Existing Conditions Report

JANUARY 01, 2025

SolTrans Comprehensive Operational Analysis

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ATTACHMENT B
Agenda Item 11A

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

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1 Introduction

What are we doing here?

The SolTrans Comprehensive Operational Analysis (COA) is a planning study that will develop recommendations to improve the overall efficiency and operational effectiveness of the agency's services. In other words, this project will identify possible changes to SolTrans' fixed route bus network that could make it more attractive to passengers.

Study Overview

Through the COA process, SolTrans will develop options for future changes to its service through three main efforts:

- A detailed analysis of the existing state of the system, travel market and post-pandemic changes; this report.
- An intensive design process where staff from SolTrans, the consultant team and partner agencies use the existing conditions analysis and input from the public to develop detailed recommendations for potential changes.
- Engagement of the public, stakeholders and partner government agencies. Initial engagement was conducted in Summer 2024 as an input to the development of this report; further engagement will be carried out to solicit feedback on draft and final recommendations.

This report was developed in Fall 2024, for release along with the first draft recommendations in early 2025. SolTrans and the consultant team collaboratively developed those recommendations based on this analysis and conversations with the public, stakeholders and partner agencies.

Next Steps & Timeline

After the Winter 2025 engagement period, SolTrans will use the feedback received to make changes to the draft recommendations. A final recommended plan will be released in late Spring 2025.

Figure 1 shows the overall timeline for this project.

Outcomes

This project will develop a set of recommendations that are expected to be finalized in Spring 2025. These recommendations would then be further refined by SolTrans staff through the agency's regular service change process, with the first potential changes to the existing network implemented in 2026 if approved by the SolTrans Board.

SolTrans Basics

SolTrans is a joint powers authority (JPA) the provides public transportation to the Solano County cities of Vallejo and Benicia. It was established in 2010, and began operating transit services in the two cities in 2011. Since 2022, SolTrans has also operated all express bus service in Solano County, including the Red, Blue, Green, Yellow and 82 Solano Express routes that connect Vallejo, Benicia, Fairfield, Vacaville, Dixon and Davis to the BART rapid transit network.

Figure 2 summarizes SolTrans' trend in ridership (dashed line) and service level (solid line) over the past four years. The color indicates service and ridership on local (purple) or express (blue) routes.

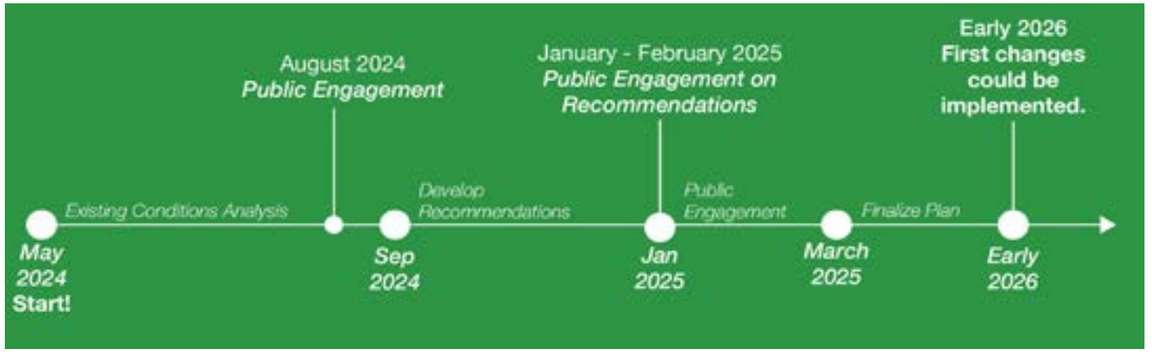

Figure 1: SolTrans COA Timeline

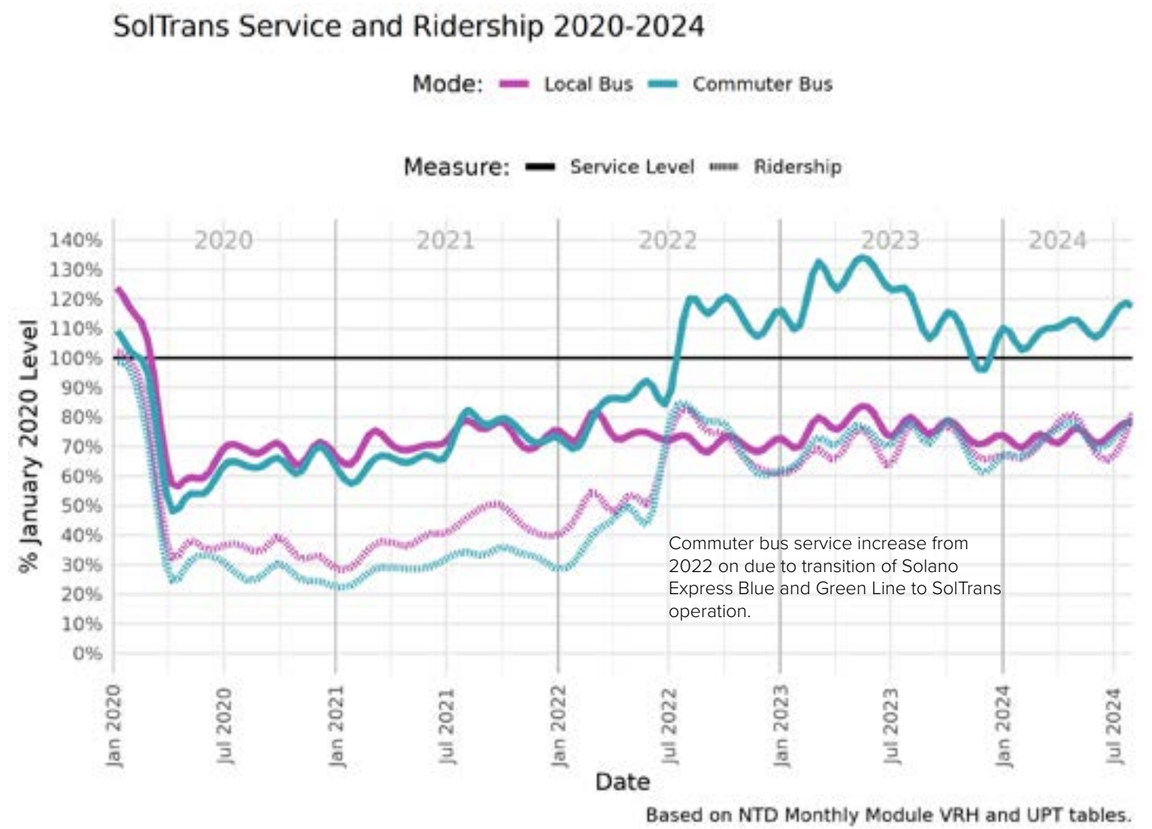

Figure 2: SolTrans Service & Ridership, Jan 2020 - August 2024

Background Studies and Plans

2022 SolTrans Short-Range Transit Plan

SolTrans' most recent short-range transit plan (SRTP) update was completed in 2022. This document provides a snapshot of the agency's condition and outlook emerging from the pandemic.

The SRTP provides a succinct overview of the measures SolTrans was forced to take early in the pandemic, when it initially implemented cuts to reducing the frequency of all local routes to every 60 minutes. Saturday service was reduced as well. In making these cuts, SolTrans prioritized continuity of service and preserving span over frequency. As a result, the overall span of service and availability of routes was largely maintained, at the cost of all of the agency's pre-pandemic 30-minute routes.

Like nearly all US transit agencies, SolTrans was forced to cut service at the beginning of the pandemic when ridership collapsed. In 2020 and early 2021, ridership on both express and local routes reached as low as 25-30% of last 2019 levels.

Ridership has recovered substantially since the depths of the pandemic, but as of August 2024 was still approximately 20% below pre-pandemic levels. Service levels on the local network in Vallejo and Benicia have been relatively flat since 2019, when SolTrans restored some of the service that was initially cut at the onset of the pandemic. The amount of commuter bus service increased substantially in 2022, when SolTrans assumed operation of the Blue and Green Solano Express lines from FAST (in addition to its existing Red and Yellow services).

This initial cut represented a nearly 50% reduction in the level of weekday service offered by the agency. SolTrans began restoring service later in 2020, but as more recent NTD data show, the overall service level is still well below what was offered in 2019, primarily due to the increase in cost of the new labor contract awarded in 2021. As the SRTP update explains, "a full return to pre-COVID levels is not feasible within the foreseeable future, given the steadily increasing operating costs, flat revenue streams, and uncertain future revenue forecasts."

The SRTP also lays out three high-level scenarios for current service planning. Under all three of these scenarios, SolTrans would operate less local service than in 2020 prior to the pandemic

- **"Robust Recovery" - ridership and overall system funding return to pre-pandemic levels; increased costs mean 100% recovery of pre-pandemic service levels not possible, but improvements above 2022 service baseline could be made.** By year 5 (2028 fiscal year), SolTrans operates about 78% of its pre-COVID local service level. As of mid-2024, SolTrans was operating about 80% of its pre-COVID local service level.
- **"Revenue Recovery, with Fewer Riders - overall funding returns to pre-pandemic level, but ridership recovery is slower, impacting farebox recovery and potentially impeding service restoration and/or requiring modest cuts.** By year 5 (2028 fiscal year), SolTrans operates about 77% of its pre-COVID local service level.
- **"Some Progress" - ridership and funding both stall due to service level reductions.** Limited funding plus increased cost require further cuts, further depressing ridership. By year 5 (2028 fiscal year), SolTrans operates about 68% of its pre-COVID local service level.

2018 SolTrans COA

SolTrans last conducted a COA in 2018. That project examined the system as it existed before the pandemic and made a set of recommendations, some of which have been implemented in Fall 2019. The 2018 COA did not analyze the express services.

The most important single recommendation from this project was labeled the "Grand Circle" at the time; this was the conceptual design for a loop route serving most major destinations in Vallejo that was ultimately implemented as routes 7A and 7B. This concept also including supporting network changes such as the termination of Route 2 in north Vallejo (at the time, Route 2 ended in a loop near Solano Community College), and the shortening of Route 3 to enable 30-minute headways.

The 2018 COA also made some recommendations that were not implemented. The most important among these was the "Short-Term BRT Lite Scenario", which would have tweaked Route 1 and 2 so that they operated along the same routing via Sonoma Blvd, combining for 15-minute service. At the time of the 2018 COA, these routes both operated at 30-minute headways, but with the onset of the COVID pandemic, SolTrans made service reductions across all routes, reducing these frequencies to every 60 minutes and rendering this concept inoperable.

Why redesign the SolTrans network now?

Since the last time SolTrans examined the design of its network, major shifts have occurred in travel demand. The pandemic was a shock to the entire transportation industry: where, when and how people travel changed dramatically overnight. In the years since, a "new normal" has begun to emerge that involves more travel in the middle of the day, somewhat more working from home, somewhat less peak commuting, and the continued displacement of brick-and-mortar retail by online and app-based services.

SolTrans must work to make its service more useful to more people if it is to continue to recover ridership lost since 2020. The agency has already made great strides, including the launch of the Youth Pass program in mid-2024, but ultimately to prevent the more pessimistic scenarios forecast in the SRTP, service changes that make the network substantially more useful will be required to attract more riders. With few major changes made since 2020 apart from the full integration of Solano Express into SolTrans, the static nature of ridership recovery suggests that the current design of the network has reached its limit in terms of its capacity to naturally recover riders.

SolTrans has never before conducted a study evaluating the entire system, including both local and express routes and how they interact.

2 SolTrans' Market

The Ridership Recipe

SolTrans' set out a clear goal in developing this project:

> *...to optimally allocate resources to provide the highest quality of service to the community in order to maximize ridership.*

The main goal of this effort is to rebuild ridership lost during the pandemic by improving the quality of service. But what does that mean in practice? Transit ridership arises from the combination of a useful service that provides access to a wide range of potential destinations, and a supportive market that puts lots of potential customers nearby.

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 important to consider in designing service plans with the goal of building transit ridership.

Five Geographic Indicators

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.

The built environment factors shown in **Figure 3** are critical to facilitating a broadly useful network:

- **Density.** Where there are many people, jobs and destinations, there are more potential travelers.
- **Walkability.** An area only becomes accessible by transit if most people can safely walk to nearby transit stops.
- **Linearity.** Direct paths between busy places are faster and cheaper for SolTrans to operate. Deviations increase cost and add travel time for riders.
- **Proximity.** The longer the distance between two places, the more expensive it is to connect them.
- **Mix of Uses.** Where there is a mix of land uses along a direct path, transit can provide access to a variety of destinations. Mixed-use transit corridors tend to be more productive because people ride in both directions all day.

Regardless of the intricacies of local geography, the combination of these five elements determine where transit can be useful for many people, at a relatively low cost.

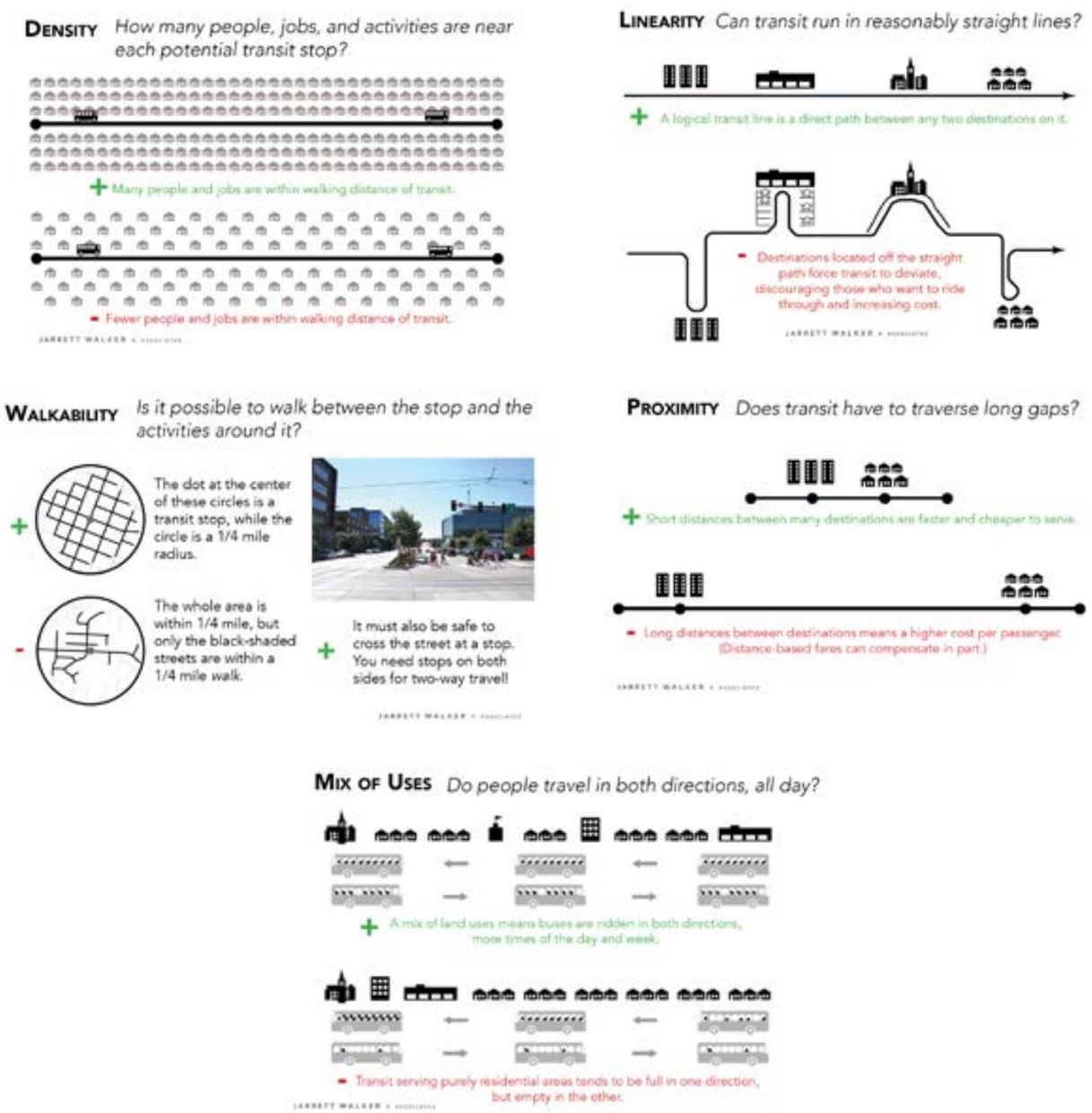

Figure 3: The Transit Ridership Recipe

Population Density

Residential density is an essential consideration when thinking about the transit market and where to locate service. This measure tells us how many people live nearby could potentially choose to ride transit. When more people are close together, the potential market that transit can address is larger.

