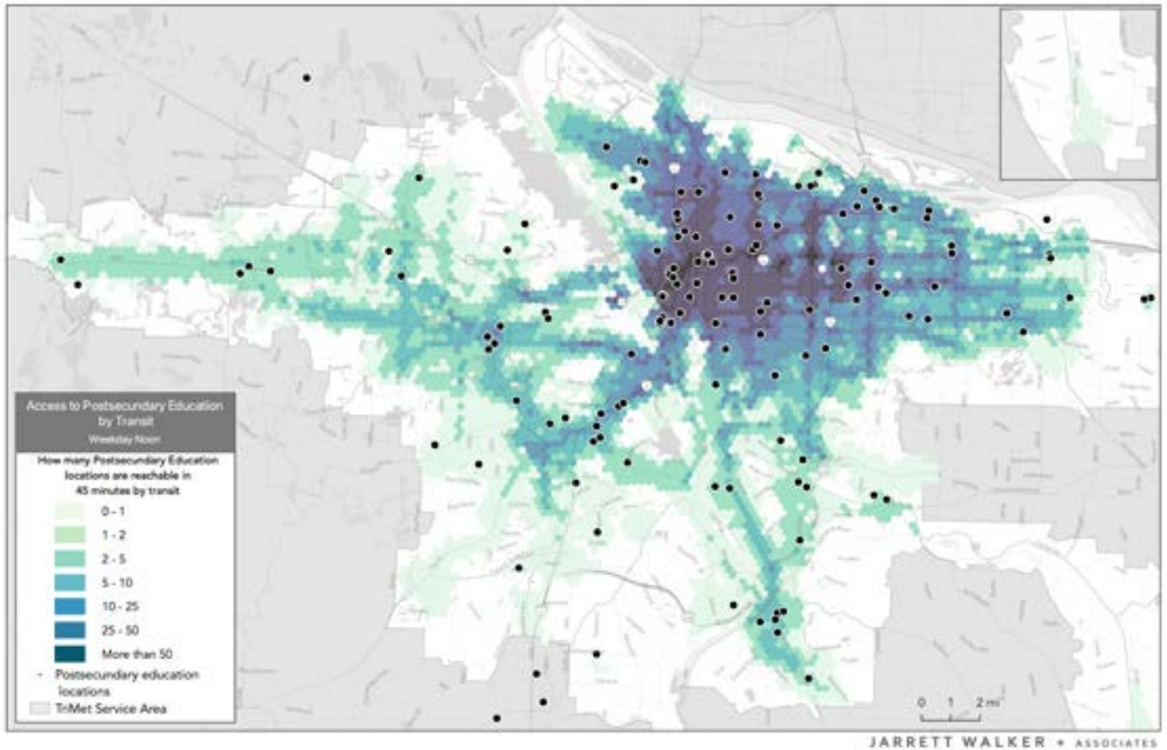


Figure 65: Access to Post-secondary / higher education in 45 min by transit at noon

Figure 64 shows the number of High schools reachable from all locations in the TriMet service area. While TriMet performs student transportation for Portland Public Schools only, high schools can still be important destinations even in places with their own school bus systems due to the greater degree of flexibility and choice travel by public transit can offer to students.

High schools are built based on where people live, so their distribution is more event. In most areas there is at least one reachable in 45 minutes. Central areas of Portland have better access to high schools because due to the greater residential density there are more schools, and also because these locations (and all Portland high schools) are located near high-frequency bus routes Ⓐ.

Figure 65 shows the number of higher education locations reachable from all locations in the TriMet service area. These locations include colleges, universities, and professional education.

In the city of Portland, the distribution of these locations resembles where most of the jobs are located in the region, so the places with access to many higher education institutions are similar to those with access to many jobs.

While the overall distribution is centralized, most parts of the service area have access to at least a few of these locations. Part of this is the result of the region's community college systems, which operate campuses throughout the three counties so that residents are able to access higher education opportunities without a time-consuming trip into Portland.

Access to Key Destinations

Figure 66 and **Figure 67** show the median number of key destinations reachable in 45 minutes and 60 minutes by residents of the service area, split by race and poverty status. This is a *person-focused measure of usefulness.*

Across the entire service area, the median resident can reach approximately 20 key retail locations in 45 minutes, and 36 in 60 minutes. Across the entire service area, the median number reachable by people of color and lower-income people is higher than for the entire population.

In general, median access to these destinations is quite similar between the different demographic groups analyzed. As with job access, the number of key retailers reachable by white residents is slightly lower, a function of the many white residents living in outlying suburban areas where transit is not present, runs infrequently, or requires a long trip to commercial areas where these stores are present.

	How many key destinations can the median resident access by transit in 45 minutes?			
	Key retail	Health care	High school	Postsecondary education
All Residents	20	3	3	6
White	19	3	3	6
People of Color	22	3	4	7
Lower-Income People	25	3	4	9

Figure 66: Median access to key locations by different demographic groups

	How many key destinations can the median resident access by transit in 60 minutes?			
	Key retail	Health care	High school	Postsecondary education
All Residents	36	7	8	17
White	35	7	8	17
People of Color	38	7	8	17
Lower-Income People	46	8	9	24

Figure 67: Median access to key locations by different demographic groups

Small Area Analysis

So far, we've examined the network at a high level, looking at the entire service area. This section describes the current design, planned improvements in TriMet's Service Enhancement Plans and potential future related projects in each sub-area.

What are the Service Enhancement Plans?

TriMet's last major network planning effort were the Service Enhancement Plans. With the completion of the unified Service Enhancement Plan (SEP) in 2018, TriMet laid out a set of future changes for each area of the network. The SEPs are not constrained plans - they imagine new services that would require new resources above and beyond the level of service TriMet operates today.

The sub-area SEP's were developed over 5 years, from 2011 to 2016, and include a wide variety of network changes that respond to needs and desires for the network that emerged from substantial outreach to the public and stakeholders. TriMet staff also conducted detailed analysis of existing ridership and performance data and consulted with local jurisdictions on their priorities for future service expansion.

The SEP framework has guided the evolution of the TriMet network over the past decade. When thinking about new planning ideas for transit service, it is important to understand that framework and the input that shaped it.

For the most part, the SEPs do not call for major restructuring of the established network pattern. Many routes have improvements identified to frequency, span or weekend service, or even small adjustments to routing, but there are just a few added routes or large-scale reconsiderations of the structure of the network.

This section summarizes some of the major themes of the SEPs that represent the greatest changes from the pre-SEP network.

Upgraded Frequent Service routes in the SEP

The SEPs identified a number of routes to be upgraded to Frequent Service. TriMet's Frequent Bus Network is the foundation of transit mobility in the region. It carries a majority of all bus passengers, and the areas with the greatest levels of transit access are all found near either MAX or Frequent Service lines.

In some cases, these were lines that had operated frequently prior to the service cuts that followed the late-2000s recession. By 2022, these new Frequent Service lines had been implemented:

- **Line 12 - Barbur / Sandy.** High-frequency service extended along Barbur segment.
- **Line 20 - Burnside / Stark**
- **Line 73 - 122nd Ave**
- **Line 76 - Hall / Greenberg.**

There were also several new Frequent Service lines identified in the SEPs that have not yet been implemented:

- **Line 35 - Highway 43 / Macadam.**
- **Line 44 - Capitol Highway.**
- **Line 54 - Beaverton-Hillsdale Highway.** While lines 54 and 56 together provide Frequent Service between Downtown Portland and Scholls Ferry Rd, each individual line runs only every 30 minutes.

New routes and new coverage areas

While the SEPs include new Frequent Service lines that concentrate resources on busy corridors, they also identify many opportunities to provide transit service in previously unserved areas or segments. Examples include:

- In the southeast, service on Johnson Creek Blvd.
- On the eastside, new service on 148th Ave and 162nd Ave.
- In Portland, new service on Prescott.

Community Connectors

Each SEP includes several ares identified for "Community Connector" service. As explained in the Westside SEP, a Community Connector is a new type of transit service:

> *"Proposed for areas with limited ridership potential. Community Connector Service can be tailored to the community served and could range from low-cost fixed route bus services to flexible shuttle services. This type of service will be feasible if the traditional cost structure for transit is modified or another entity operates the service."*

The HB 2017 legislation includes funding for community and job shuttles available to the general public in areas that are not cost effective for TriMet to serve but could be served via a third-party operator. Several of these services have now been implemented.

The Role of the SEPs in Forward Together

The SEPs are the product of a huge amount of planning and engagement work and contain a lot of ideas that directly address issues with the network identified by TriMet's partners and the community. TriMet has implemented elements of the SEPs over the past decade, and while not everything has been possible within the financial constraints the agency must operate within, all of the ideas they contain are worth considering. Some may be less relevant now than in the past due to changes in demand before or during the pandemic. Many others speak to gaps and shortfalls of the transit network that continue to impact passengers today.

One of the most important things to understand about the SEPs are that they are including a wide variety of improvements that address ridership, coverage and equity goals.

Forward Together is about designing contrasting alternatives that show how TriMet's network could look if designed to emphasize different priorities than those that have animated its service planning in the past. The SEPs are a product of the existing policy structure and represent a mix of network changes that serve different goals and priorities.

Where SEP projects address the goal of a Forward Together alternative, that alternative may incorporate the improvement wholesale. Or, the network issue that was addressed by a particular SEP project could be solved in a different way, through the more holistic look at network structure that is at the heart of the Forward Together process.

Westside and Southwest

The west side of TriMet's service area (here focused on Washington County and the area west and south of Downtown Portland) is organized around several high-frequency radial services: foremost are the MAX Red and Blue lines, as well as Frequent Service bus lines 12, 20 and 54/56. Each of these routes begin at a regional center and major transit node, and travel into Downtown Portland. The MAX lines, as well as Line 12 and Line 20, continue through downtown to reach other destinations on the east side of the service area. TriMet's WES commuter rail line also operates in this area from Wilsonville to Beaverton.