Figure 4 shows the population density of each census block in Vallejo and Benicia, based on data from the 2020 US Census. While more recent data on population is available via the sample-based American Community Survey, the decennial census provides the most detailed and comprehensive look at where people live, so it is a good starting point for thinking about SolTrans' market.

While not all trips start or end at home, nearly everybody makes at least one trip starting or ending at home on most days. Further, places with many residents are also destinations for other people, whether for visiting, caring for family or home-based trades.

A transit network designed to be useful to a large number of people will offer the most useful services in areas with high residential densities.

A transit network designed to get a little bit of transit close to everyone, no matter how many people live in each area, will have routes going into many low-density residential areas, where few people live near any given stop.

The highest residential densities can be found in Solano County in a few areas.

Vallejo has higher overall residential density with some pockets of high density downtown near Florida and Georgia St. Ⓐ, and in the northern part of the city, near Chabot Terrace and Flosden Acres Ⓑ. There are also some high density pockets near Benicia, in the southeastern part of the city Ⓒ.

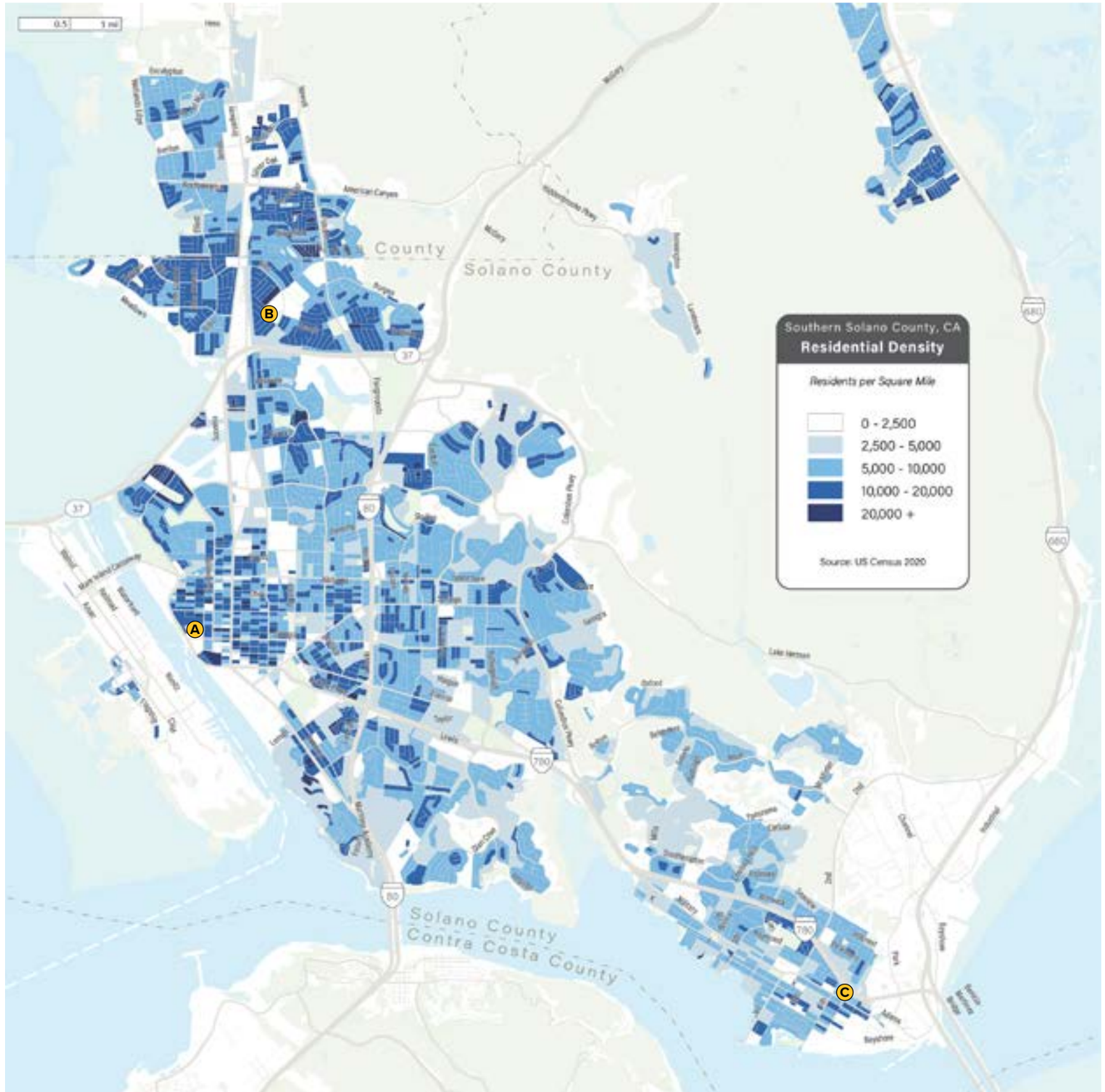

Figure 4: Population Density - Vallejo & Benicia

Employment Density

Job density can tell us not just about where people go for work, but also about important destinations people travel to. Particularly for retail and service sectors, high job density suggests places that are likely to be major destinations for customers and clients.

Figure 5 maps the density of jobs per square mile within every census block in Vallejo and Benicia, based on a US census data product called the "Longitudinal Employer Household Dynamics" Program, or LEHD. This map displays LEHD employment estimates for 2021, the most recent year available.

A map of job density shows us not only the places people need to travel for work, but also places people go for services, shopping, social needs and more. One person's workplace may be, throughout the day, a destination for dozens or even hundreds of people. For this reason, job density is typically a better predictor of transit ridership than residential density.

The strongest levels of job density are located in downtown Vallejo (A) , along Sonoma Boulevard (B), and near Gateway Plaza (C). High levels of job density are also located around eastern Benicia, where several industrial sites are located (D).

Other important pockets of higher employment density include the Kaiser (E) and Sutter (F) hospitals, the industrial area near the Meyer Corporation headquarters (G), and the section of Highway 29 / Broadway in American Canyon north of American Canyon Way (H), which includes a mixture of grocery stores, shopping centers, several hotels, and a Wal-Mart.

There is one important employer that is missing from this map - Six Flags (I). This is likely related to either the payroll location or seasonality of Six Flags employees. Because LEHD is based on reporting through unemployment insurance and the quarterly census of employment and wages, there can sometimes be inconsistencies based on the way individual employers report their locations, especially for larger corporations with multiple work sites and a highly seasonal labor force.

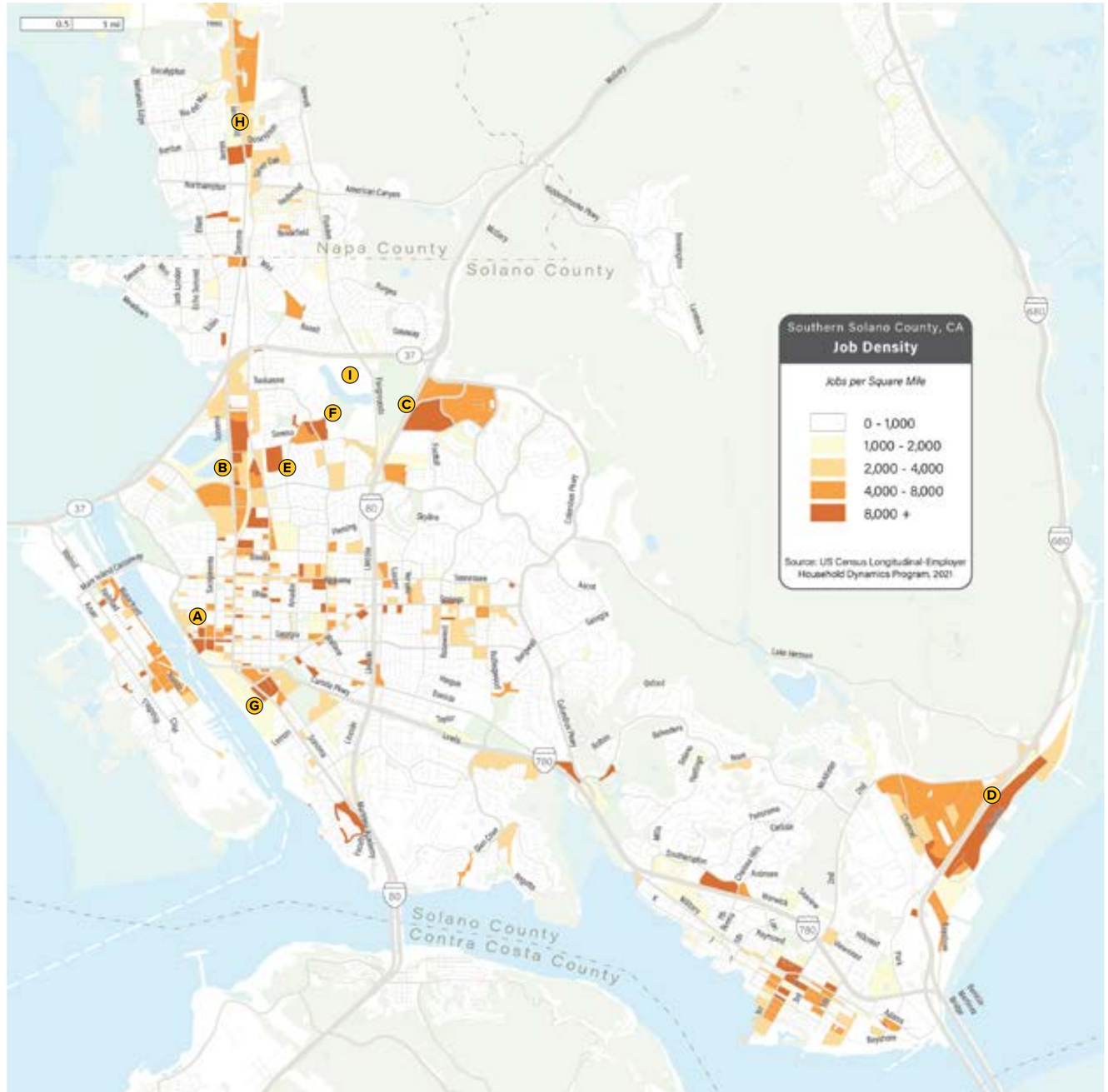

Figure 5: Employment Density - Vallejo & Benicia

Activity Density

Resident and job density can be combined in a single map that shows activity density. Activity density helps visualize the overall strength of the transit market in an area or along a corridor.

Figure 6 maps activity density with a three-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 purple and red. The darker the color, the greater the number of jobs and/or residents in the area. In places where there are high densities of both jobs and residents, there is likely to be a strong market for travel for most or all of the day.

In addition to density, the mix of uses along a corridor affects how many people transit can attract, relative to cost. This is because an area with a mix of housing, retail, services and jobs tends to generate more demand for transit in both directions, throughout the day.

Where residential, commercial and other uses are mixed, people are traveling in both directions so buses can be full in both directions. Transit routes serving purely residential neighborhoods, or purely employment areas, tend to get less ridership, and cost more to provide, than routes serving a mix of land uses.

The activity density map shows a relatively high degree of separation between employment areas and residential areas. The main exceptions are in Downtown Vallejo Ⓐ, and some pockets along Sonoma Boulevard Ⓑ. The area around Sutter Solano Medical Center Ⓒ also shows a high concentration of both jobs and residents.

There is also some mixing of residential and employment uses along some of the east-west running commercial corridors like Tennessee, Springs, and Georgia. Each of these corridors are home to varied businesses and stores, but surrounded by moderately dense residential blocks. The result is a pattern of alternating yellow and blue blocks, indicative of a mixture of uses in these areas.

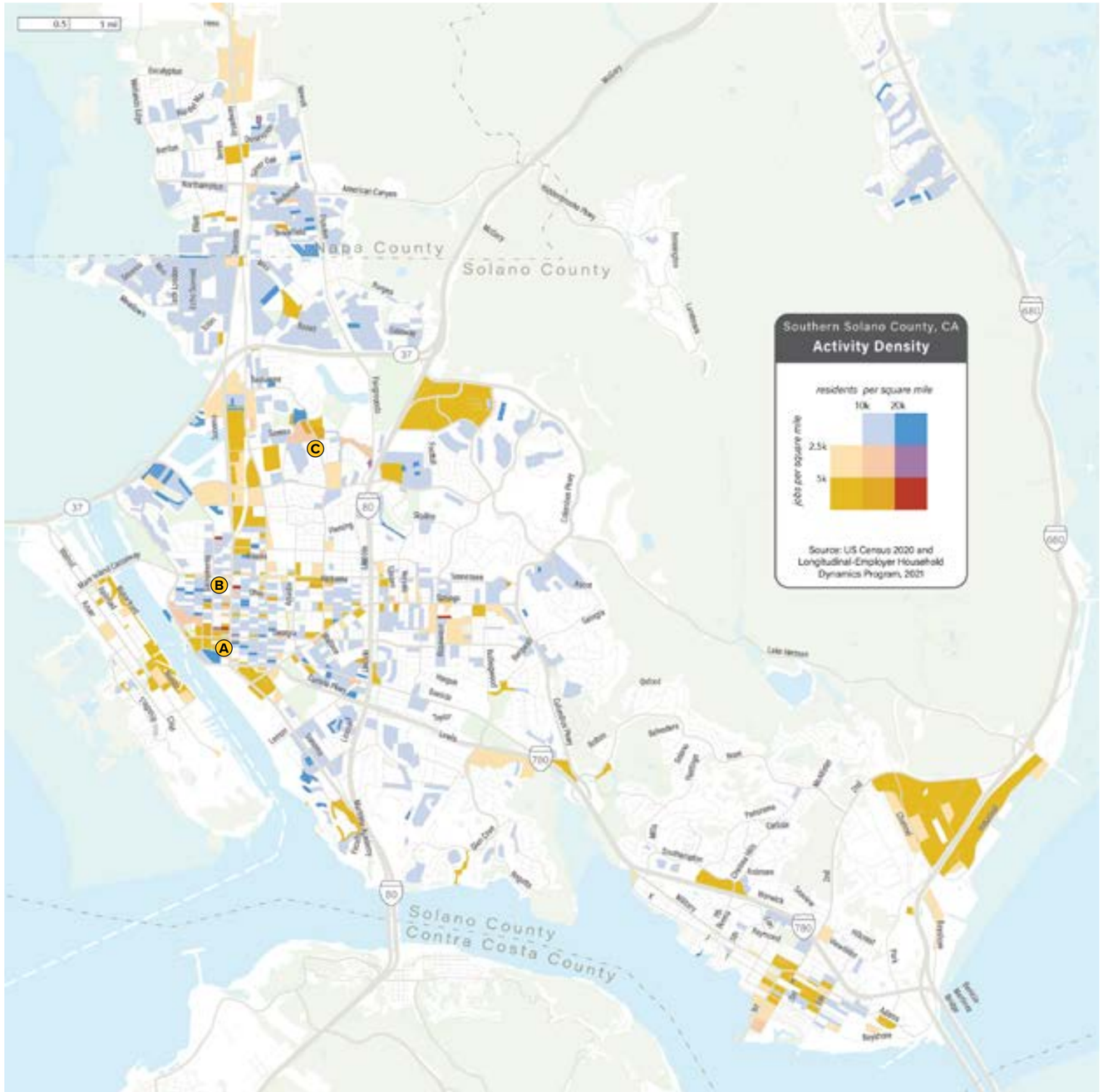

Figure 6: Activity Density - Vallejo & Benicia

Walk Network Connectivity

Even if there are many people nearby who could choose to ride transit, it is unlikely that many of them will ride if it is impossible, unsafe or very challenging to walk between the transit stops and their final destinations. To evaluate this factor in the ridership recipe, we use a measure called "walk connectivity" that compares the area actually reachable within a short 10-minute walk on foot to the area reachable in 10 minutes in the straight line ("as the crow flies"). **Figure 8** provides an illustration of how measure is calculated.

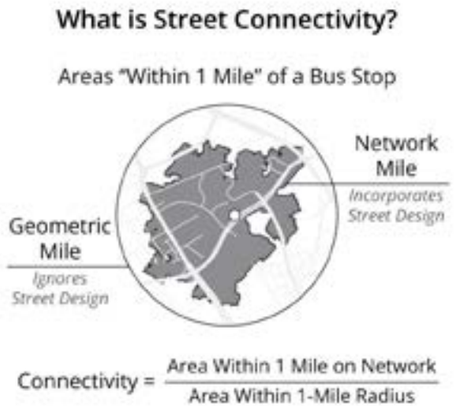

Figure 8: Walk Connectivity Measure

Figure 8 maps the connectivity of the pedestrian network in Vallejo and Benicia.

Walk connectivity shows where the local street network makes it easier to reach transit. This measure does not speak to the level of safety or comfort provided by pedestrian infrastructure. It only tells us about how many pedestrian connections the street network makes possible.

Walk connectivity is highest in central Vallejo Ⓐ, where the streets are laid out in a grid pattern that produces many potential pedestrian paths. Walk connectivity is similarly high in central Benicia Ⓑ, where streets are predominately laid out as a grid.

Walk connectivity is moderate but lower in areas farther from the oldest central sections of both cities. For example, the northern residential neighborhoods of Vallejo on either side of Highway 29 Ⓒ have lower walk network connectivity than do neighborhoods closer to the center of town, because while their local street network is relatively connected, with few cul-de-sacs or major interruptions, it is laid out in a less regular and more circuitous fashion, which produces longer walking paths and reduces the area reachable in a given travel time on foot.

Walk network connectivity is lowest in the suburban areas of eastern Vallejo Ⓓ and northern Benicia Ⓔ, where neighborhoods are laid out with fewer, more circuitous streets. This produces a pedestrian network with fewer options, reducing the area reachable in a short walk.

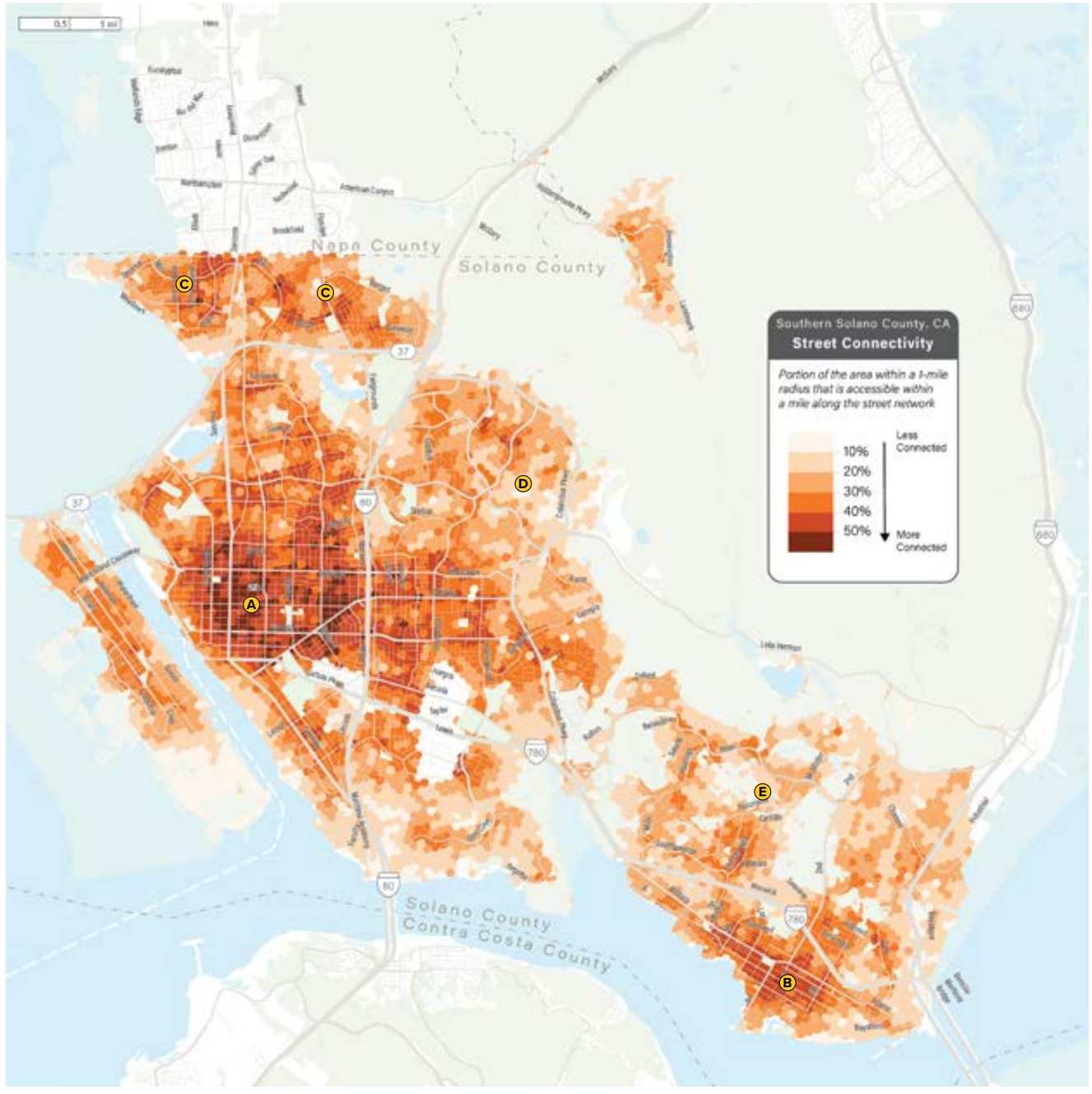

Figure 7: Walk Connectivity - Vallejo & Benicia

People in Poverty

Understanding residents' incomes can help inform the design of transit services. People living on low incomes are less likely to afford to own reliable cars and therefore more likely to use public transit.

Figure 9 shows where households that are 200% below the Federal Poverty Line are concentrated, based on ACS 2022 5-year estimates.

The highest densities of low-vehicle households are concentrated around downtown Vallejo Ⓐ. High areas of poverty are also located along Springs Rd in Vallejo Ⓑ, and near Chabot Terrace, where some mobile home parks are located Ⓒ.

In neighborhoods with medium to high density of lower-income residents, there is often high ridership potential especially if they have walkable street networks. However, an area with low-income residents doesn't necessarily generate high transit ridership just because of income. If transit isn't useful for the trips people need to make, in a reasonable amount of time, even lower-income residents will not use it. Most people can find other travel options, even if those other options cause them financial distress (such as taking out a high-interest loan for a used car).

People with lower incomes should thus be viewed as a good market for public transit, but one whose ridership must still be earned with service that is good enough to be reasonably convenient. Like everyone else, low-income people only have 24 hours in the day and must use that time efficiently.

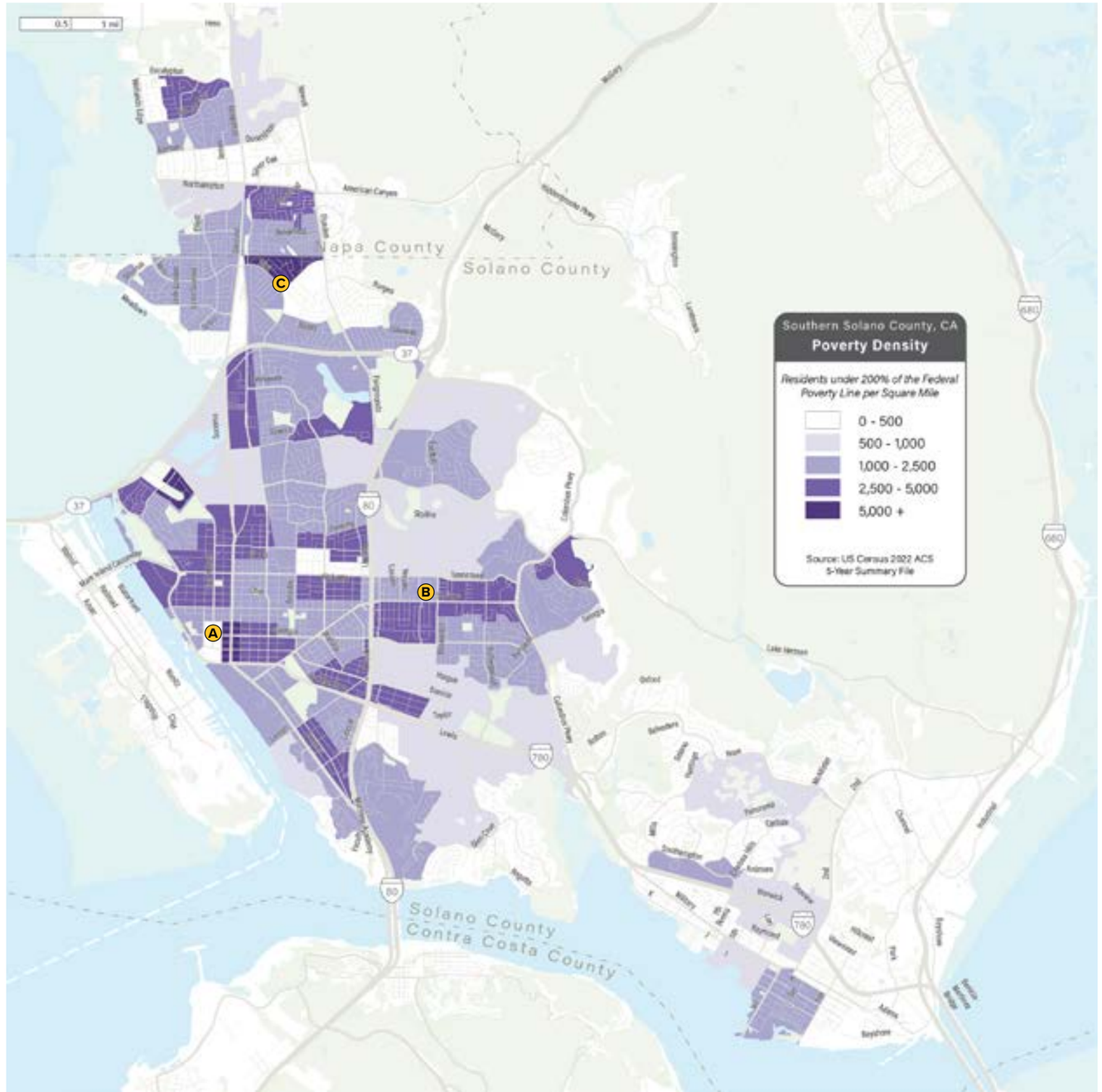

Figure 9: Density of Lower-Income People - Vallejo & Benicia

Seniors

Figure 10 shows where seniors (those over the age of 65) live at high densities, based on ACS 2022 5-year estimates.

These areas which have a high proportion of seniors tend to have retirement homes or senior-only housing developments within them. Some seniors cannot drive and may be more likely to use transit.

Seniors tend to have different transit needs than younger people. They may be more sensitive to walking distance, because of limits on their physical ability. Because many seniors are retired, they may have more flexible schedules, and may be less likely to be discouraged by infrequent, slow or indirect routes that take them out of their way.

Most riders who are employed, in school or caring for kids in school will find service with long waits to be intolerable. Thus, 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.

In Vallejo, there is a high density of seniors located in the northwest Ⓐ, where a few senior care homes are located. In Benicia, there is a high density of seniors in the south Ⓑ.

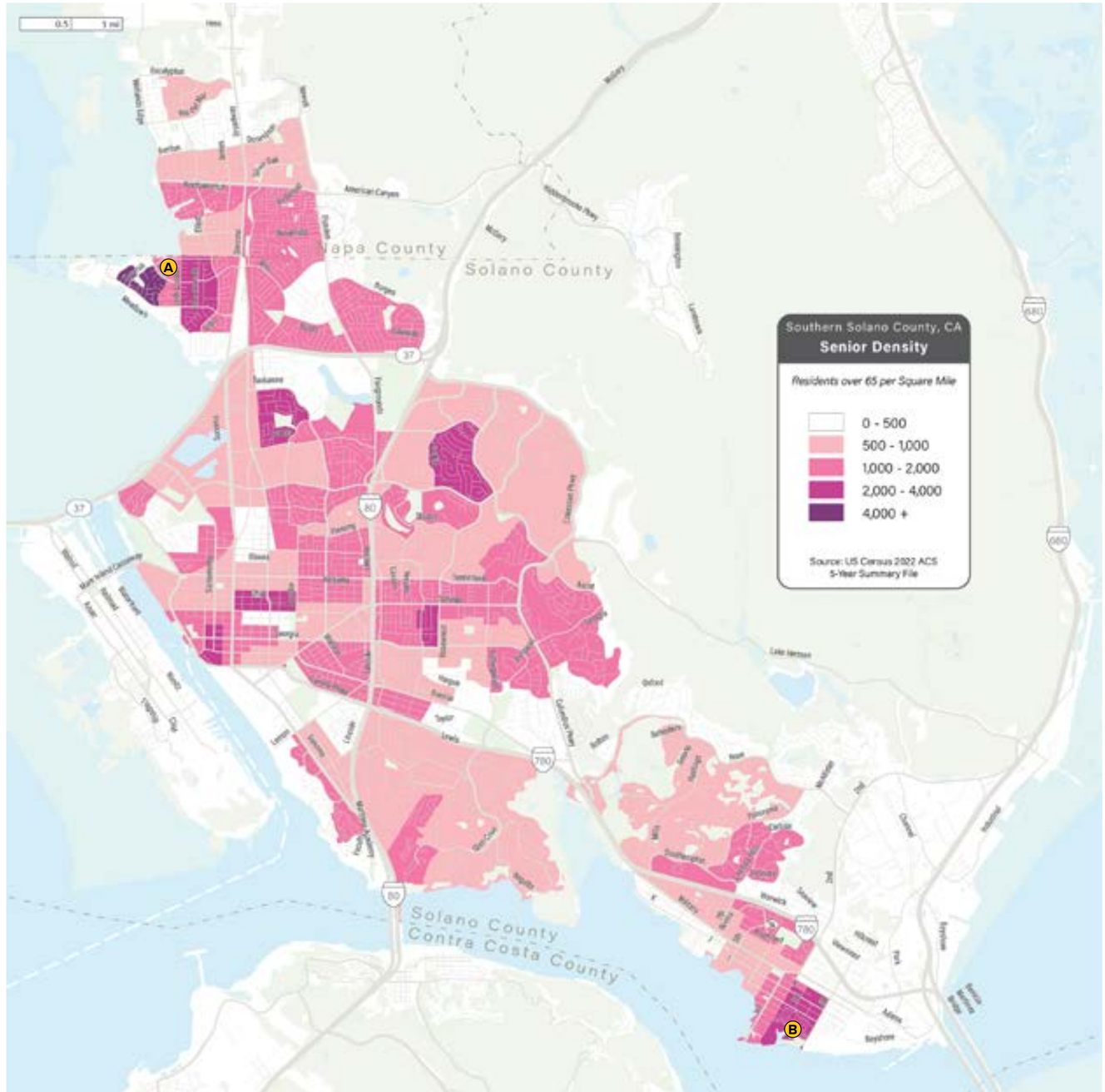

Figure 10: Senior Density - Vallejo & Benicia

Youth

Just as transit coverage can meet the needs of seniors who cannot or choose not to drive, transit coverage can also meet the needs of children and teenagers who are too young to drive.

Young people and seniors are also often living on a tighter budget than working people, and can therefore be more sensitive to transit fares. Parents of multiple children who rely on transit can be quite sensitive to paying a fare for each child. Whatever effect a change in transit price has on ridership among working age people, it generally has a stronger effect on ridership among young and old people. To help encourage youth ridership, SolTrans is currently running a pilot program through June 2025, to provide free rides for youth 18 and under.

High densities of people under 18 also tend to reflect high densities of adults with high demands on their time. Parents are sometimes perceived as a relatively weak market for transit, because their needs are so specific in time and pull them in many directions. However, a transit system that can allow children (who are old enough to travel on their own) not to depend on their parents for rides, can also be a significant factor in saving parents time, and can make transit a more viable option for them as well.

Figure 11 shows the density of residents under the age of 18 in Vallejo and Benicia, based on ACS 2022 5-year estimates.

Overall, the density of young residents is higher than senior residents. The density of youth generally tracks with the density of residents overall. There is a pocket of high density of youth near Chabot Terrace (A).