Two other high-frequency routes serve the westside that don't go to Downtown Portland:

- Line 76 is a frequent crosstown connecting Tualatin, Tigard, Washington Square and Beaverton along Hall Blvd and Greenberg Rd Ⓐ
- Line 57 serves TV Highway between Beaverton, Hillsboro and Forest Grove Ⓑ.

Line 76 connects several major transit nodes and nearby commercial and employment areas, and serves mainly lower-density residential areas between these centers. The TV Highway corridor is more continuously developed, with a mixture of residential, commercial, and industrial uses including major employers like the Intel campus in Aloha. TV Highway also presents some particular pedestrian access problems for transit riders due to its high speed limit, discontinuous pedestrian infrastructure and widely spaced signals.

East of Hall Blvd

All other routes on the westside run infrequently. East of Line 76-Hall/Greenberg, most infrequent services are radial, traveling to Downtown Portland. These include lines like 35-Macadam/Greeley, 45-Garden Home, and 58-Canyon Rd, as well as rush hour only routes like Line 1-Vermont or 55-Hamilton. Each of these low-frequency radial routes connect residential areas to Downtown Portland and a westside transit center, where riders can continue to other destinations by transferring to one of the crosstown routes: the high-frequency Line 76 and less-frequent Line 78. Because of the lack of major destinations or a continuously developed commercial corridor, there is not a crosstown service that travels north-south in the area between the West Hills and Hall Blvd.

TriMet's Southwest Service Enhancement Plan is focused on this area.

West of Hall Blvd

The network operates on a different principle west of Hall Blvd and Sunset TC. Rather than connecting residential areas to downtown, infrequent services feed into major connection points: MAX stations or transit centers like Washington Square TC or Tigard TC. From these points, riders can continue towards Downtown Portland or other regional centers using MAX or Frequent Service bus routes. Most of these routes are designed to serve two of these connection points, expanding the range of possible destinations reachable with a one seat ride.

TriMet's Westside Service Enhancement Plan is focused on this area.

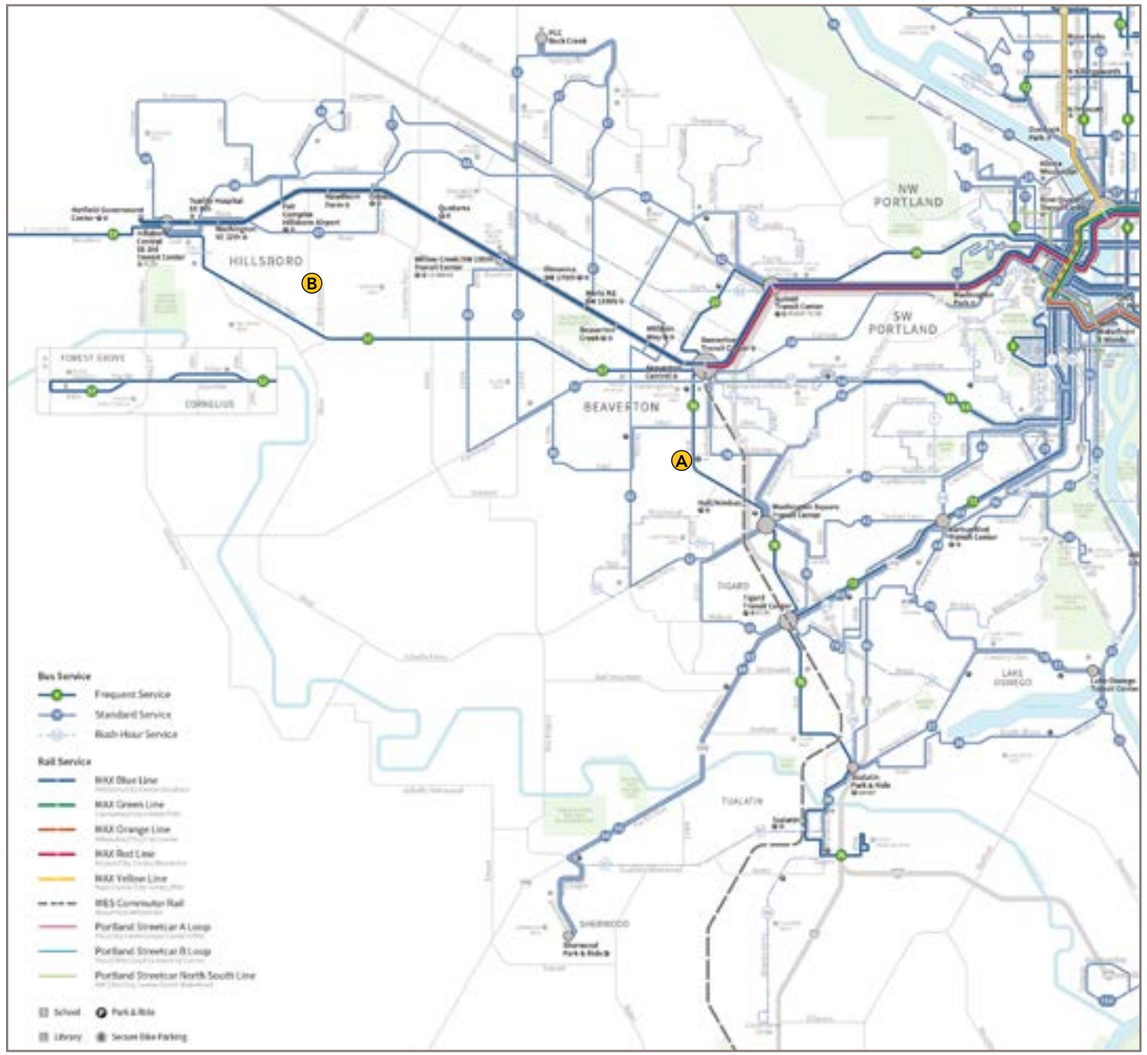


Figure 68: TriMet Network Map - Westside Detail

Key Changes in Southwest SEP

Figure 69 shows the future service vision map from the Southwest Service Enhancement Plan. The Southwest SEP includes both new Frequent Service improvements, as well as coverage expansion to extend new services to places that do not currently have nearby transit.

The Southwest SEP envisions the following new Frequent Services:

- **Line 35 - Macadam .** Upgrade existing route to Frequent Service (not yet implemented).
- **Line 44 - Capitol Hwy .** New Frequent Service between PCC Sylvania and Downtown Portland (not yet implemented).
- **Line 54-Beaverton Hillsdale Hwy .** Line 54 and 56 currently combine to provide Frequent Service from the Beaverton-Hillsdale Hwy / Scholls Ferry intersection to Downtown Portland. In the Southwest SEP, Line 54 becomes a standalone Frequent Service, while Line 56 is realigned to stay on Scholls Ferry to Washington Park (not yet implemented).
- **Line 76 - Hall / Greenberg Ⓐ.** New Frequent Service between Beaverton and Tualatin (implemented).

A big idea consistent in both the Southwest and Southeast SEPs is the need for an east-west connection that does not require passing through Downtown Portland. In the SEPs, this is accomplished by extending Line 43-Taylors Ferry Rd east across the Sellwood Bridge Ⓑ.

This has not yet been implemented.

The Southwest SEP also includes new coverage expansions, marked on the map as Line A. These include new service on the following segments:

- Tualatin-Sherwood Rd Ⓒ (implemented as Line 97).
- SE 124th Ⓓ (not yet implemented).
- Salamo Rd Ⓔ (not yet implemented).

Finally, the yellow areas on the map in **Figure 69** indicate future Community Connector shuttle services in the King City, Tualatin, Sherwood and Stafford areas. The Tualatin Shuttle Ⓕ was implemented in 2021[13] and is operated by Ride Connection. This service provides timed connections between WES trains and neighboring employment areas.

Major Projects in Southwest

TriMet, Metro and the local partner jurisdictions have completed extensive planning work on a new MAX light rail line serving the southwest part of the service area. The Southwest Corridor would connect Downtown Portland to Tualatin at Bridgeport Village, serving Tigard, PCC Sylvania and the Barbur Blvd corridor. At this time, further planning and design for the Southwest Corridor are on hold until funding is identified.