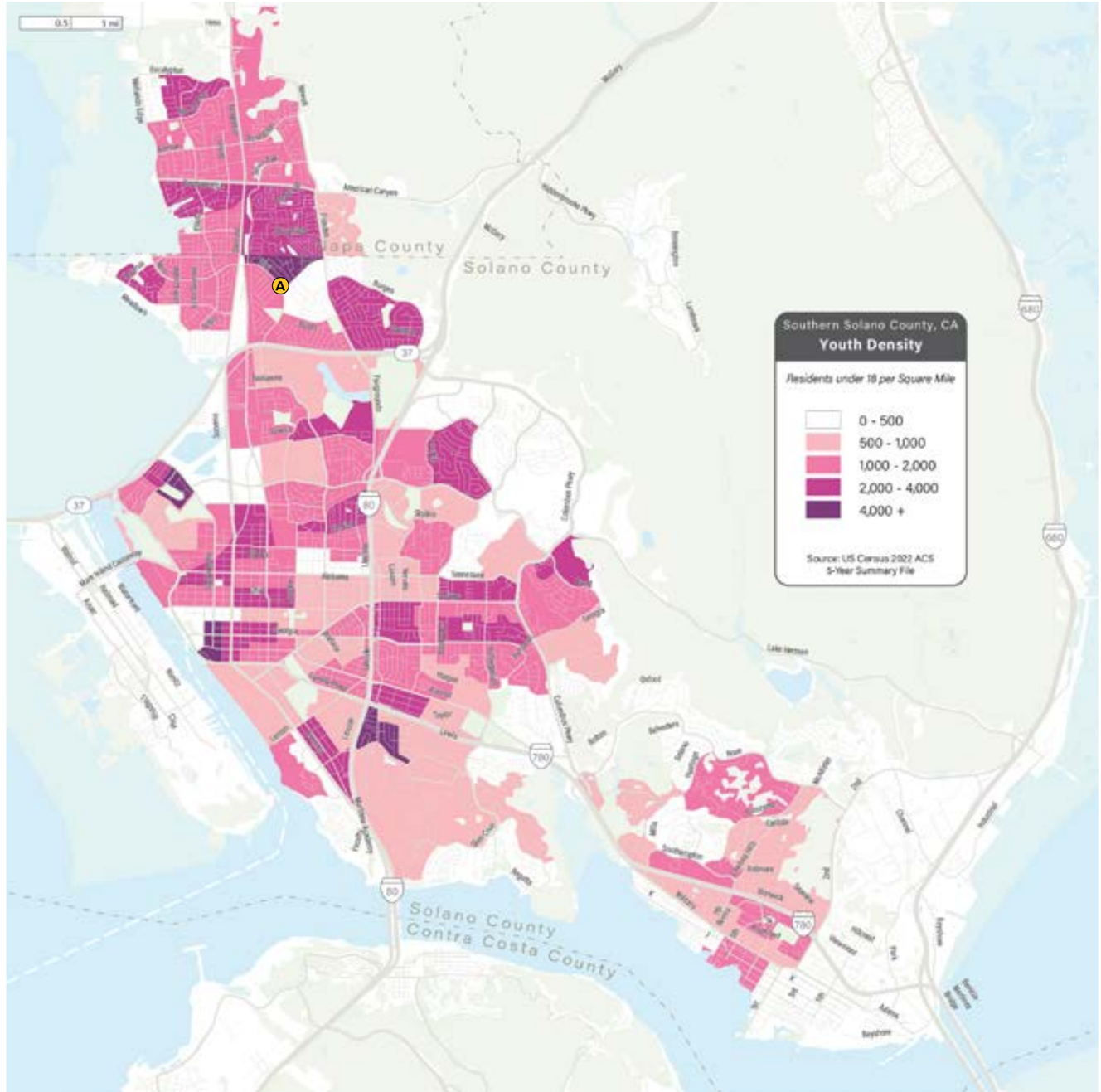

Figure 11: Youth Density - Vallejo & Benicia

Low/No-Car Households

People who have less or no car access will need to use other modes when they travel. This might include walking, cycling, getting a ride from a friend or family member, or, if makes sense for their trip, transit. Transit can be especially helpful for those without access to a car, or those who cannot drive for a multitude of reasons.

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. People in households without vehicles are not necessarily "transit dependent" but do have a greater inclination toward transit use because they don't have a car in their driveway, always ready to go.

Zero and low-vehicle households are often correlated with elderly or young residents, high student populations, and low incomes. These are all indicators of people's individual inclination to use transit.

Figure 12 shows where households without vehicles, or one vehicle, are concentrated, based on ACS 2022 5-year estimates.

The highest densities of low-vehicle households are concentrated around downtown Vallejo Ⓐ, as well as in the dense multifamily residential area of South Vallejo south of Lemon St. Ⓑ, and the central residential area of Benicia Ⓒ.

In Solano County, about 4.6% of households have access to no vehicles; about 31% of households have access to a single vehicle. In Vallejo, these numbers are slightly higher: about 6% of households have 0 vehicles, and 34% just one vehicle. Over half of 0-and-1-vehicle households are single people living alone. For about 18% of Vallejo households and 13% of Solano County households, a single vehicle is available for at least two people's travel needs.

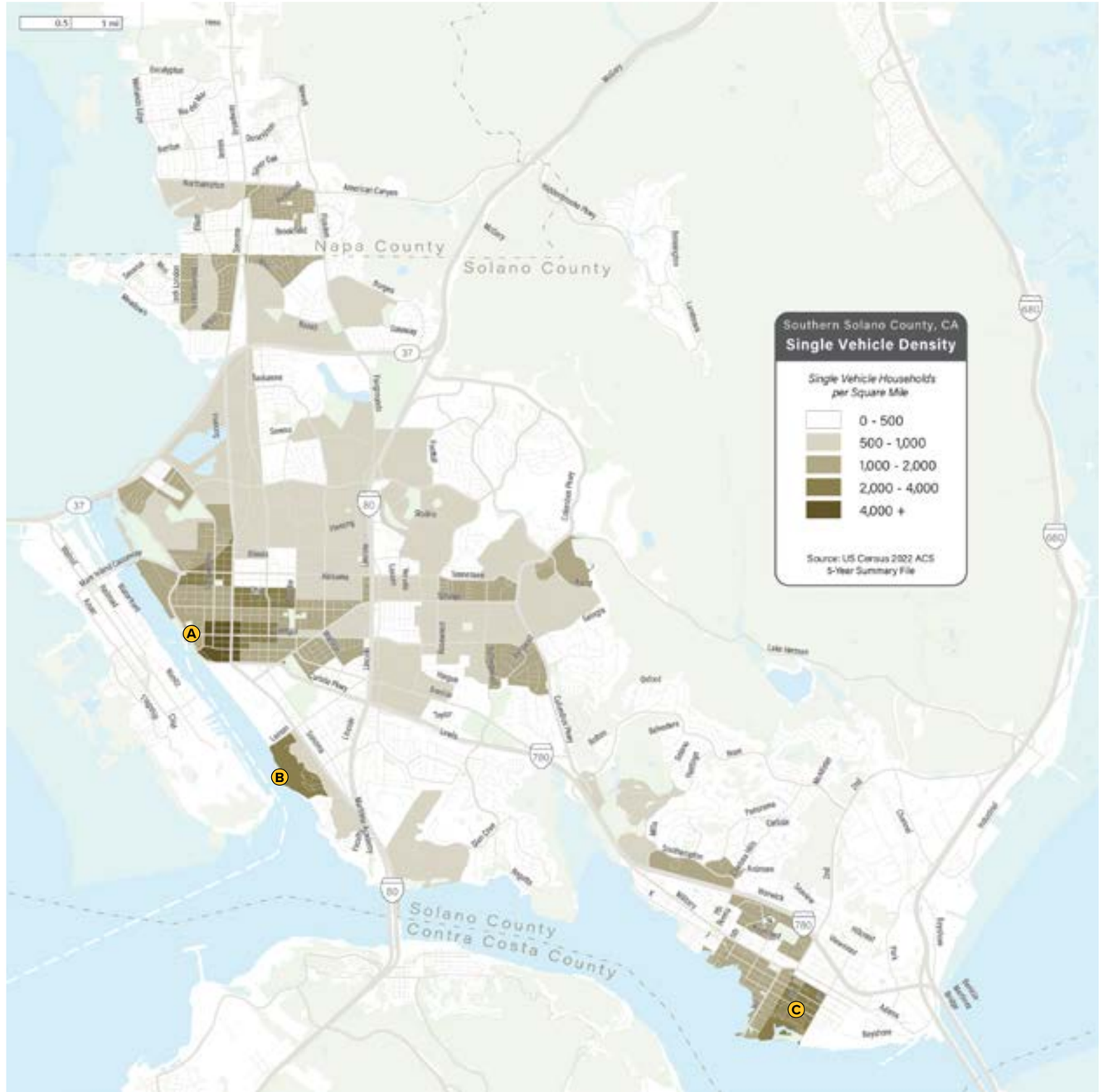

Figure 12: Low/No-Car Households - Vallejo & Benicia

Race & Ethnicity

Figure 13 shows where people of different racial and ethnic identities live, based on ACS 2022 5-year estimates.

Each dot in the map represents 10 residents, with the different colors representing Race or Ethnicity categories from the US Census. 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.

Understanding where people of color live is crucial to fulfilling the obligations of Title VI of the Civil Rights Act and other federal requirements. These federal rules require that SolTrans consider the way benefits and burdens of transit service changes are distributed for historically marginalized populations.

Solano County overall has a very ethnically and racially diverse population. Vallejo is Solano County's most diverse city. According to the 2022 ACS US Census data, in Vallejo, 29% of the population is Hispanic, 23% are Asian; 22% are white; 18% are Black/African American; and 8% are of mixed or other heritage. Benicia is less racially diverse, with 60% of the population being white.

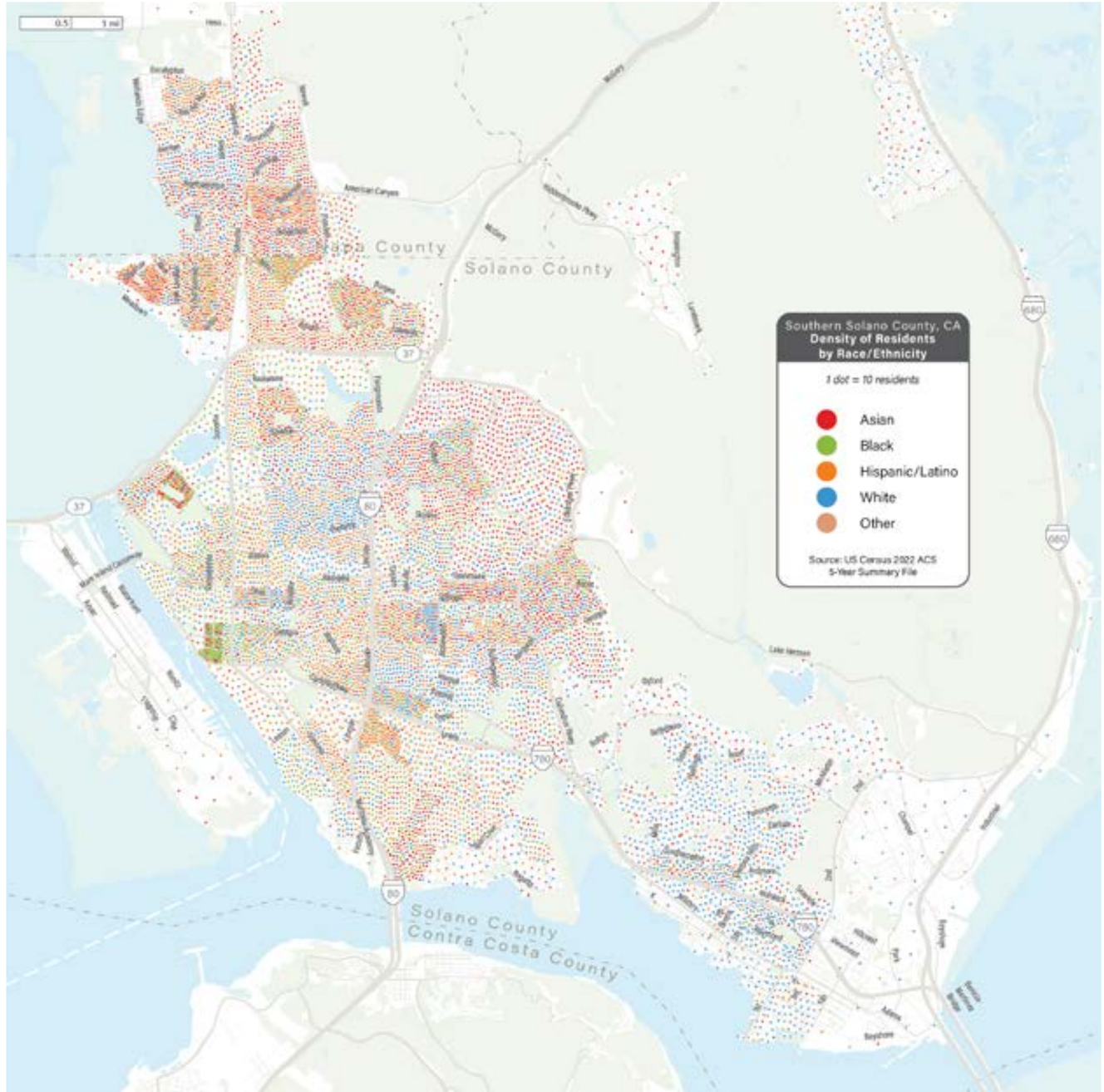

Figure 13: Race & Ethnicity - Vallejo & Benicia

Travel Demand - All Trips

The previous maps of population, employment and demographics tell us about where people might be located, but they don't provide a sense of where people are going. To understand total travel demand, we use a data source called Replica that combines data from cell phone apps, connected vehicles, the US Census and other public sources to produce a highly demand model of travel across the Bay Area.

Figure 14 shows how many estimated trips per square mile are located in Census block groups in Vallejo and Benicia. Block groups shown in darker shades of purple attract more weekday travel demand. This map shows estimated trip data for a typical Fall 2023 weekday.

This map includes trips for all purposes, including going to work, returning home, shopping, socializing, and recreating. The most common single trip purpose is returning home (39%). For non-home trips, the most common purposes are shopping (18%), going to work (10%), and going to eat (9%)

Some of the highest demand areas on this map include the Gateway Plaza shopping center Ⓐ and the Solano 80 shopping center Ⓑ in Vallejo and the Southampton Shopping Center in Benicia Ⓒ. Downtown Vallejo Ⓓ, which is home to a variety of potential destinations including employment, public services, and shopping or errands is also an area of elevated demand.

The northern section of Sonoma Blvd between Highway 37 and Redwood Blvd Ⓔ also shows up as a higher-demand area on this map; its trip density is lower than in some other areas because of the large size of the census block groups.

We can also observe higher travel demand in the central commercial areas of Benicia along Military Rd and First St Ⓕ. This area includes not just shopping and employment destinations; it also encompasses the high school, city offices, public library, and other demand generators.

Examining travel demand is essential for understanding a community's transit needs because it reveals the patterns and preferences of how, when, and why people travel within the area. This can add important context to the demographic and employment mapping presented earlier, because it helps show which places in Vallejo are important in the context of people's lives beyond home and work.

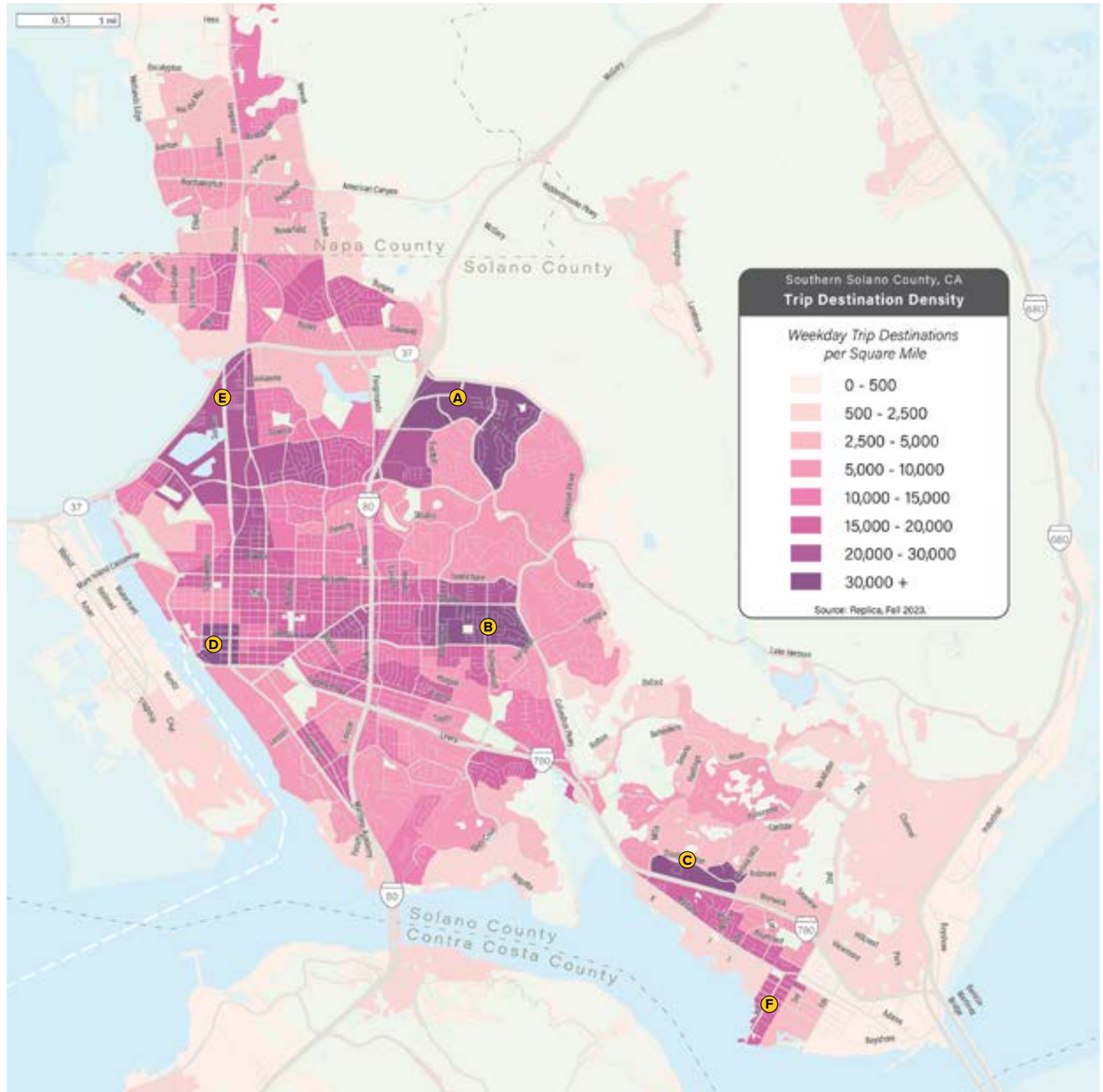

Figure 14: Travel Demand - Vallejo & Benicia

Travel Demand - Non-Work Trips

Are the trips that people make for all other purposes besides going to work and coming home distributed differently than the entirety of the dataset? **Figure 15** maps the density of trip destinations for only non-work, non-home trips. This map shows estimated trip data for a typical Fall 2023 weekday.

This map shows us where people are going for errands, to eat, for recreation, to shop, and to socialize. It excludes commuting to work, and returning home; as a result, the total trip volume on this map is about half that shown on the map on the preceding page. Among these trips, the most common specific purpose is shopping at 38%, followed by dining (19%) and socializing (16%).

While at first glance, this map looks somewhat similar to the map of all trips on the last page, there are a few important differences that immediately stand out.

The retail areas of Gateway Plaza (A), Southampton Shopping Center (B), and the commercial area near Springs Rd & Rollingwood Dr (C) show the highest density of non-commute trip destinations.

The busy commercial area around Sonoma Blvd and Redwood St (D) appears only moderately dense when work and home trips are removed; this is likely due to both the large geographic size of the census block groups in this area, and because this view removes commuting trips.

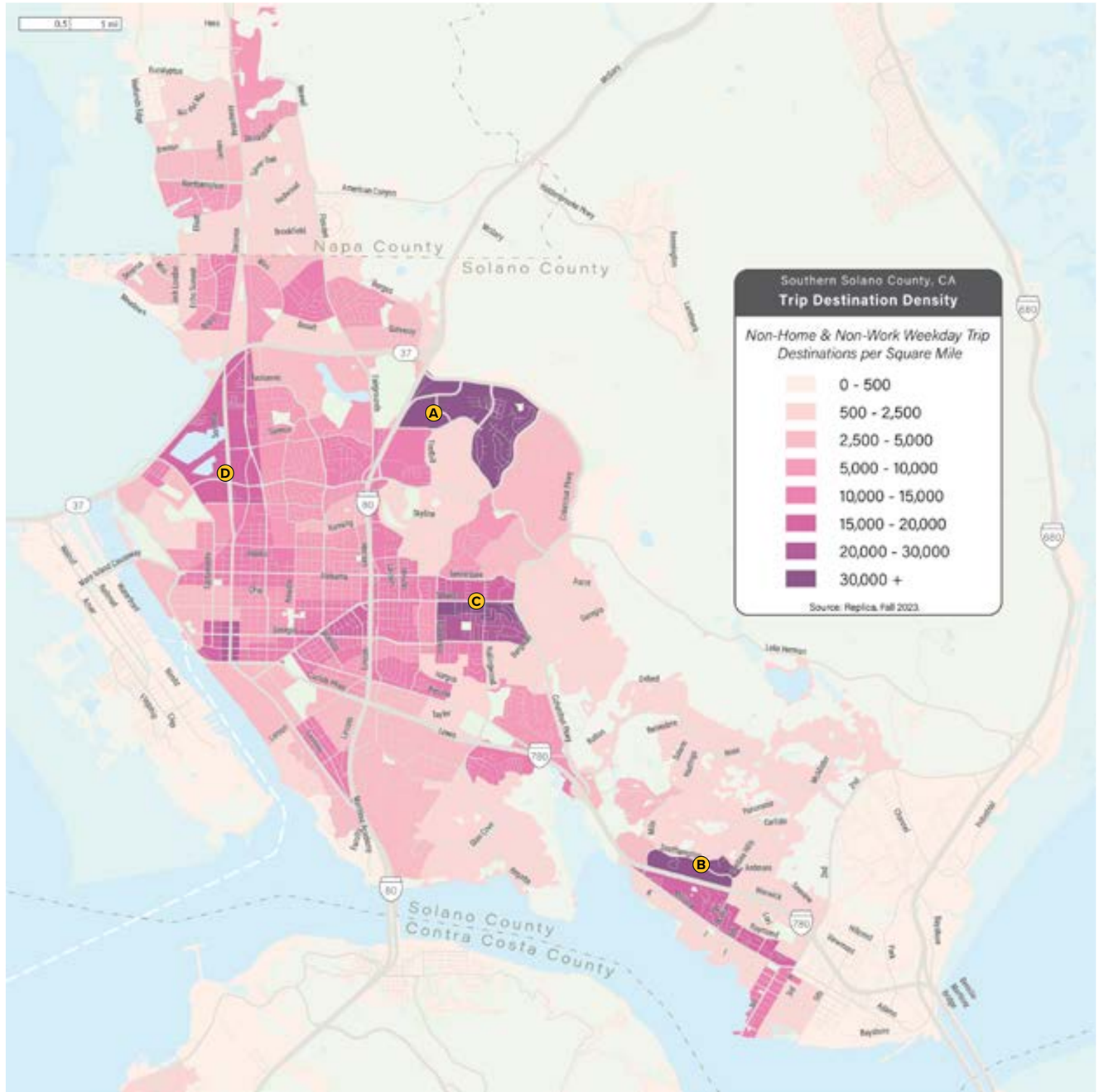

Figure 15: Travel Demand - Vallejo & Benicia

The Regional Travel Market

So far, this section has focused on the travel market in Vallejo and Benicia. These are the markets that are addressable by SolTrans' local routes. SolTrans also operates the Solano Express network that connects communities throughout the county, so its also crucial to understand the broader regional travel market.

Commuting

Solano County has sometimes been characterized as a "bedroom community" because a majority of people that live in the county work outside of it.

Figure 16 shows a summary of data from the LEHD of the percentage of workers living in each community SolTrans serves split by whether they work in or out of Solano County. In all of these communities, a majority of workers work outside of the county, with the highest share of out-of-county workers found in Vallejo and Benicia, the communities closest to the largest Bay Area job centers.

The fact that most Solano County workers commute to a job elsewhere is why SolTrans' Solano Express lines are organized around connecting with BART. Most people need to leave the county to work; the best way to facilitate that by transit is to tap into the region's rapid transit network.

Figure 18 provides some additional detail on Solano County residents' commuting patterns. This table shows the number of county residents by the city they are employed within (for all work locations over 1% of all county workers). Communities in Solano County are shown in italic.

The top three destinations are Fairfield, Vacaville and Vallejo, representing over 20%

City	% Employed in Solano County	% Employed Outside of Solano County
Vallejo	25%	75%
Benicia	27%	73%
Fairfield	35%	65%
Vacaville	41%	39%
Suisun City	38%	62%
Dixon	38%	62%
Entire County	***33%***	***66%***

Figure 16: Solano County Workplace Location by Home Location (LEHD 2021)

City	% Trip Destinations in Solano County	% Trip Destinations Outside of Solano County
Vallejo	76%	24%
Benicia	75%	25%
Fairfield	86%	14%
Vacaville	87%	13%
Suisun City	86%	14%
Dixon	75%	25%
Entire County	***83%***	***17%***

Figure 17: Solano County Trip Destination by Home Location (Replica 2023)

Destination	County	% of Total
Fairfield	***22,209***	***11.5%***
Vacaville	***16,195***	***8.4%***
Vallejo	***12,042***	***6.3%***
San Francisco	11,659	6.1%
Oakland	6,707	3.5%
Sacramento	6,463	3.4%
Benicia	***5,881***	***3.1%***
Napa	5,435	2.8%
Concord	4,660	2.4%
Walnut Creek	3,113	1.6%
Richmond	3,052	1.6%
San Jose	3,041	1.6%
Martinez	2,918	1.5%
Dixon	***2,068***	***1.1%***

Figure 18: Workplace Location of Solano County Employees (LEHD 2021)

of workers living in Solano County. These data probably exaggerate the importance of Fairfield as a commuting destination due to the presence of the US Air Force base there. Most of the other major commuting destinations are located outside of Solano County.

All Trips

Where people live and work doesn't even tell half the story about where they need to go. Only about 22% of trips are work trips; the rest are trips people make for all other reasons, like shopping, picking up kids, visiting friends or relatives, dining, recreation, getting medical care, and all the other necessities of life.

Figure 17 shows data from Replica on the destinations for all trips (based on a typical weekday in Fall 2023), split by whether those destinations were in Solano County or elsewhere. When we look at the entire universe of trips, rather than just employment, we see how the vast majority of travel happens locally. Even someone who commutes out of the county to San Francisco, Oakland or Sacramento will likely visit their local supermarket for groceries.

The difference between where people travel for work and where they travel for all other purposes is an extremely important consideration for the future design of Solano Express. Today, Solano Express is optimized around taking peak commuters from Solano County south into the Bay Area. This means it runs more service during rush hour, less during the middle of the day, and its schedule is structured around the BART schedule. These attributes make it more useful for these commuting trips, but potentially less useful for other types of trips and other types of travelers.

Regional Travel Flows - All Trips

Figure 19 shows Replica typical weekday travel flows between Solano County cities and other nearby counties for all trip types. The thickness and color of the line between locations represents the total travel flow between them. This map shows total travel volume, including trips to and from each place. Destinations outside of Solano County are aggregated: for example, the line from Vallejo to Contra Costa County includes trips to and from Richmond, Walnut Creek, and all other locations. Inside Solano County, trips that start or end outside of the cities are grouped into two zones north and south of I-80.

The highest-demand trips that start or end in Solano County are local trips within Vallejo, Vacaville and Fairfield.

The busiest intercity trips are between Fairfield and Vacaille, Vallejo and Contra Costa County, and Vallejo and Napa County.

Vallejo's highest-volume links are trips to Contra Costa and Napa Counties. The next busiest connections are to Alameda County, and then to Fairfield and Vacaville.

Fairfield, Vacaville and Dixon's highest-volume connections are less oriented toward the center of the Bay Area. The highest-volume link in this area is between Fairfield and Vacaville; more trips occur between Fairfield and Vacaville and Vallejo than between Fairfield, Vacaville and any of the other counties. For the northern cities, the volume of travel north into Sacramento and Yolo counties is much greater than the number of trips headed south to Alameda or San Francisco.

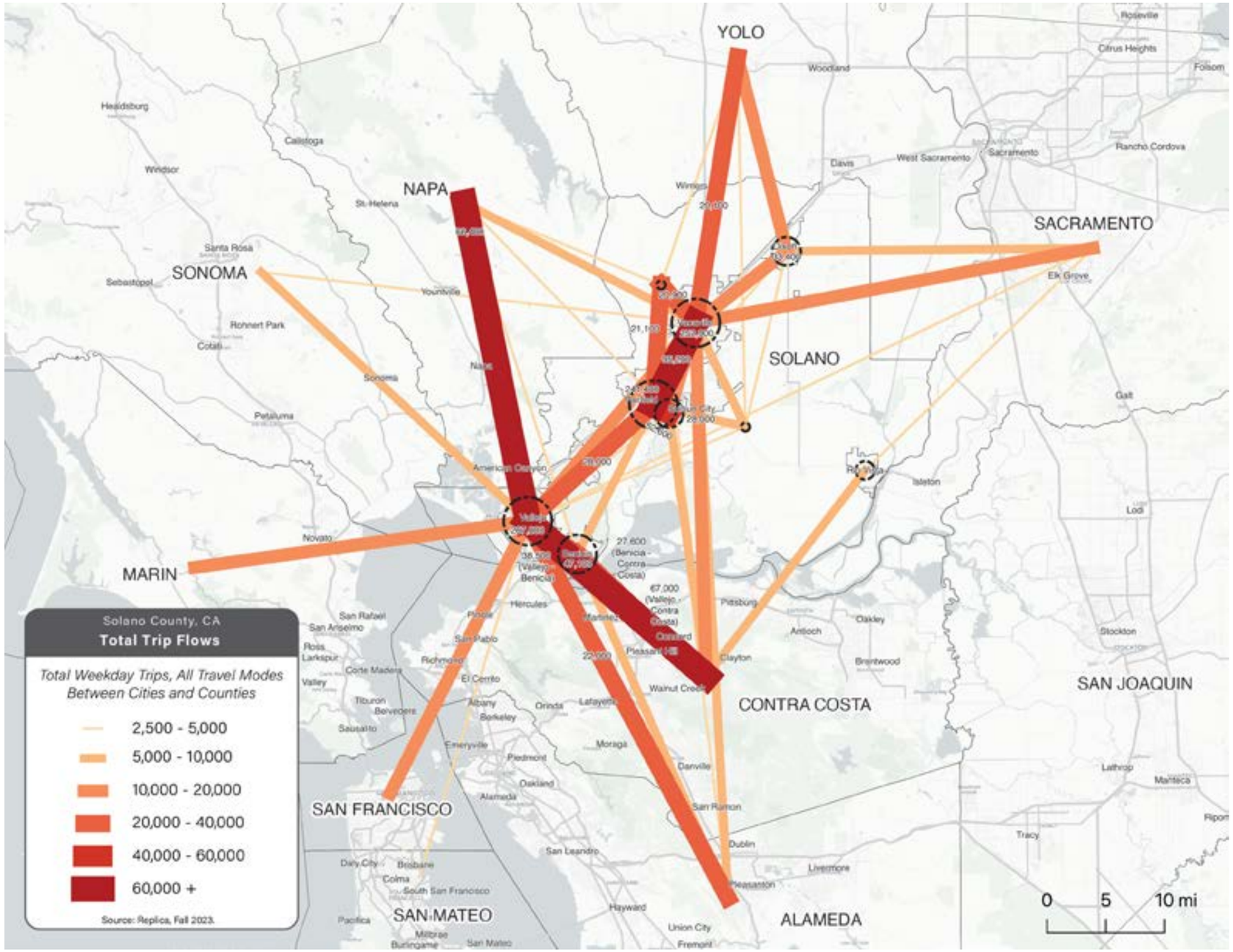

Figure 19: Regional Travel Flows - All Trips

Regional Travel Flows - Trips by County

We know that a majority of Solano County workers leave the county to travel to their worksite, but what does the volume of overall travel between Solano and the surrounding counties look like? **Figure 20** maps the volume of all trips (including trips to work and returning home) to and from Solano and nearby counties. The number of local trips (with the origin and destination in the county) is shown in the circle at the center.

As with all maps based on Replica data, the numbers shown here refer to modeled trips on a typical weekday, not people or commuters. One commute round trip from Solano County to Contra Costa County would add a value of "2" to the line connecting them: 1 for the trip to work, and 1 for the return trip home.

On the modeled average weekday in Replica, over 1.2 million local trips occur within Solano County. About 500,000 trips occur between Solano and another county, with the largest partners being Contra Costa County (153,000 trips), and Napa County (112,000 trips). Yolo, Alameda and Sacramento were also high-volume destinations.

Fewer trips happened between Solano County and San Francisco and the peninsula, with about 19,000 per day between Solano and San Francisco, and fewer than 10,000 to San Mateo. Similarly, about 19,000 daily trips occur between Marin and Solano.

Its important to put these trips between Solano and other counties in context; overall, internal trips within the county make up over 70% of the total, and no single other county is a destination for over 9% of total trips.