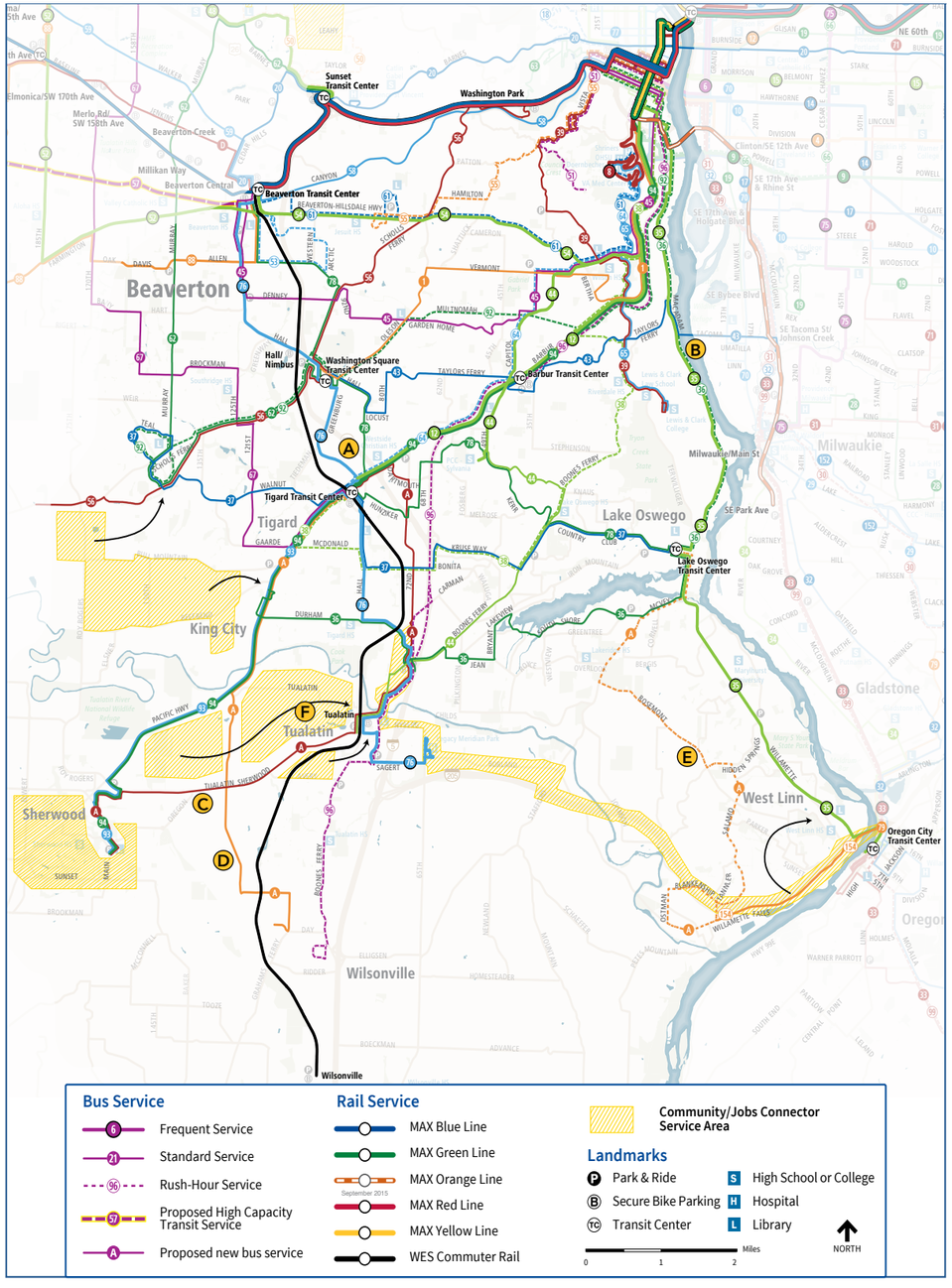


Figure 69: TriMet Southwest Service Enhancement Plan Map

Key Changes in Westside SEP

While most of the sub-area SEPs consist of a list of detailed changes to existing routes, the Westside SEP takes a more visionary approach, appropriate given the rapid pace of development occurring at the time of the plan's design and in the years since. It calls for a much more frequent future network that complements MAX with new high-capacity transit lines between Beaverton TC and Forest Grove via TV Highway, and between the MAX Blue Line at Tanasbourne.

In the Westside SEP, there are three new Frequent Service lines:

- **Line 47 - 231st Century.** In the Westside SEP, Line 47 would continue south from Baseline to terminate near the Reeds Crossing South Hillsboro development.
- **Line 48 - Cornell Rd**
- **Line 52 - 185th**

These Frequent Service lines would be supported by a network of local routes that would run every 15 minutes during rush hour, and every 20-30 minutes at other times.

The Westside SEP is the greatest departure from the existing network in terms of the level of resources that would be required to implement all its elements. It presents a blueprint for Washington County that would replace the existing structure of low-frequency feeder services with a frequent bus network grid akin to that present across much of Portland.

The Westside Service Enhancement Plan identifies a future where much of the developed area of Washington County has access to a high-frequency grid of bus services.

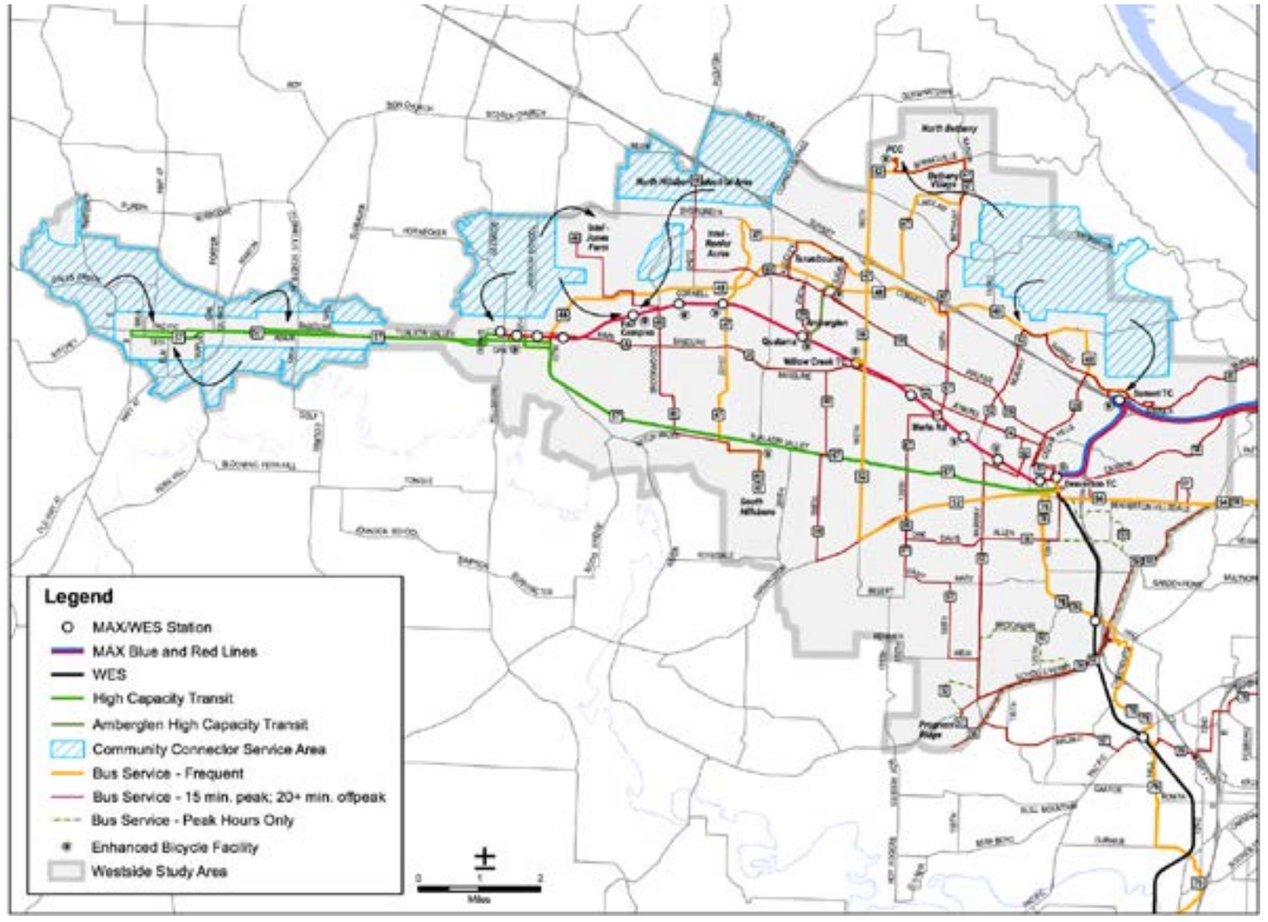


Figure 70: The Westside SEP map. Orange and brown lines would run every 15 or 20 minutes.

North / Central

The center of TriMet's network is the grid of high-frequency services covering the areas of Portland and Milwaukie between the West Hills, 122nd Ave, the Columbia River, and Milwaukie City Center.

The MAX lines form the spine of this part of the network. Each connects with many routes, and provide fast, frequent, and direct service between key destinations like the Lloyd District, Gateway, the airport and Clackamas Town Center. Some MAX stations directly serve places that are themselves major destinations, as is the case with the Gateway, Hollywood TC and two Lloyd District stations. The Yellow Line functions as the local transit service for the Interstate Ave commercial corridor, while the Orange and Green Lines connect with many other services en route to their endpoints at major destinations.

Most of the major arterials that reach Downtown Portland have a Frequent Service bus line. These routes generally adhere to the 0.5-mile spacing principle discussed previously where this is possible given the street network. Each frequent radial serves a high-demand commercial corridor; these routes generate high ridership by serving a diversity of trip types, from downtown-oriented commutes, to short trips along long corridors like Martin Luther King or Hawthorne.

Crosstown Services

Three key frequent crosstowns enable diagonal movement across the grid: Line 75, 72, and 73. Lines 72 and 75 are designed along the same principle - each originates a major transit node at the south end of this portion of the network, travels north until the end of the continuously developed residential area near Columbia Blvd, and then turns west to terminate near the Willamette River (at Swan Island and St. Johns, respectively). These frequent crosstowns are very long and thus very expensive to operate, but by linking many dense places and important destinations, they have historically been among TriMet's highest-ridership routes, both in total and per unit cost.

Line 73 is a more recent addition to the frequent bus network and is shorter with its anchors at Parkrose TC and Lents Town Center. Still, this service on 122nd Ave has proven extremely successful since its implementation in 2018. In 2021, it was TriMet's second most productive route, in terms of ridership per unit cost.

There are also several other less-frequent routes that perform crosstown functions, including Line 70, Line 71 and the Fremont segment of Line 24. Each of these routes connects to multiple other frequent and infrequent services, and both run at approximately 20-minute frequency at most times.

Infrequent Services

While most of inner Portland is covered by the frequent grid, there are still some important areas that Frequent Service lines do not reach. The most extensive example is along Columbia Blvd Ⓐ, including the residential and industrial areas along the corridor and in the flood plain to the north. Along Columbia and to the north, the development pattern has limited pedestrian infrastructure and many buildings are located on cul-de-sacs, private roadways or transit-inoperable streets. Service of any kind is limited in this area.

Other parts of north and northeast Portland have access to only infrequent service, including the center of the Cully neighborhood Ⓑ , the Fremont commercial corridor Ⓒ, and the Rosa Parks corridor Ⓓ. Before COVID, each of the routes that fill in the gaps between

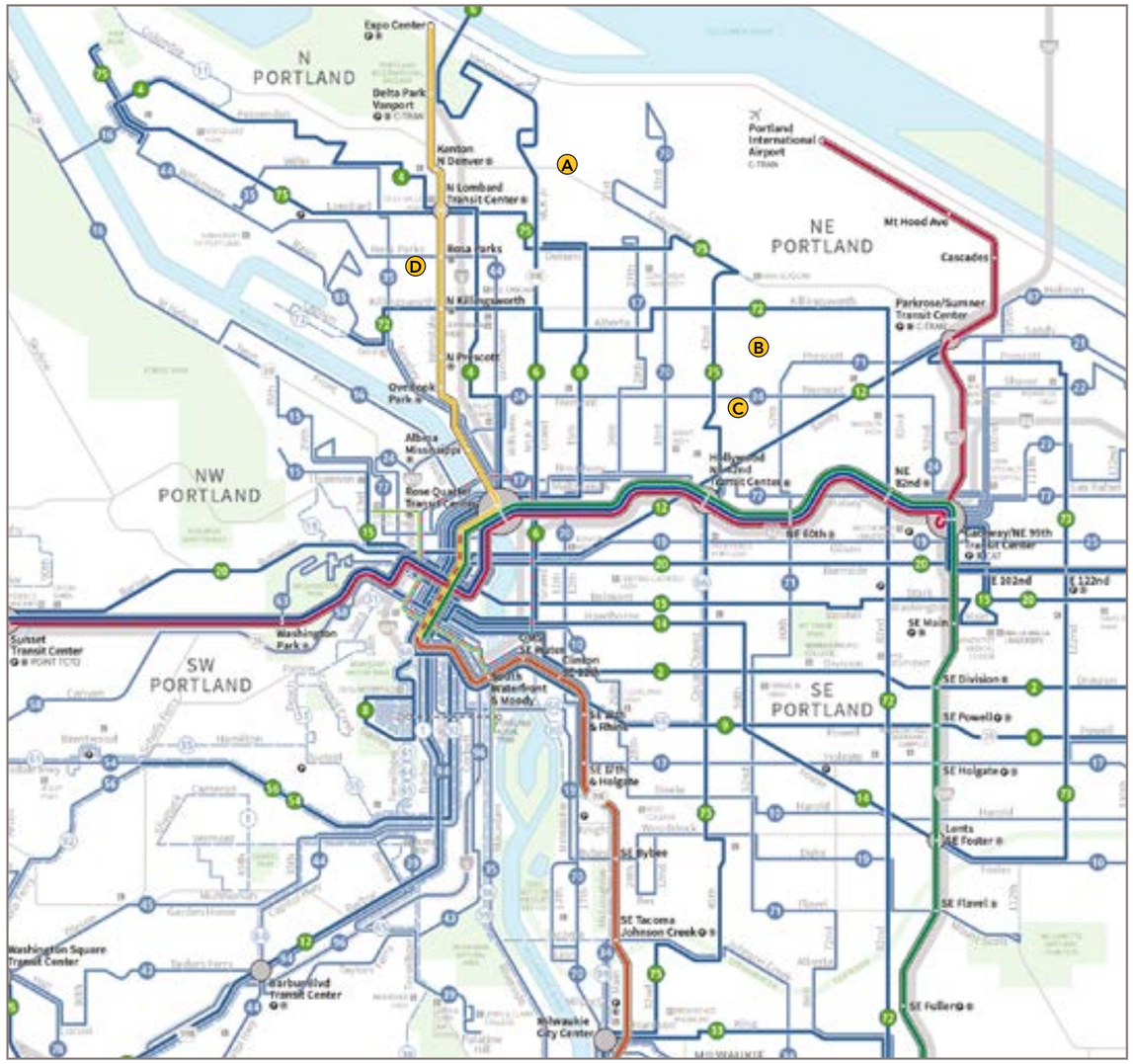


Figure 71: TriMet Network Map - North/Central Detail

Frequent Bus Network services (including lines 17, 34, 70, 71, 35 and 44) ran every 30 minutes or better, and most ran every 20-25 minutes.

South of Powell Blvd, the frequency of east-west radial services is lower. Lines 17-Holgate, 10-Harold and 19-Woodstock/Glisan each ran at 20-30 minute frequencies before the pandemic, with more service available during the rush hours. Service has been reduced on Lines 10 and 19 since the beginning of the Covid-19 pandemic.

Another gap area with no access to Frequent Service exists in Sellwood, where Line 70 is the main route available. In this segment, every other trip serves either SE 13th Ave or SE Milwaukie. This service pattern is effective at putting transit service within a short walk of the entire neighborhood, but as a result, service on each street runs only about every 40 minutes.

Major projects in North/Central

As this document was being drafted, TriMet was preparing to launch its biggest change to eastside service yet: the new FX (Frequent Express) service on Division. FX is a new service type for TriMet that will offer faster, more frequent service along the entire Division corridor, using higher-capacity articulated buses, and stopping at improved stations. With FX, a trip from Gresham to Downtown Portland will be about 20% faster than the existing Line 2 service.

Key changes in North/Central SEP

Figure 72 shows the North/Central SEP map. In North/Central Portland, the biggest changes from the existing network structure are two new routes, Line Y and Line Z.

Line Y is a future north-south crosstown route that would travel between Northeast Portland (near the former Concordia University campus Ⓐ) and Sellwood, using transit-operable streets in the 20s.

With this change, Line Y would take over the NE 24th / NE 27th segments that are today still operated by Line 17, while Line 17 would shift to become the route for NE 33rd.

Providing crosstown service in the 20s in Portland has been a network planning consideration since the implementation of the frequent grid in the 1980s, given the long gap between Line 75-Cesar Chavez/Lombard and Line 70-11th/12th. However, there are challenges to operating on SE 20th Ave; a route along this alignment would be slow, impacting its usefulness for short trips.

In Sellwood, Line Y would have used Bybee Blvd and SE 13th Ave, enabling Line 70 to consolidate service onto SE Milwaukie for a more frequent and more direct travel option. As of 2022, Line Y has not been implemented.

The other new service addition is a continuous line on Prescott, Line Z. This route would run from Parkrose TC to Downtown Portland along Prescott and Alberta, and then duplicating Line 6 along MLK from Alberta to the Steel Bridge. Line Z has two related network changes:

- Line 72 would no longer run on Alberta, staying on Killingsworth between 33rd and MLK Ⓑ (a segment that has no service today).
- Line 71 would be extended further along Cully Blvd Ⓒ, using Cully and Killingsworth to approach Parkrose TC rather than the current Prescott / Sandy routing.

As of 2022, Line Z has not been implemented.

The North/Central Service Enhancement Plan identifies network improvements that fill many of the remaining transit service gaps in Portland.

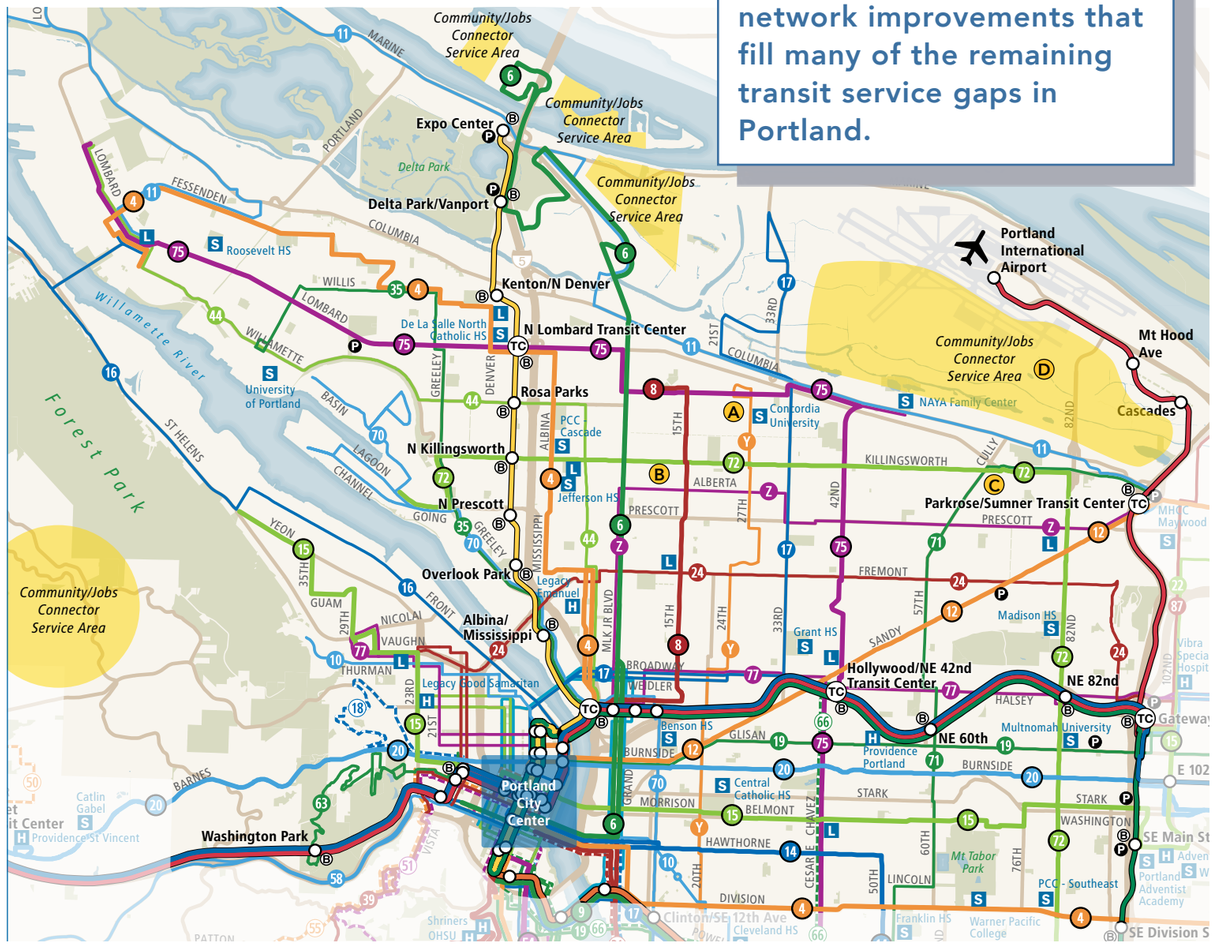


Figure 72: North / Central Service Enhancement Plan Map

Several other important network changes are included in the North/Central SEP:

- Extension of 24-Fremont into Downtown via the Fremont Bridge and NW 18th/19th (implemented).
- Extension of 11-Rivergate/Marine Dr to Parkrose TC (not yet implemented)
- Extension of 10-Harold into Pearl District and NW Portland (not yet implemented).
- New Community/Jobs Connectors in industrial areas of North and Northeast Portland. The first of these serving the areas south of the airport is scheduled for implementation in mid-2022 Ⓓ.