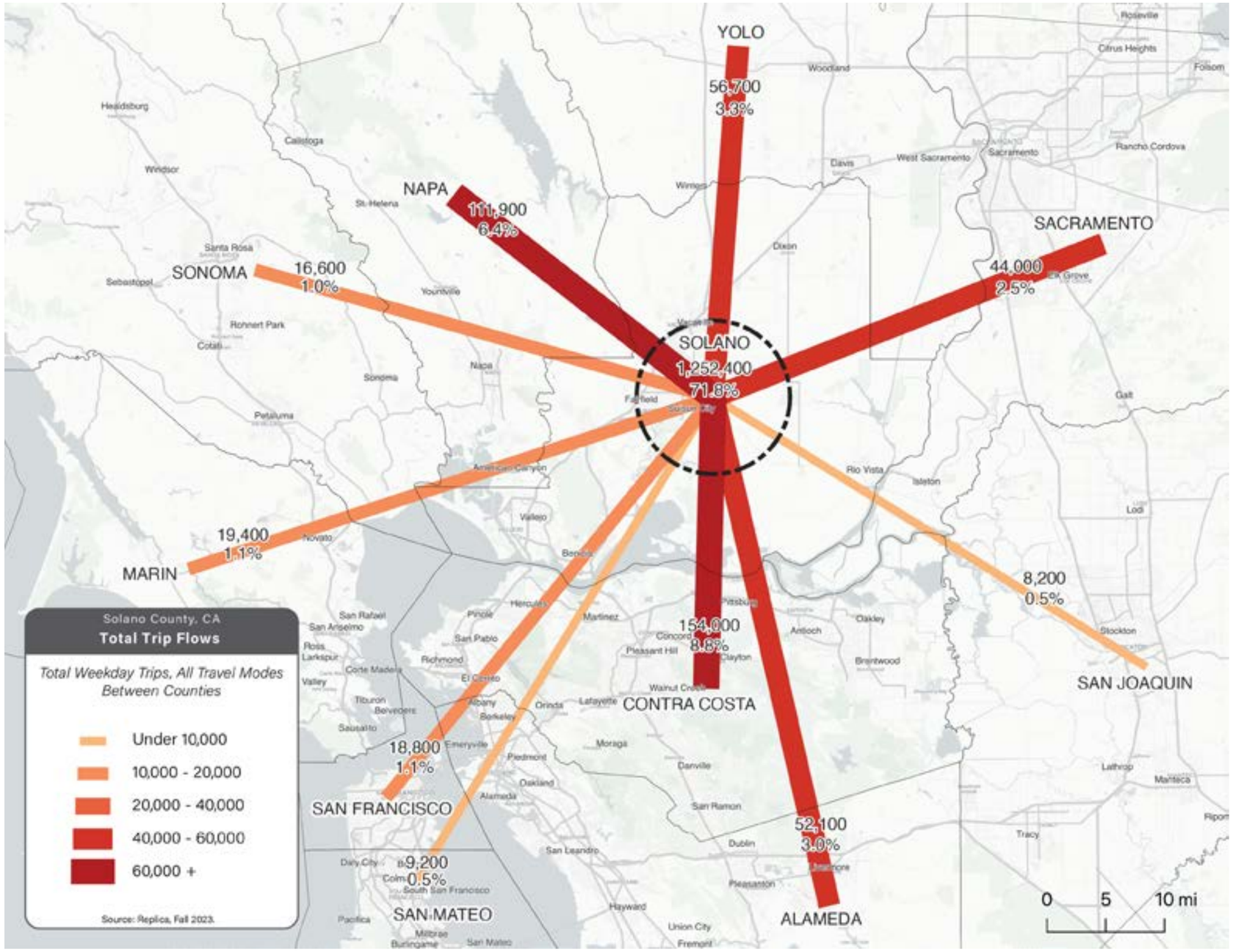

Figure 20: Regional Travel Flows - All Trips by County

Regional Travel Flows - Non-Work, Non-Home Trips

Figure 21 shows travel flows between Solano County cities and to other nearby counties for non-work, non-home trips. This map includes trips for all other purposes - dining, shopping, recreation, etc. Because it excludes home trips, it shows only the volume of travel to access other kinds of needs and opportunities.

The largest share of these trips happen within individual cities; most people traveling for an errand or to access services do so in their local area. From this map, we can see that when people leave their community for these kinds of trips, the largest volumes occur between Fairfield and Vacaville, between Vallejo, Napa County and Contra Costa County, and between Fairfield and Vallejo.

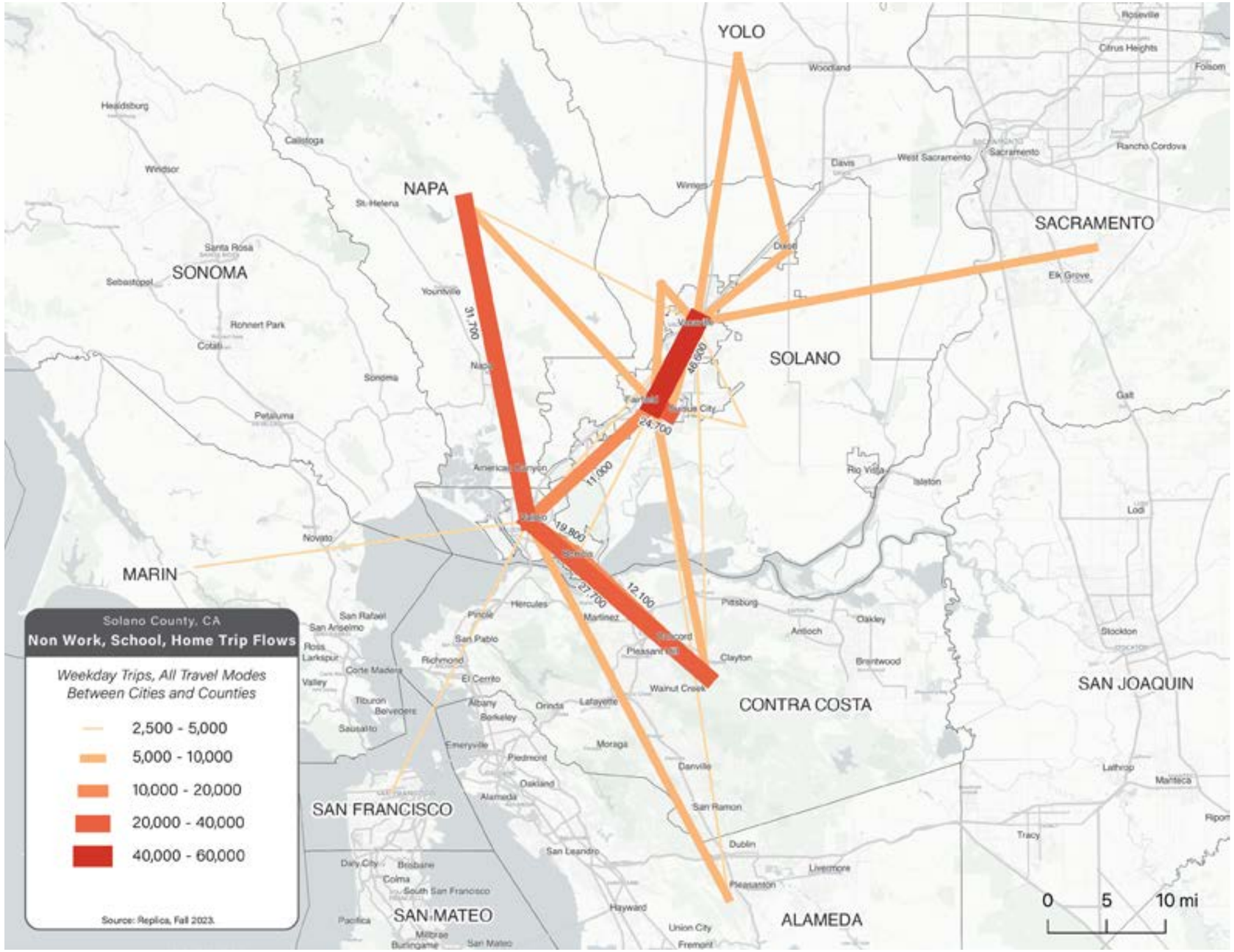

Figure 21: Regional Trip Flows - Non-Work, Non-Home Trips

3 Existing Local & Regional Network

System Overview

Figure 22 maps the existing SolTrans network, focused on Vallejo and Benicia. Places served by the express network outside of Vallejo and Benicia are indicated in the diagrams at the top of the page.

Network Frequency

On this map, routes are color coded based on their midday frequency: how often the bus comes during the middle of the day on a weekday:

- The single dark blue line highlights SolTrans' single 30-minute route: Route 3.
- Most other routes in Vallejo are color-coded light blue for hourly (60-minute) service.
- Routes that run only during certain times of the day, like the school services (routes 15, 17 and 38) are shown in orange lines.

There are also a few lines shown in green. These represent routes operated by the Vine (the transit provider for Napa County) that run in Solano County.

Some routes, like the Red and Green lines, are shown with a dashed line on this map. This indicates that these routes run non-stop, with no local stops in the segments shown with dashed lines.

Today, SolTrans local network is almost entirely hourly. This means that there is a single opportunity to board a bus at each stop each hour, except where multiple routes serve the same stop. With hourly service, a person showing up randomly at a stop will experience an average wait time of 30 minutes.

Local Network Structure

All local routes converge at Vallejo Transit Center (TC). There are no all-day "crosstown" services in SolTrans network; a rider who wants to travel from somewhere in north side of Vallejo must pass through downtown and transfer at the transit center to complete a trip to the east side, and vice versa.

Service in Benicia

Vallejo and Benicia are connected by the Yellow Line express service, which continues south to terminate at the Walnut Creek BART station. The Yellow Line is Benicia's only all-day transit service; it is also served by school services (Route 15 and 17), and the Blue Line express stops at the Benicia Park & Ride on the east side of the city en route to BART at Walnut Creek.

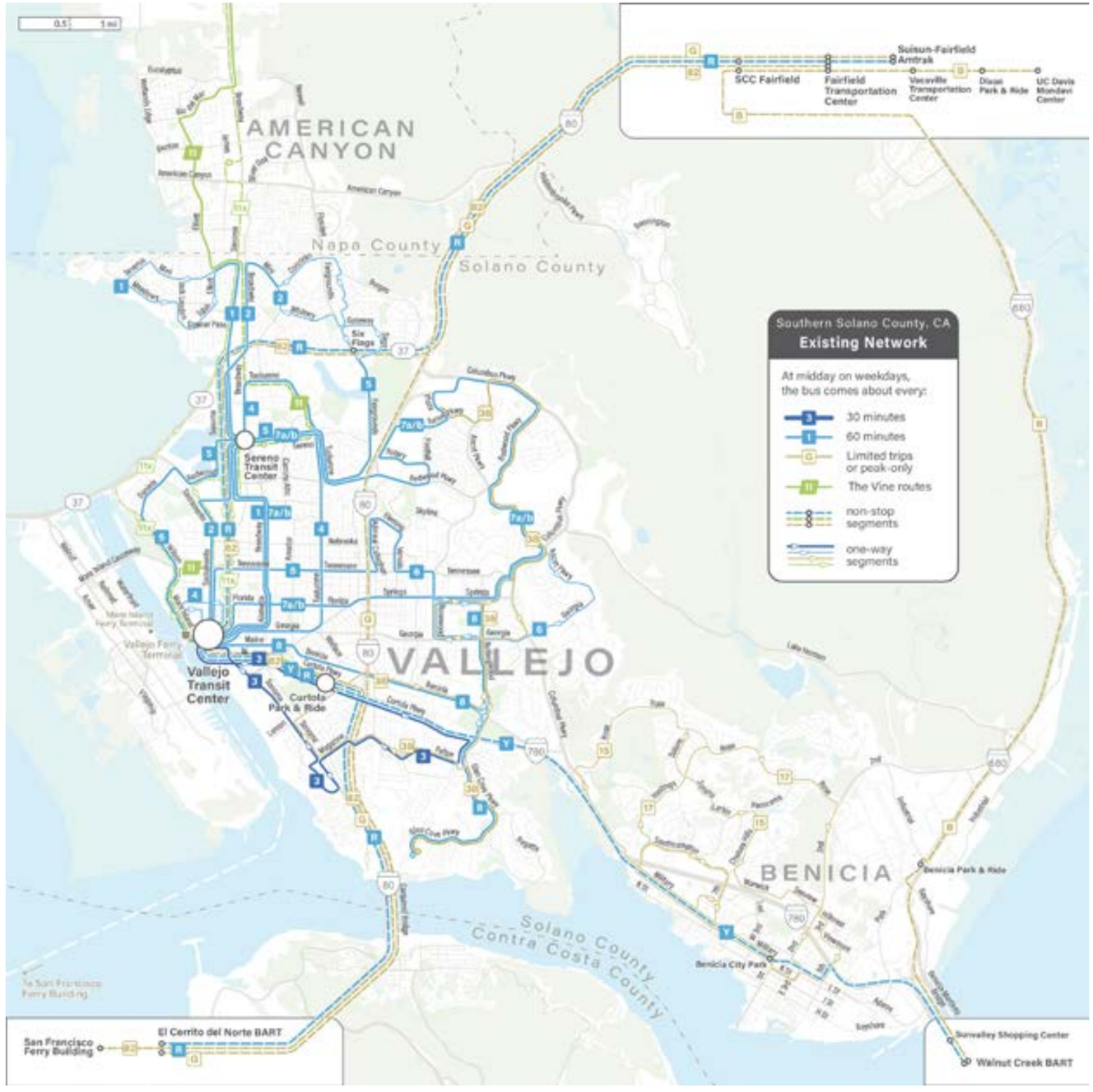

Figure 22: SolTrans Existing Network

Express Service Structure

Figure 23 shows a diagram of SolTrans' express services, which connect Solano County cities to the BART rapid transit network. Each line on this map is sized based on the number of daily weekday trips provided per direction.

Red Line

The Red Line is the busiest of these services, carrying nearly a third of overall SolTrans system daily ridership. It connects Suisun City, Fairfield, and Vallejo to the El Cerrito del Norte BART station. Most trips stop at Six Flags, and some serve the Sereno Transit Center. The Red Line provides two trips per hour for most of the day between El Cerrito del Norte and Vallejo TC; one trip per hour typically continues north to Fairfield. During rush hour, additional Red Line trips operate between Vallejo and BART.

Green Line

The Green Line provides a direct connection between Suisun City, Fairfield and El Cerrito del Norte BART, bypassing Vallejo. It provides 1-2 trips per hour during the peak periods, with no service available in the middle of the day.

Yellow Line

The Yellow Line connects Vallejo and Benicia, continuing south to end at the Walnut Creek BART station. The Yellow Line runs hourly.

Blue Line

The Blue Line connects Fairfield, Vacaville and Dixon to BART at Walnut Creek. A limited number of trips serve Davis, although due to operating issues related to campus security and roadway infrastructure, the Blue Line does not actually stop near on campus center of the university, but south of campus near the Mondavi Center. En route to Walnut Creek, the Blue Line stops at the Benicia Park & Ride, but does not serve the main residential area of the city directly.

The Blue Line's schedule is complex, with multiple patterns. This means that not all stops are served by all trips. While there is hourly service between Fairfield and Walnut Creek, only one trip runs north of Fairfield during the middle of the day.

Route 82

The four color-name lines operate under the Solano Express brand; the fifth line (Route 82) is a pilot service that provides a one-seat trip to and from Fairfield, Vallejo and San Francisco at times when the Vallejo-San Francisco ferry is not operating. Route 82 runs four round trips between Vallejo and San Francisco each weekday.