Portland City Center

The most intense portion of TriMet's network where many high-frequency rail and bus lines meet is in and around Downtown Portland. Downtown Portland is the region's largest job center. Its surrounding residential areas are some of the highest-density, most walkable places in the region, and it is also the connection point for transit services the carry trips between the westside and eastside. The City Center and adjacent areas are home to some of the largest institutional drivers of transit demand (as well as TriMet ridership and pass program participation), including PSU (A), OHSU's Marquam Hill (B) and South Waterfront (C) campuses, and the variety of state and local government agencies located in Downtown itself.

TriMet's City Center network is structured to facilitate connections for trips to and from all parts of the region. All MAX lines come together at Pioneer Square (D), and almost all bus routes either serve or cross the transit mall (SW 5th and 6th). The three Portland Streetcar lines tie nearby areas that are out of walking distance to the downtown core into this structure.

The only exceptions to this structure are Line 24 (the NW 18th / 19th route) and the West Hills feeder services (Lines 18 and 63), which terminate near the Providence Park MAX (E) station served by the Blue and Red lines. These routes do not touch the transit mall.

In most cases, bus lines that travel through downtown use a couplet of one-way streets, like Jefferson/Columbia or Main/Madison in the downtown core, or Everett / Glisan in Old Town. This forms a predictable grid of services, where both directions of a given route are never more than 1 or 2 blocks apart. The exceptions to this are Line 16 (which runs two-way on SW Oak), and Line 15, which splits more widely running westbound on SW Washington and eastbound on SW Salmon 5 blocks away. In order to reduce passenger travel time and simplify the service, TriMet's 2022 service improvement program will move eastbound service on Line 15 to SW Alder.

Northwest Portland the Pearl District

The dense areas north of Downtown Portland are laid out on a regular street grid, so the network operates on a grid pattern similar to the much larger one overlaid across the east side. North-south service is provided by the MAX lines on the transit mall, the Portland Streetcar on the 10th/11th couplet, Line 24 on the 18th / 19th couplet, and Frequent Service Line 15 on NW 23rd. East-west grid connections across NW, and to places east of the Willamette River are possible with Line 20 and Line 77; the Portland Streetcar NS Line also serves east-west trips on Lovejoy and Northrup.

It is worth noting that while there are many grid connections within Northwest, only Line 15, Line 20 and the Portland Streetcar operate at high frequency. For very short trips of the distances required to move between NW 21st or 23rd and the Pearl District (often less than one mile), the average waiting time for Line 77 (10 minutes) will often render transit no faster than walking.

Figure 73: TriMet Portland City Center Map - South Waterfront Detail

South Waterfront and South Portland

The pedestrian and roadway network of the area of inner Southwest Portland just south of downtown are fragmented by the I-5 and I-405 freeways. Routes enter downtown from the south using every arterial that crosses I-405. I-5 and the steep grade of Marquam Hill preclude the possibility of running service in a grid pattern as in Northwest. These barries are what make the direct connection of the Portland Aerial Tram between the South Waterfront and OHSU so useful.

Service in this area is organized into three distinct groups of lines- those serving OHSU and Terwilliger Blvd Ⓐ, including Frequent Service Line 8; the group of routes heading southwest on the west side of I-5 via Barbur and Corbett Ⓑ; and those passing through the South Waterfront Ⓒ (either approaching the Tilikum Crossing or heading further south) .

Because of the complexity of this area, not every route adheres to a simple pattern. Line 19-Woodstock and Line 66-Marquam Hill / Hollywood TC use the Ross Island Bridge to cross the Willamette, while Line 99-Macadam McLoughlin uses the I-5 frontage roads to reach SW Macadam.

The Central Eastside and Lloyd District

The eastside frequent bus network grid begins at the MLK/Grand couplet. At each bridgehead, at least one east-west Frequent Service begins, serving the Burnside, Belmont, Hawthorne/Foster, and Division corridors. These services meet the first crosstown grid element, the Portland Streetcar A/B line. Just east of the edge of **Figure 74** at the SE 11th/12th couplet, Line 70 provides the second crosstown connection.

The Role of the Streetcar

While the Portland Streetcar is not a TriMet service, it plays an important role in the network in the Central City and serves several trip types that the bus network does not.

The most important function of the Streetcar is provided by the original NS Line. The NS Line provides a direct transit connection between six important places: the dense Northwest and Pearl District residential areas; the employment core of Downtown Portland; the campus of Portland State University; the growing OHSU South Waterfront campus; and the dense residential area of South Waterfront south of the Ross Island Bridge. These are all major destinations, and far enough apart to make waiting worthwhile. While a walk between Pioneer Square and PSU may take just a few minutes, a walk between Northwest 23rd and PSU is much less practical. The NS line connects the dots on westside Central City connections, and knits together the grid by putting all of these places on a high-frequency service that crosses major east-west grid routes like Lines 77, 20, 15 and 6.

Figure 74: TriMet Portland City Center Map - Central Eastside Detail

The A/B loop serves the same segments from the Tilikum Crossing to NW Lovejoy, but then crosses the Willamette to reach the Rose Quarter, Lloyd District, Central Eastside and OMSI. While these are all important destinations similar to those served by the NS Line, the loop structure makes these lines useful for different types of trips that the straight NS Line. For example, while the A/B Loop serves both SW 10th & Morrison and SE Grand & Morrison, these points are connected much more directly by Line 15 via the Morrison Bridge. The A/B Loop will rarely be the fastest way to travel from one side of the loop to the other.

The loop structure makes certain connections uniquely possible. For example, the A/B Loop is the only continuous service in the Central Eastside between NE Broadway and OMSI, and the only direct route between the South Waterfront and Central Eastside.

Major Projects in Portland City Center

Two major recent or upcoming projects are worth noting in the City Center:

- TriMet's new FX (Frequent Express) service on Division St will terminate downtown.
- TriMet has recently closed three downtown MAX stations, in order to speed up travel times for passengers riding MAX through downtown between the eastside and

westside of the region.

Additionally, the City Center is the location of many of the transit priority improvements implemented as part of the Portland Bureau of Transportation's Rose Lane Project[12]. Developed in partnership with TriMet, the Rose Lane Project is an effort to make transit faster by installing quick-build transit lanes on segments and key intersections where transit is prone to delay. Many of the locations in the transit network with the greatest levels of delay are in the Center City, and the red pavement markings of Rose Lane Project improvements are now widespread throughout the area.

Key Changes in SEPs

The Center City does not have its own SEP, but changes in the plans would create new routes that would end downtown and service Center City areas. Examples include the extension of Line 24 across the Fremont Bridge into Downtown, and the extension of Line 10 into Northwest Portland.

Eastside

Most of the radial Frequent Service corridors continue east of I-205, serving East Portland and the cities of Gresham, Fairview, Wood Village and Troutdale. The backbone of the eastside network is the MAX Blue Line, which serves Burnside from 97th to 197th, before continuing to its terminus in Gresham on its own right-of-way. The Blue Line is a fast, frequent and useful service for trips between eastside destinations, and towards points further west in the center city or even Washington County. Some stations have even seen substantial nearby dense residential development.

The east side of the service area has been one of the fastest-growing areas over the past two decades; it is also the most diverse part of the service area, with the greatest concentration of people of color and lower-income people. Much of the eastside ranks as areas of high equity priority on TriMet's own Equity Index, which evaluates a combination of factors including race and ethnicity, income, English proficiency, and zero-vehicle households.

People traveling on the eastside face a number of access barriers, whether using transit, walking or riding bikes. The street network is less connected, which means walk distances are longer and more likely to require walking along a major arterial. In some areas, as between Stark and Division (A), there are no continuous east-west streets that transit can easily run on.

The continuous streets that do exist and that transit serves are large and fast, and many are among the City of Portland's High-Crash Corridors that are the focus of its efforts to reduce pedestrian fatalities. The distances between safe crossings are long, and the presence and quality of key pedestrian infrastructure like sidewalks and ramps is highly varied.

Frequent Services

Several of TriMet's high-frequency east-west bus lines also travel through this part of the network.

- Line 20-Burnside/Stark transitions to Stark at 102nd , and then continues via Stark until 257th, where it turns south towards its eventual terminus in at Gresham Central TC.
- Lines 2 and 9 serve Division and Powell, terminating at Gresham TC. Each of these routes serve a busy residential and commercial corridor and connect with north-south services to facilitate grid movements.

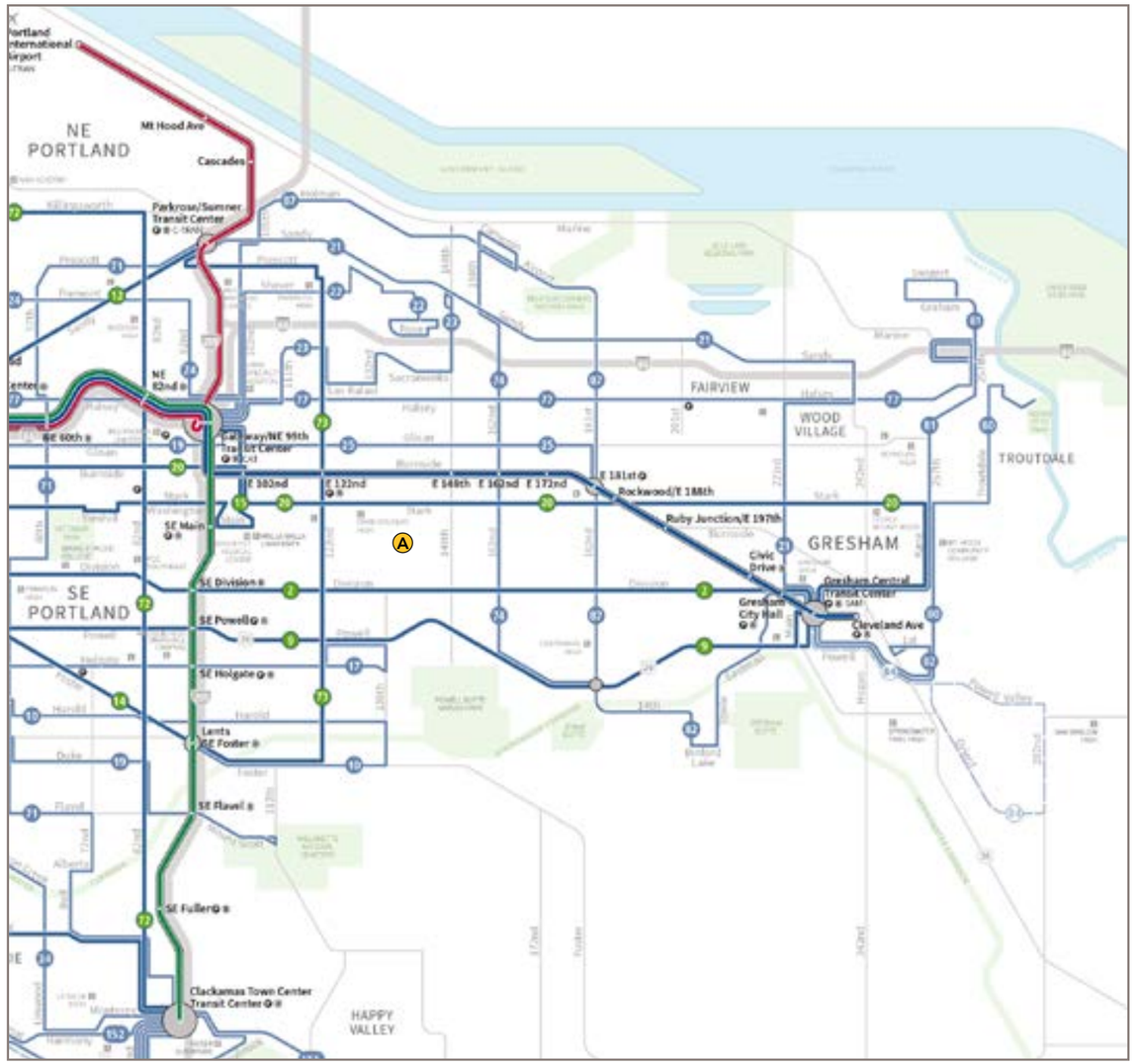


Figure 75: TriMet System Map - Eastside Detail

In 2018, TriMet upgraded the 122nd route to Frequent Service and renamed it Line 73 . This became the first frequent crosstown service east of I-205, and since implementation has been one of TriMet's busiest routes.

Infrequent Services

East of 122nd, all north-south crosstown service runs infrequently, while north of Burnside, all east-west service runs infrequently. Some routes run at near-frequent headways, like Line 77-Halsey, which comes about ever 20 minutes. Most other routes run every 30 minutes, except for Line 25-Glisan/ Rockwood, which runs about every 60 minutes.

Low frequencies make transit less useful, because they require longer waits. For local trips, this may make a short distance require so much time that it becomes impractical by transit. For longer trips requiring a transfer, an infrequent leg is a leg where a missed connection means waiting a long time for the next bus and a greater likelihood of being late to their destination.

Major projects on the eastside

As this document was being developed, TriMet was preparing to launch its biggest change to eastside service yet: the new FX (Frequent Express) service on Division. FX is a new service type for TriMet that will offer faster, frequent service along the entire Division corridor, using higher-capacity articulated buses, and stopping at improved stations. With FX, a trip from Gresham to Downtown Portland will be about 20% faster than the existing Line 2 service.

As we observed in the access analysis, transit is less useful on the eastside, because the eastside is farther from major job centers than close-in areas of central Portland. FX helps to close that gap by running faster and reducing the travel time for trips both within the eastside and between the eastside and destinations further west.

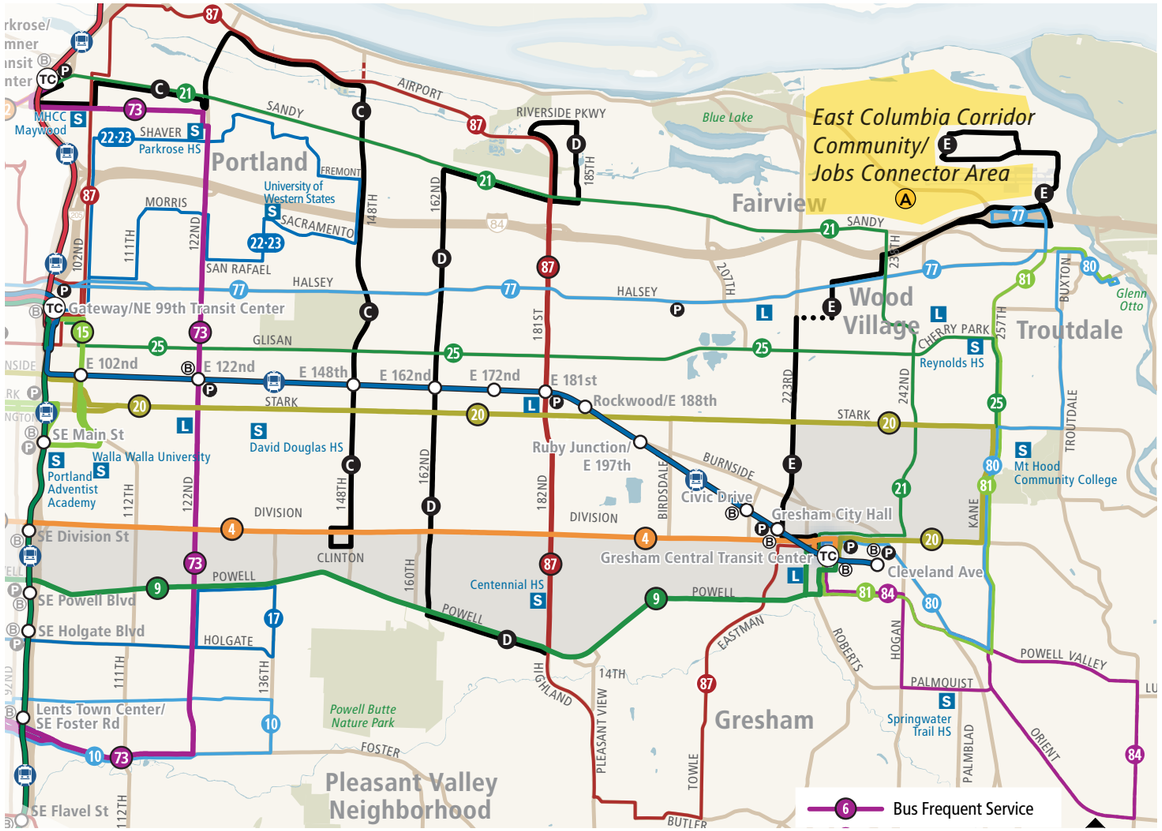


Figure 76: Eastside Service Enhancement Plan map showing new services on 148th, 1623nd and 223rd from the Eastside SEP. The 162nd and 223rd services have been implemented.

Key changes in the Eastside SEP

The most significant changes in the SEP address the challenge of north-south transit movements. Most service on the eastside runs east-west, and at the time of the SEP's development, all north-south service operated a low frequency. **Figure 76** shows the Eastside SEP map, with new routes in black.

To address the north-south movement issues, the SEP planned two Frequent Service upgrades:

- New Line 73, providing Frequent Service on 122nd Ave (implemented).
- Upgrade Line 87 to Frequent Service between Sandy and Powell (not yet implemented).

These new Frequent Service routes would make the eastside grid much more useful, by reducing waiting time for many trips along two of the busiest eastside commercial corridors. As mentioned earlier, Line 73 was implemented in 2018, and immediately became one of TriMet's highest-productivity routes, in terms of ridership per unit cost.

A few other important network changes were identified in the Eastside SEP. These include:

- New Line C serving 148th Ave (not yet implemented).
- New Line D service 162nd Ave (implemented)
- New Line E serving 223rd Ave (partially implemented).
- Extension of Line 25 to Gresham via Glisan and 257th (not yet implemented).

Today, the 162nd service has been implemented as Line 74. The 223rd service was implemented by shifting the routing of Line 21 from 242nd. Both routes operate infrequently. The 148th service remains to be implemented.

The Eastside SEP includes one Community Connector, service the Troutdale Reynolds Industrial Park area Ⓐ. This service has been implemented on weekends and holidays only as the Troutdale Job Connector Shuttle, operated by ecoShuttle.

The biggest changes in the Eastside Service Enhancement Plan are new Frequent Service lines on 122nd (implemented) and 223rd. The Eastside SEP also identifies new routes to improve north-south travel.