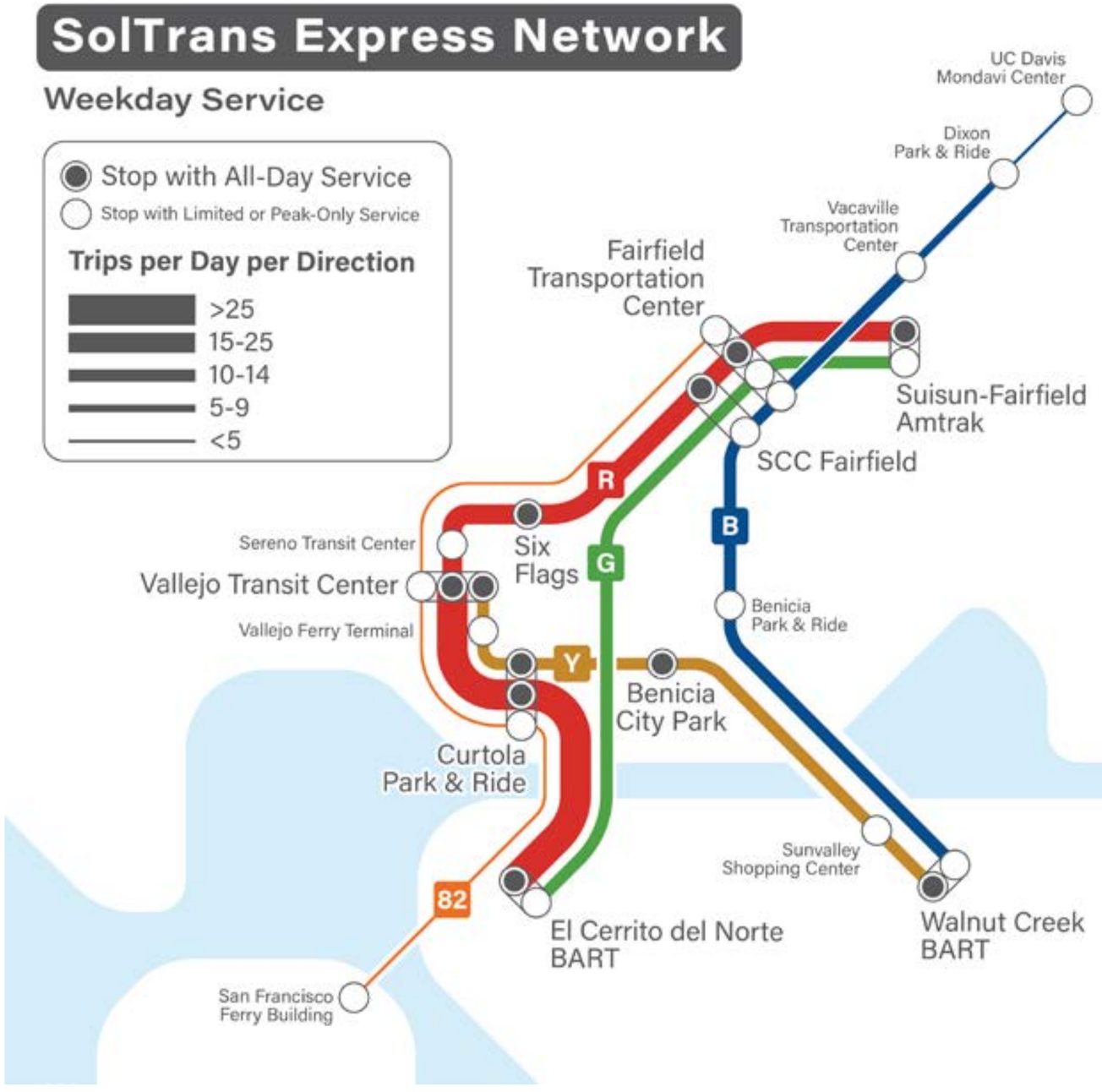

Figure 23: SolTrans Express Network

Frequency & Span of Service

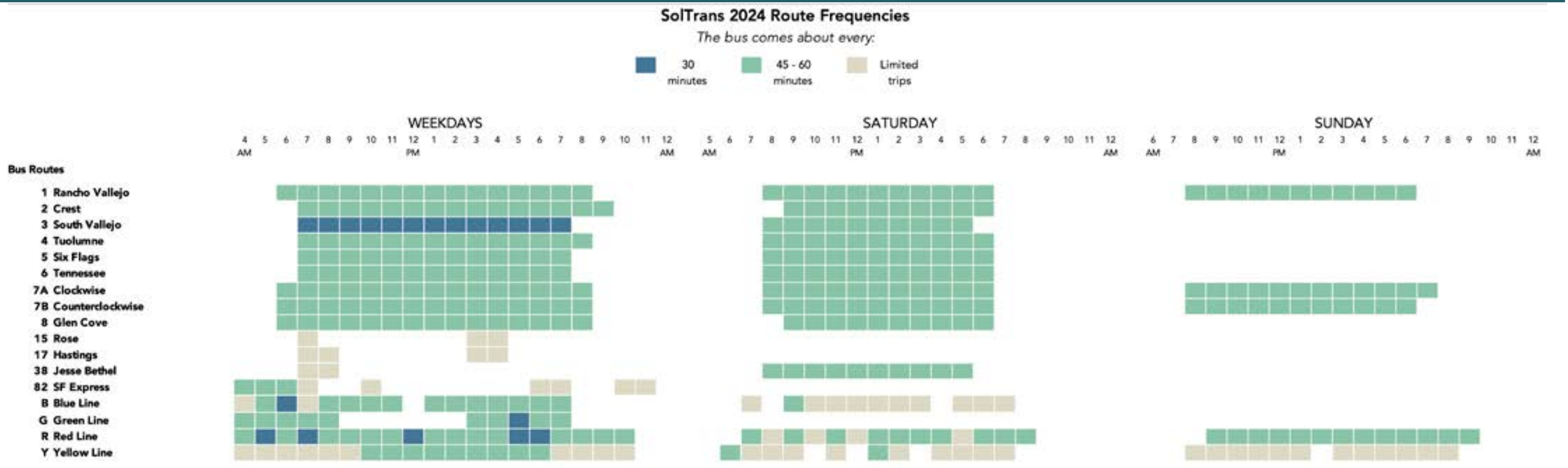

Figure 24: Existing Frequency and Span of Service

SolTrans service runs hourly most of the time. **Figure 24** charts the frequency of SolTrans service by hour, with each hour shown as a square colored-coded by how often the bus ran during that time. This table is based on the "95th percentile" headway; in other words, the worst frequency a person would experience the vast majority (95%) of the time. This means that when a route operates different frequencies in either direction, the worst frequency is shown.

Local Service Frequency

All local services run every hour, except for Route 3 which serves South Vallejo every 30 minutes in a loop along Curtola Parkway, Fulton Ave, Magazine St and Sonoma Blvd. Route 3's market is comparable in terms of residential density to other neighborhoods in Vallejo, and the higher frequency of this route is not based on higher demand. Route 3's short runtime enables it to be operated using the excess time on other routes. On a typical weekday, 8 different vehicles will be used on Route 3, which will alternate with trips on routes 1, 2, 7A and 7B.

Local Service Span

On weekdays, local services operate a 12-14 hour span of service, with most routes beginning service at 6 a.m. and ending by 9 p.m. The service day is shorter on weekends, with local routes running from 8 a.m. to 7 p.m. All local routes run on Saturdays, but on Sundays, only routes 1, 7A and 7B operate. Routes 15, 17 and 38 provide service only during school hours on weekdays.

Express Service Frequency

Because they operate multiple patterns and are timed with BART schedules, the express services (Red, Yellow, Blue, Green and 82) have more complicated timetables and more variability in frequency throughout the day. For a more detailed breakdown, see the individual sections on each express service on the following pages.

Weekend Service

Saturday Service

SolTrans local service on Saturday is similar to weekday, but express services operate a reduced schedule. Only the Green Line, Route 82 and school services don't operate. That means that for local trips in Vallejo, the network provides a similar level of mobility on Saturdays and on weekdays. For trips to BART, the Red, Yellow and Blue line all run, although with reduced schedules due to lower peak demand.

Sunday Service

Sunday service (shown in **Figure 25**) is much sparser compared to weekdays or Saturdays. Only a handful of routes operate: Routes 1, 7A, and 7B in Vallejo, and then the Red and Yellow express lines. The map on this page shows all routes that do not offer service on Sundays in grey.

As **Figure 24** shows, on Sundays, big parts of Vallejo are without transit service entirely. That includes streets with shops and restaurants, like Tennessee St, Tuolumne St, and Benicia Rd; important destinations like Six Flags (which is open Sundays); and residential neighborhoods like South Vallejo Ⓐ, Chabot Terrace Ⓑ, or Glen Cove Ⓒ.

For everyone who needs to go to or from these places, transit is simply not an option on Sundays (unless a person has a very high tolerance for walking). For anyone who works on Sunday and is considering transit as a options to travel to their job, if their home or job is in one of these places, there's at least one day of the week for them where the system isn't there for them.

The Red and Yellow express services continue to operate on Sundays, though with a reduced schedule compared to weekdays. The Red Line runs only between Vallejo and BART on Sundays. The Blue Line doesn't' run at all, which means Vacaville and Dixon are not connected to the rest of the county by transit.

On Sundays, only routes 1 and 7A/7B in Vallejo, along with the Yellow and Red Solano Express lines operate. No other services are available.

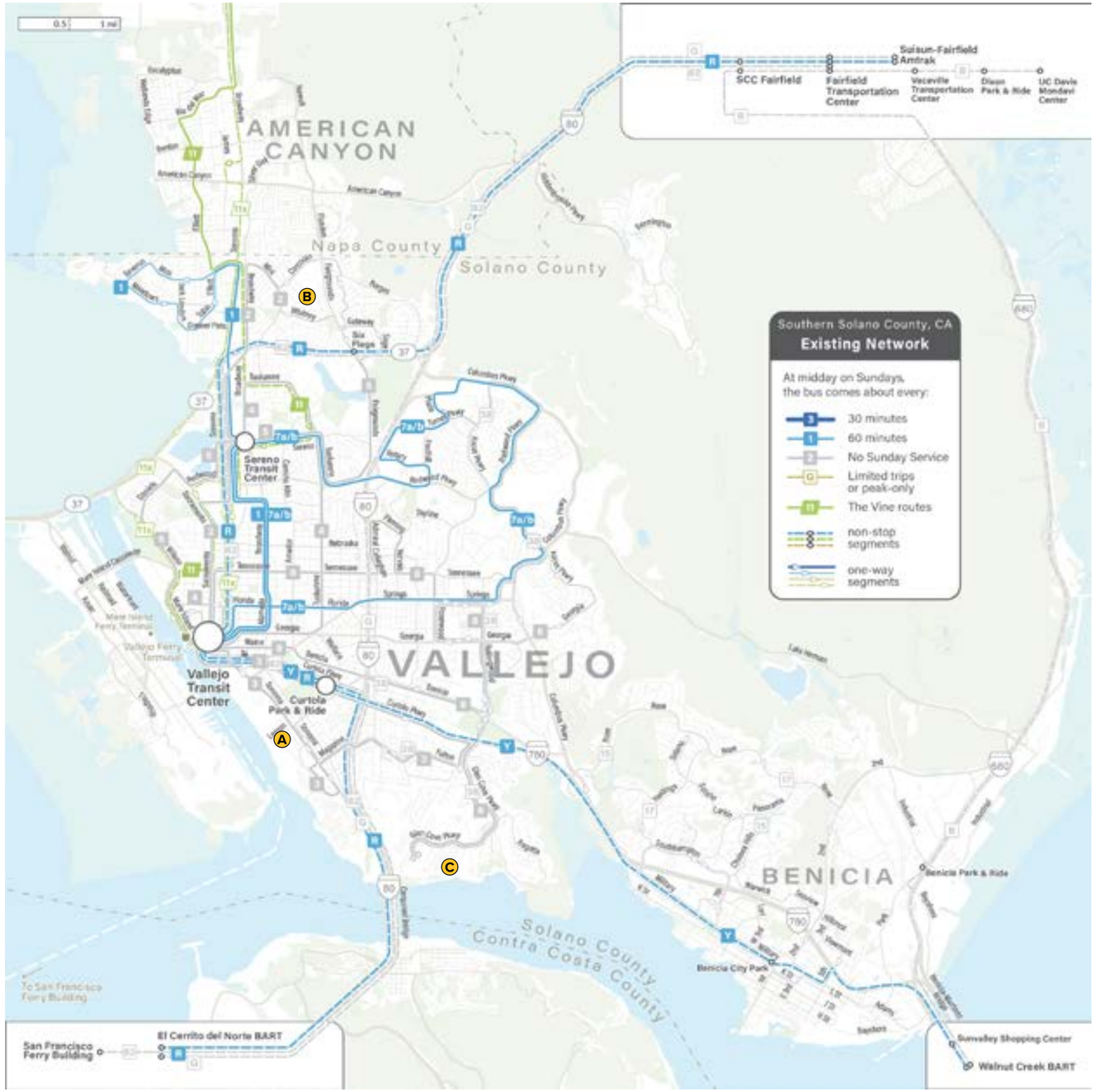

Figure 25: SolTrans Existing Network - Saturdays

Regional Services - Red Line

The Red Line is SolTrans' busiest route, connecting Suisun City, Fairfield, and Vallejo to the El Cerrito del Norte BART station. All southbound trips end at BART. Trips begin in Suisun City, and at Sereno TC and Vallejo TC.

Figure 26 plots the weekday schedule of the route; the colors indicate the origin and destination stop of each trip, while the line indicates the scheduled travel time of that trip. On this plot red indicates El Cerrito del Norte, Blue indicates the stop at the Suisun City Amtrak station, and purple indicates Vallejo TC.

The Red Line's primary pattern operates between Suisun City and El Cerrito del Norte. Trips depart southbound from Suisun City hourly from 5:55 AM Ⓐ until 9:08 PM. The pattern is similar northbound.

This basic pattern is supplemented with numerous shorter trips. The most common of these are shown in purple, between El Cerrito del Norte and Vallejo TC, but some (4 southbound in the morning and 3 northbound in the evening) trips also serve Sereno Transit Center. Trips before 5:55 AM start from Vallejo and Sereno transit center. After the last northbound trip to Fairfield arrives at 8:52 PM Ⓑ , the remaining northbound trips end at Vallejo or Sereno transit center.

With this pattern, there are 15-16 trips per day in each direction from Suisun City and Fairfield to Vallejo and El Cerrito. There are an additional 15-17 trips made by the short patterns that do not operate north of Vallejo.

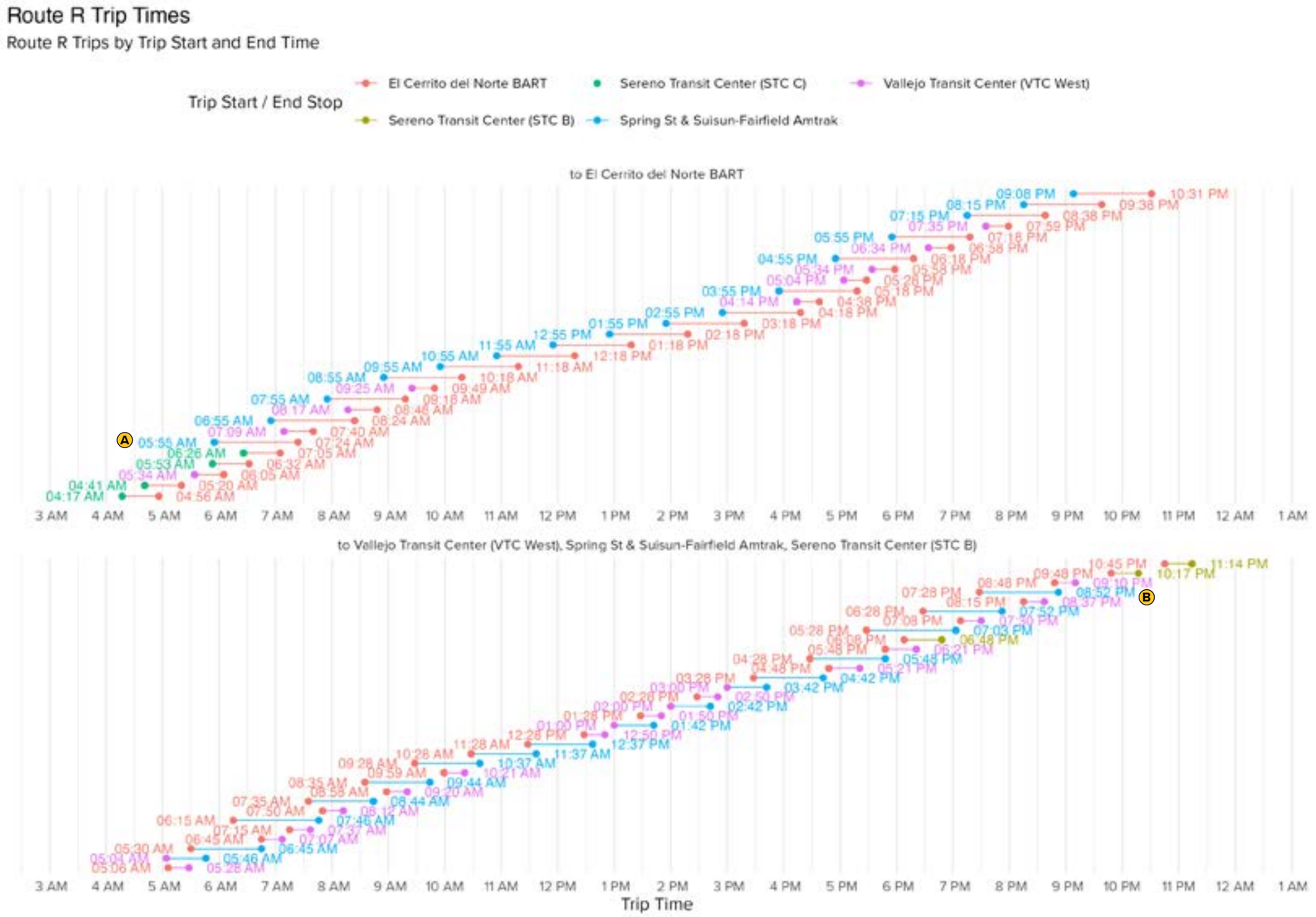

Figure 26: Red Line trips by origin and destination stop

Regional Services - Green Line

The Green Line provides a faster connection to El Cerrito del Norte from Fairfield and Suisun City. All trips serve Fairfield Transportation Center; most also serve the Suisun City - Fairfield Amtrak station:

- In the morning, northbound trips serve the Amtrak station and then proceed to Fairfield Transportation Center.
- In the afternoon, northbound trips travel directly to Fairfield Transportation Center.
- In the morning, all but two southbound trips depart from Fairfield and do not serve the Amtrak station.
- In the afternoon, all southbound trips start at the Amtrak station and serve Fairfield Transportation Center second.