Southeast

The Southeast portion of the network covers the developed areas within the urban growth boundary: Milwaukie, Happy Valley, Oregon City, Gladstone, Oak Grove and Oatfield. Damascus and the residential areas along Highway 212 leading to Boring are outside of the TriMet district and are not served. Estacada to the southeast is within the district.

The Clackamas County network is organized around three major nodes, at the Milwaukie, Clackamas and Oregon City Transit Centers. Milwaukie is served by the MAX Orange Line (terminating a bit further south at the SE Park station), while Clackamas TC is the terminus of the Green Line. The other two major frequent crosstowns serving Portland, Lines 72 and 75, end at Clackamas and Milwaukie, respectively. As a result, most of Portland is reachable from these two facilities, and most routes in the Southwest tie into them.

Frequent Service

Only one frequent bus service is present in the Southeast, Line 33 - McLoughlin / King. This route links the three transit centers and provides 15-minute service to the busy McLoughlin commercial corridor. Line 33 continues south of Oregon City to terminate at Clackamas Community College Ⓐ, using local streets rather than the more direct Mollala Ave Ⓑ to put Frequent Service closer to more residents.

Infrequent Services

All of the other routes serving the southeast run at low frequency. These infrequent services fall into three groups:

- Radial routes that continue from the south-east into Downtown Portland. There are two of these: Line 99, the rush hour service between CCC and Downtown Portland; via McLoughlin; and Line 35, the infrequent route serving the natural areas and wealthy suburban cities along the west bank of the Willamette River.
- Local routes connecting the residential areas between two of the transit centers, like Line 31 in Gladstone Ⓒ or Line 34 in Oak Grove Ⓓ.
- Feeder services that connect a residential area to a single transit center, like Line 154 in West Linn, the Happy Valley services Lines 155 and 156, or the Estacada Line 30 service Ⓔ.

For parts of the southeast that are not near MAX or Line 33, the network structure is designed to provide most areas with a direct connection to MAX with a single ride.

Before the pandemic, most infrequent services in the southeast ran about every 30 minutes, but the Clackamas local network has seen some of the most significant service reductions since 2020. Today, lines like 31, 32, 34 and 79 run only every 40-60 minutes.

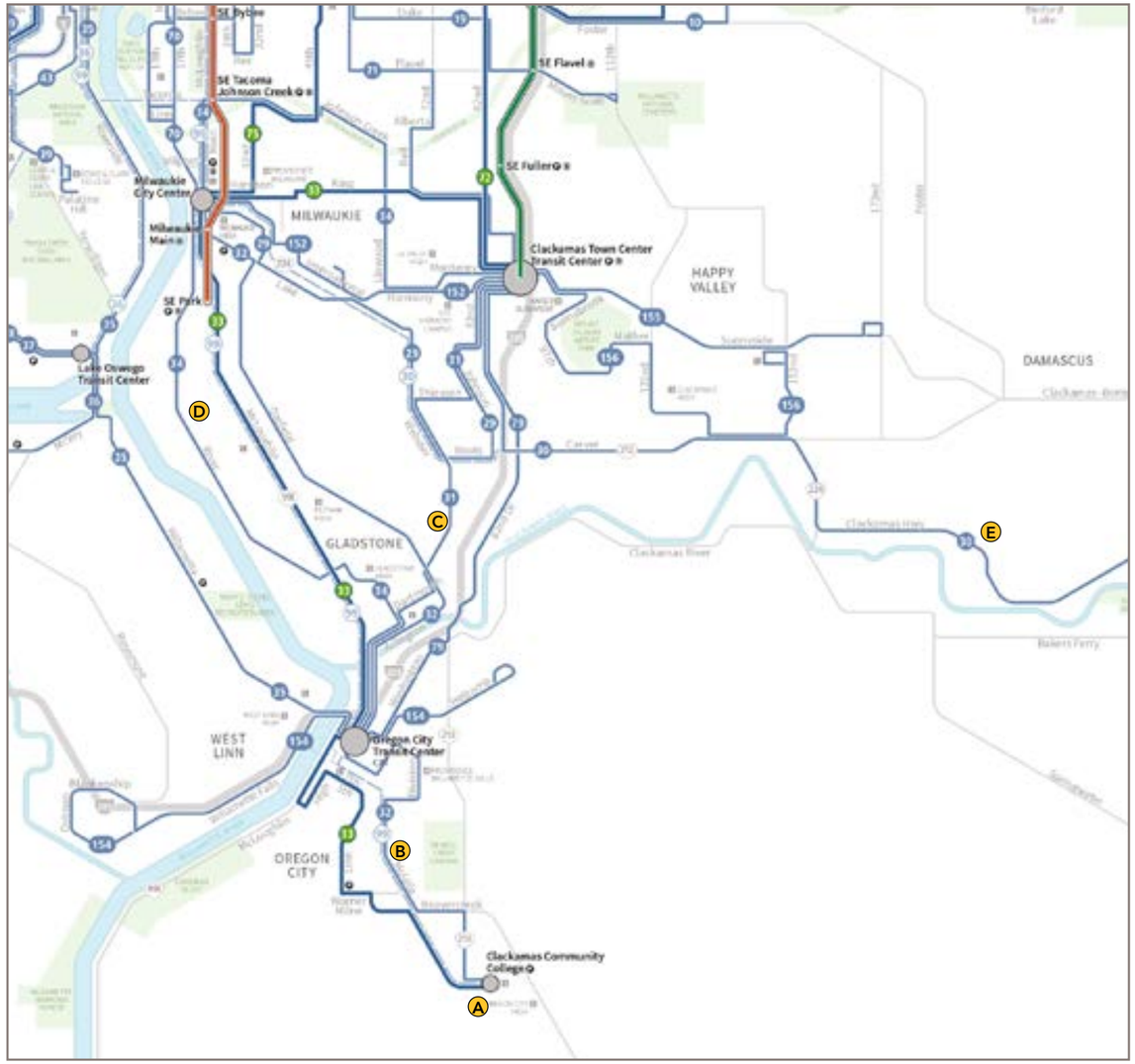


Figure 77: TriMet System Map - Southeast Detail

Key Changes in the Southeast SEP

Three new routes are identified in the Southeast SEP (**Figure 78).**

- **Line W.** This route would connect Clackamas TC and Oregon City TC via 82nd Ave and Webster (implemented).
- **Line X.** This route would travel between Happy Valley and Oregon City TC via Hwy 212, Jennings Rd and McLoughlin Blvd (not yet implemented).
- **Line 43.** This route would provide a new east-west connection between Clackamas Town Center and Washington Square. In the southeast are of the network, it would serve Johnson Creek Blvd and the Sellwood Bridge (not yet implemented).

At the time of the development of the Southeast SEP, one of the longstanding challenges for transit mobility in this area was the lack of east-west connectivity. Travel from Happy Valley to Oregon City or the McLoughlin Blvd corridor required multiple transfers between low-frequency routes. West of I-205, the network in Oatfield and Johnson City was made up of feeders into Milwaukie TC and Clackamas TC, requiring out-of-direction travel to get to places to the southwest.

Line X would have provided a new direct service between Happy Valley, McLoughlin and Oregon City, while Line W would have made a new connection from Clackamas TC to Oregon City through Oatfield and Johnson City (supplementing the Line 79 service that mainly uses 82nd Dr west of I-205).

Line X has not been implemented, but improvements to east-west mobility in the Southeast area have been made. The most important of these is the extension of Frequent Service Line 33 Ⓐ from Milwaukie to

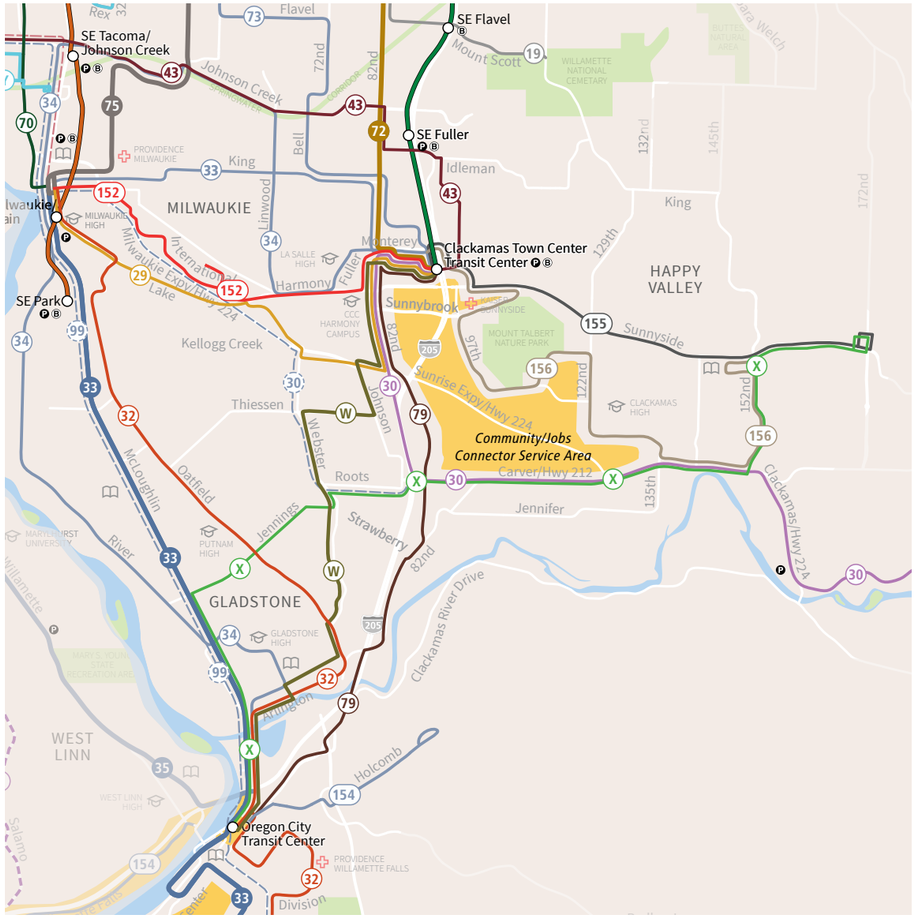


Figure 78: The Southeast SEP map showing new lines W and X.

Figure 79: TriMet's 2022 network map, showing the extended Line 33 and Line 31.

Clackamas TC. This was implemented as part of the package of changing accompanying the launch of the MAX Orange Line.

The route identified in the SEP as Line W was also implemented as Line 31 Ⓑ. Today, this route operates in almost the exact routing specified in the SEP, connecting Clackamas TC to Oregon City at 30-minute frequency. This route improves the connectivity of neighborhoods west of I-205 to two of the major commercial and employment nodes within the Southeast sub-area, and also provides a more direct, alternate option to travel from Clackamas to Oregon City that may be faster than the Frequent Service Line 33, depending upon the particular circumstances of the trip.

The Southwest Service Enhancement Plan focuses on improving access between residential areas and major centers at Clackamas, Milwaukie and Oregon City.

4 COVID Travel Market & Trends

COVID Travel Market & Trends

The Task 3: Trends in Transit and Mobility technical memo developed by the consultant team as part of Forward Together provides a detailed and comprehensive view of a range of trends in transportation that have emerged since the pandemic, and which are relevant to TriMet's future service planning.

This document includes a great detail of information sourced from review of relevant national transit and transportation statistics and research, coupled with analysis of local indicators. The summary table of key trends and potential actions TriMet could take in response is shown in **Figure 80.**

Trend	Potential Actions by TriMet
Peak commute demand has declined.	• Reschedule transit service so it is less focused on peak times and more spread through the day. • Eliminate duplicative downtown segments and reallocate service to grid connections serving all-day destinations. • Eliminate or reduce downtown peak express services.
Travel has declined less for less-educated and lower-income populations.	• Increase service for high demand areas and times. • Focus on areas with high equity demand, areas that offer services, and areas where people work in person.
Transit ridership has declined more than other modes.	• Expand transit access in areas not well served by fixed route transit and areas with equity populations. • Focus service on locations where demand for transit is strong now and will likely be strong in the coming years.
People are concerned about potential COVID-19 infection from riding transit.	• Continue with COVID-19 health and safety protocols. • Emphasize COVID-19 protocols in marketing
Transit ridership has declined since the mid-2010s.	• Make transit more useful by improving its ability to take people to the places they need to go. • Focus service on locations where demand for transit is strong now and will likely be strong in the coming years. • Expand transit access in areas not well served by fixed route transit and with equity populations. • Work with policymakers to regulate ride hailing services that compete with transit.
Transit agencies and municipalities implementing transit-priority infrastructure improvements.	• Continue implementing transit-priority improvements, such as with the Rose Lane program.
Lower-income populations are being displaced from the urban core to the urban fringes.	• Improve transit access in areas not well served by fixed route transit and with equity populations. • Improve multimodal facilities (sidewalks, crossings, bike lanes) that make it easier and safer to get to transit. • Continue to integrate anti-displacement strategies with transit improvements.
Rethinking security on transit and in other public places.	• Outreach to Black, Indigenous, and people of color (BIPOC) communities and groups. • Inclusive safety policies. • Training in anti-racism, cultural competency, mental health & de-escalation for TriMet personnel (Recommended from Reimagining Public Safety & Security on Transit) • Increased presence of TriMet personnel and unarmed safety presence (recommended from Reimagining Public Safety & Security on Transit). • Crisis intervention teams (recommended from Reimagining Public Safety & Security on Transit).
Increase in traffic fatalities.	• Invest in infrastructure to improve safety, such as illumination, traffic calming, and bike/ped facilities. • Work with local jurisdictions to encourage safe driving, particularly near transit stops and routes.
Increasing numbers of people experiencing homelessness in urban areas, as well as non-destination riders and homeless residents at/near transit stops.	• Consider findings from Portland State University research, expected to be completed summer 2022. • Social workers on transit vehicles or at transit stops. • Connect with social service providers.
Reduced fare revenue.	• Consider restructuring revenue sources to reduce dependence on fare revenue.
Driver shortage.	• Increase driver compensation.

Figure 80: Summary of Trends and Potential Actions by TriMet

On-Demand Services

Over the past decade, substantial attention in the transportation industry has been devoted to an emerging group of services variously referred to as "on-demand", "microtransit", or "New Mobility" services. These terms describe a range of transportation service types that generally involve some degree of flexibility in the pickup and dropoff locations available to passengers.

Figure 81 illustrates a range of potential new mobility services from traditional fixed routes with "flag stops" available upon request, to anywhere-to-anywhere demand response zones similar to the service provided by private Transportation Network Companies (TNCs).

TriMet and its partners have operated on-demand services for decades. These include:

- LIFT Paratransit, TriMet's shared-ride service for people who are unable to use regular buses and trains due to a disability or disabling health condition.
- Ride Connection, the non-profit organization delivering door-to-door rides for older adults and people with disabilities and Community Connector deviated fixed-route services open to the public.

Ride Connection's Community Connector services operate in Forest Grove, King City, North Hillsboro, and Tualatin. These services operate along fixed routes, but riders can also call ahead to request a trip within 1/2-mile of the route.

TriMet and Ride Connection already provide services with most of the attributes of "on-demand service" or "microtransit". The main differentiating factors associated with these terms include:

- The use of a smartphone app for trip booking.
- Rapid booking, often with same-day or on-demand trip reservations.

For customers, new mobility services are typically differentiated from traditional demand response programs by their integration of an app-based, short-notice booking system and lack of eligibility criteria.

Across the transit industry, there are many different service delivery models currently in operation, from full agency control with staff drivers to fully contracted services operated entirely by third parties. In some cases, this can even mean a fare subsidy paid by a transit agency to a private operator that is available for trips in a given area, which may be totally invisible to the customer.

What role do on demand services have in a network design study?

The other distinctive characteristic of new mobility services is their expense. On-demand trips of any kind can be much more expensive to provide than fixed route trips. This is why transit agencies are careful and thoughtful about where they offer demand response service and how they control its costs.

The cost of a fixed route is steady over time. It does not go up immediately when more people ride it. As a result, when more people ride, it becomes less expensive to provide each ride.

In contrast, the costs of demand response service rise as more people request trips and more drivers and vehicles have to be added to serve them. This is because each vehicle can only provide a few trips per hour of service, as the demand response trip is responsible for taking customers to and from their origin and final destination, not just the nearest transit stop.

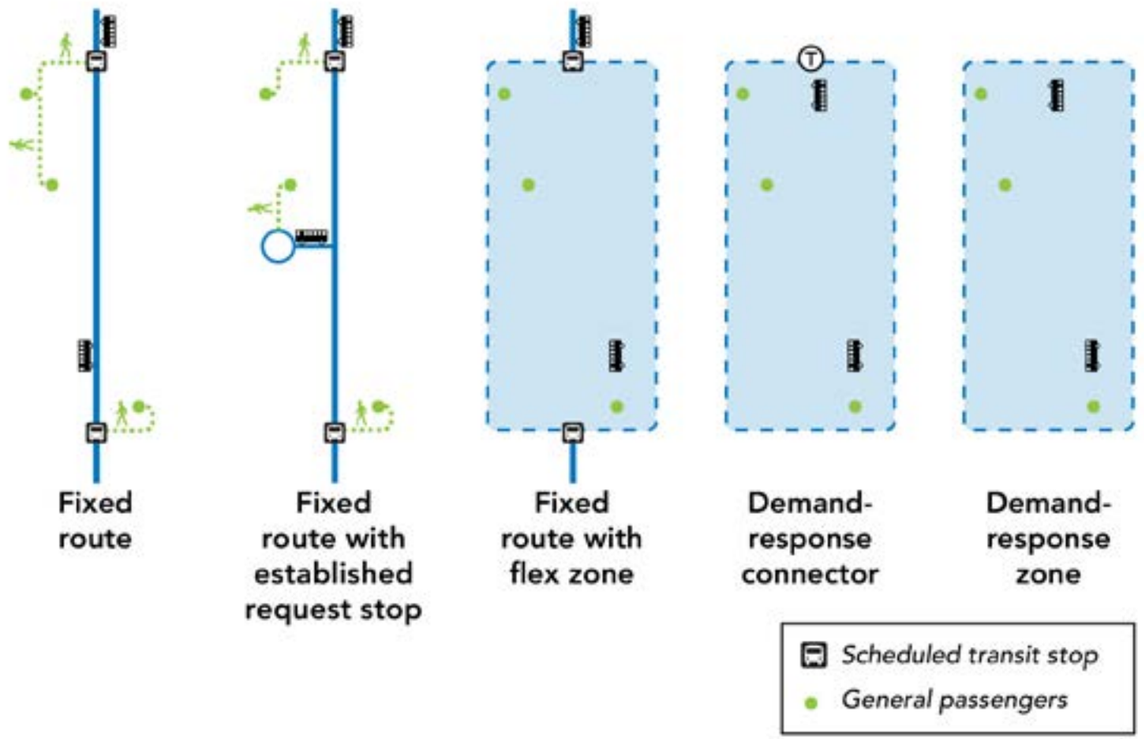


Figure 81: Microtransit service types

Even in its most efficient forms, on demand service cannot move as many people per vehicle, or as many people per dollar, as a moderately productive fixed route.

For example, when UTA, the transit agency serving the Salt Lake City metropolitan area, designed its network of on-demand service, the maximum productivity estimated for any of the 19 suburban service zones studied was 6.3 boardings per vehicle hour[14].

However, on-demand service can do something very useful - they can move *fewer* people, at a lower cost than any fixed route, while still providing a lifeline transportation option to those who need it. This can be an effective way to provide service in low-density places that are unlikely to generate much ridership with a fixed route, but where some sort of publicly-supported transportation service is desirable.

Endnotes

Endnotes

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