The Green Line operates approximately hourly during the rush hours only, with a few extra trips at the busiest times. It's first trip departs southbound at 4:15 AM; no Green Line trips operate between 9:00 AM and 2:30 PM; service end at 8:15 PM when the last northbound trip reaches Fairfield.

Along with the Blue Line, the Green Line is one of two SolTrans routes that do not serve Vallejo TC. Since the Green Line does not touch a SolTrans facility, operating this service requires deadheads between Vallejo and Fairfield or El Cerrito del Norte when vehicles go in or out of service.

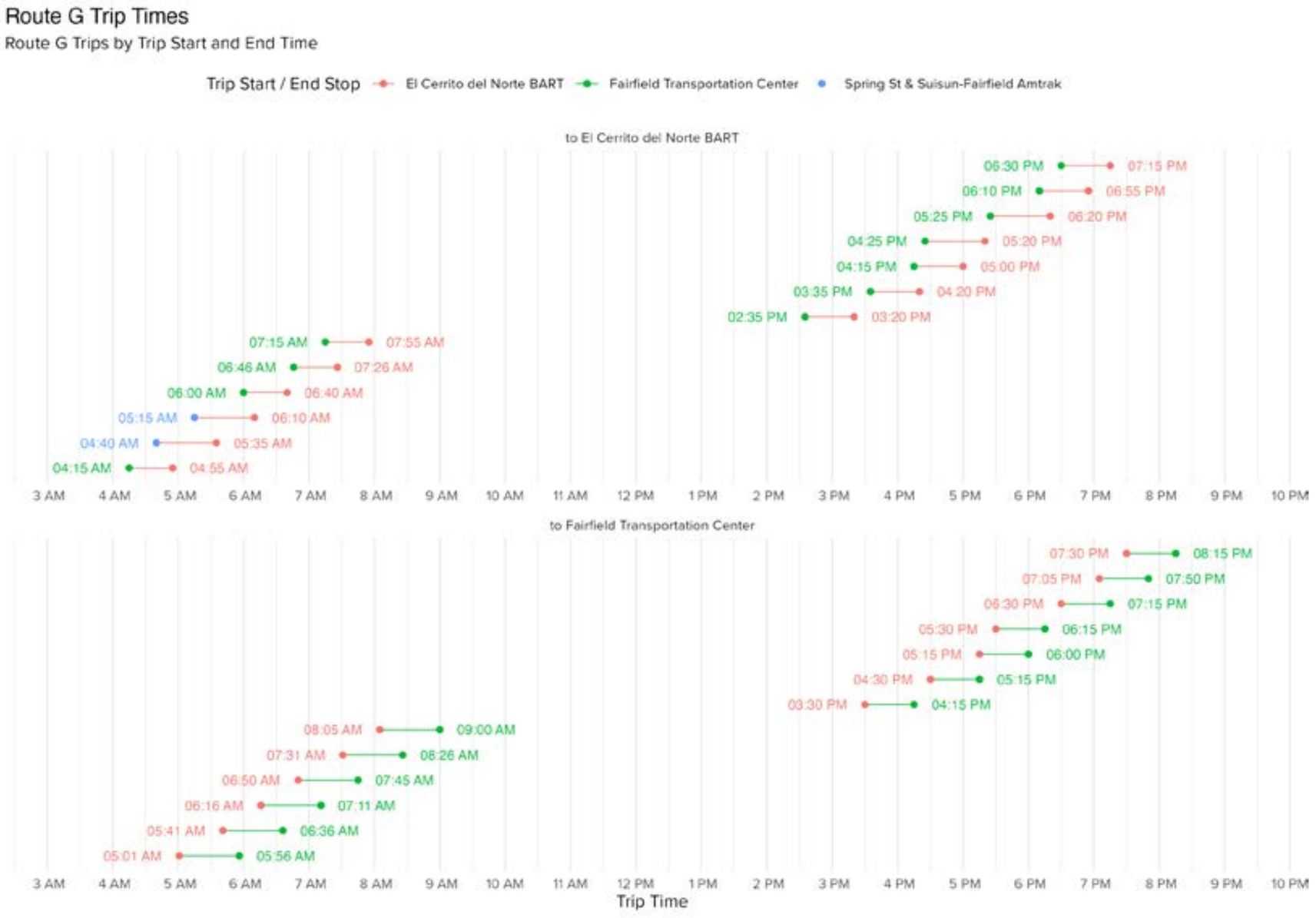

Figure 27: Green Line trips by origin and destination stop

Regional Services - Yellow Line

The Yellow Line connects Benicia to the Yellow Line BART at Walnut Creek; it is also the only route connecting Benicia to Vallejo. **Figure 28** plots the Yellow Line's weekday schedule.

The Yellow Line operates one pattern, with all trips serving Vallejo TC, Benicia and Walnut Creek. The only variation among its trips is that a few trips in the afternoon make an extra stop closer to the ferry terminal in Vallejo before continuing on to Benicia and Walnut Creek.

The Yellow Line operates approximately hourly, but with a few notable gaps in its schedule (due to constraints associated with its interline with the Blue Line). For example, in the morning, there are only four westbound trips between 5 AM and 12 PM, with 90-120 minute gaps between trips.

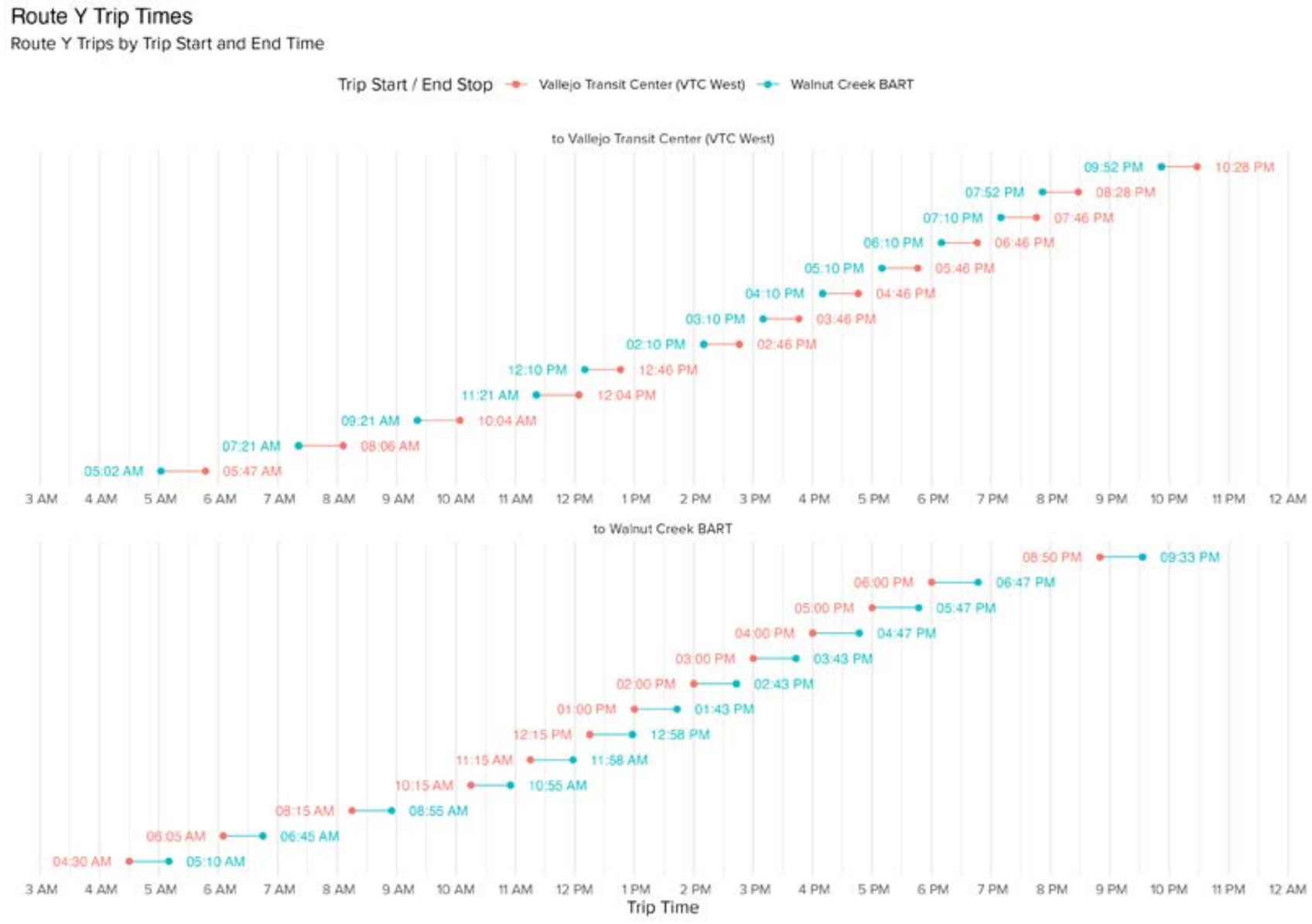

Figure 28: Yellow Line trips by origin and destination stop

Regional Services - Blue Line

The Blue Line connects Dixon, Vacaville, Fairfield, and Benicia to the Walnut Creek BART station. There are also a few trips to Davis. Because it serves so many different destinations, it has different patterns beginning and ending in each of the different towns. **Figure 29** plots the weekday schedule of the Blue Line.

All trips serve Fairfield Transportation Center. Service to Vacaville and Dixon is very limited in the middle of the day. For example, in the mornings, the trip that departs Dixon via Vacaville at 8:49 AM is the last trip south until 3:38 PM. In the other direction, the 8:51 AM departure from Walnut Creek to Dixon is the last trip north of Fairfield until 2:00 PM.

There are also a few trips that serve Davis; these are highlighted green on the chart. In the morning, trips depart at 5:21 AM and 6:21 AM from Walnut Creek. These runs take over an hour and a half, so the after they arrive in Davis, the driver returns to Dixon and takes a 30 minute break before beginning a new southbound trip.

Along with the Green Line, the Blue Line is one of two SolTrans routes that do not serve Vallejo TC. Since the Blue Line does not touch a SolTrans facility, operating this service requires vehicles to interline with the Yellow Line. Some Blue Line vehicles that enter service on the northern segment of the route require a deadhead trip from Vallejo to Vacaville.

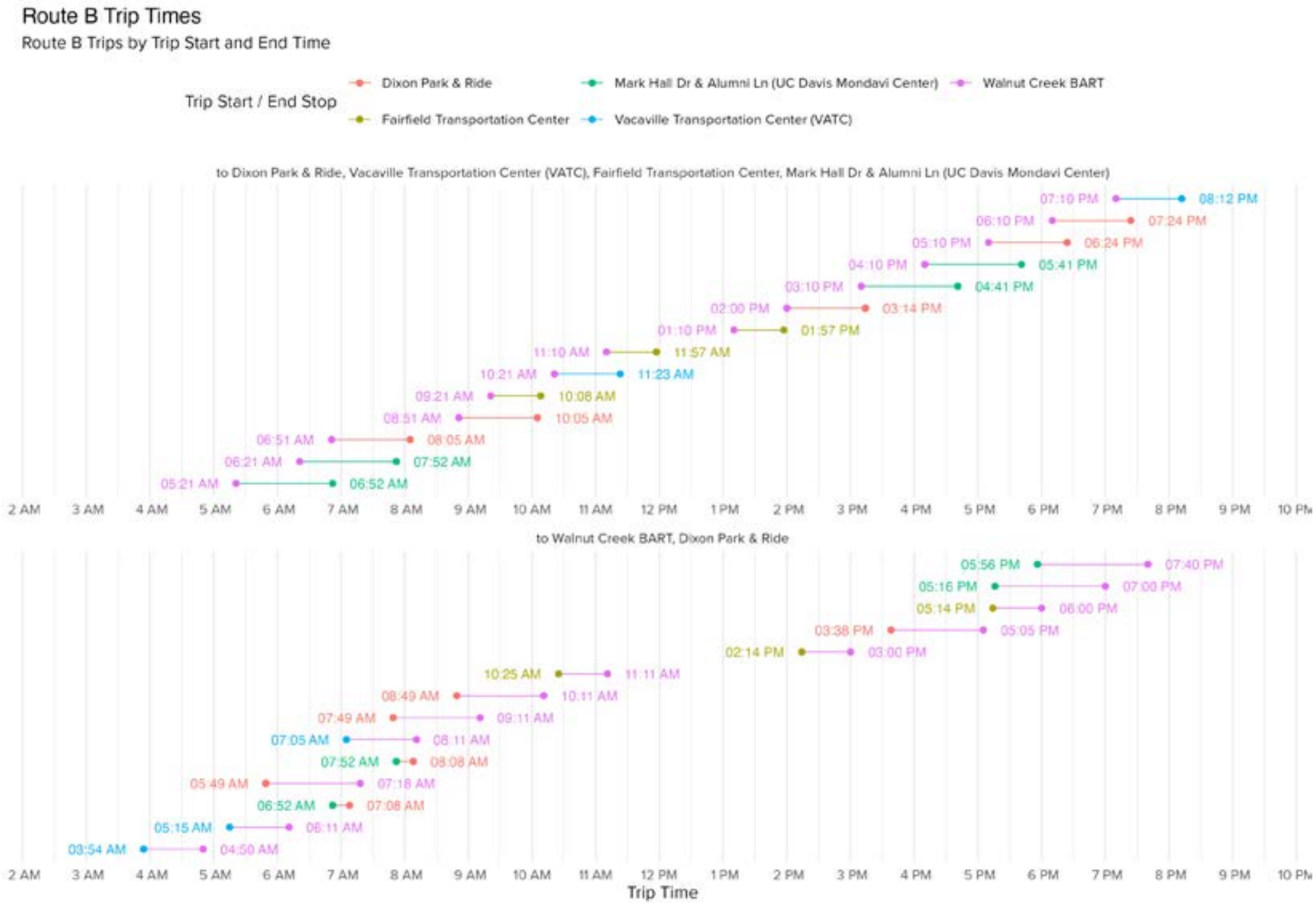

Figure 29: Blue Line trips by origin and destination stop

Regional Service - Route 82

SolTrans operates one regional service that does not share the SolanoExpress brand: Route 82. Route 82 provides direct trips between Fairfield, Vallejo and the San Francisco Ferry Building, operating during periods when the Vallejo ferry is not available. **Figure 30** plots the weekday schedule of Route 82.

Route 82 provides two trips per direction during the morning and afternoon rush routes. Morning trips arrive in San Francisco at 6:00 AM and 7:13 AM; afternoon trips depart San Francisco at 6:30 PM and 10:40 PM. Both southbound trips in the morning start from Fairfield. Only the 6:30 PM northbound trip goes all the way to Fairfield; all other northbound trips end in Vallejo.

Route 82's trips are spread widely, with a nearly 11-hour interval between the last southbound AM arrival and the first northbound PM departure. For a person using Route 82 to commute to an 8-5 job in San Fransciso within walking distance to the ferry building, this means they would arrive about 45 minutes before their shift began, and end work over an hour before the next northbound departure.

This trip timing likely makes it more convenient for many riders to use other options (for example the Vallejo ferry, or BART and the Red Line) for one side of their trip. However, for some riders the wide trip spacing may actually be more convenient, providing enough time to connect via Muni to a final destination.

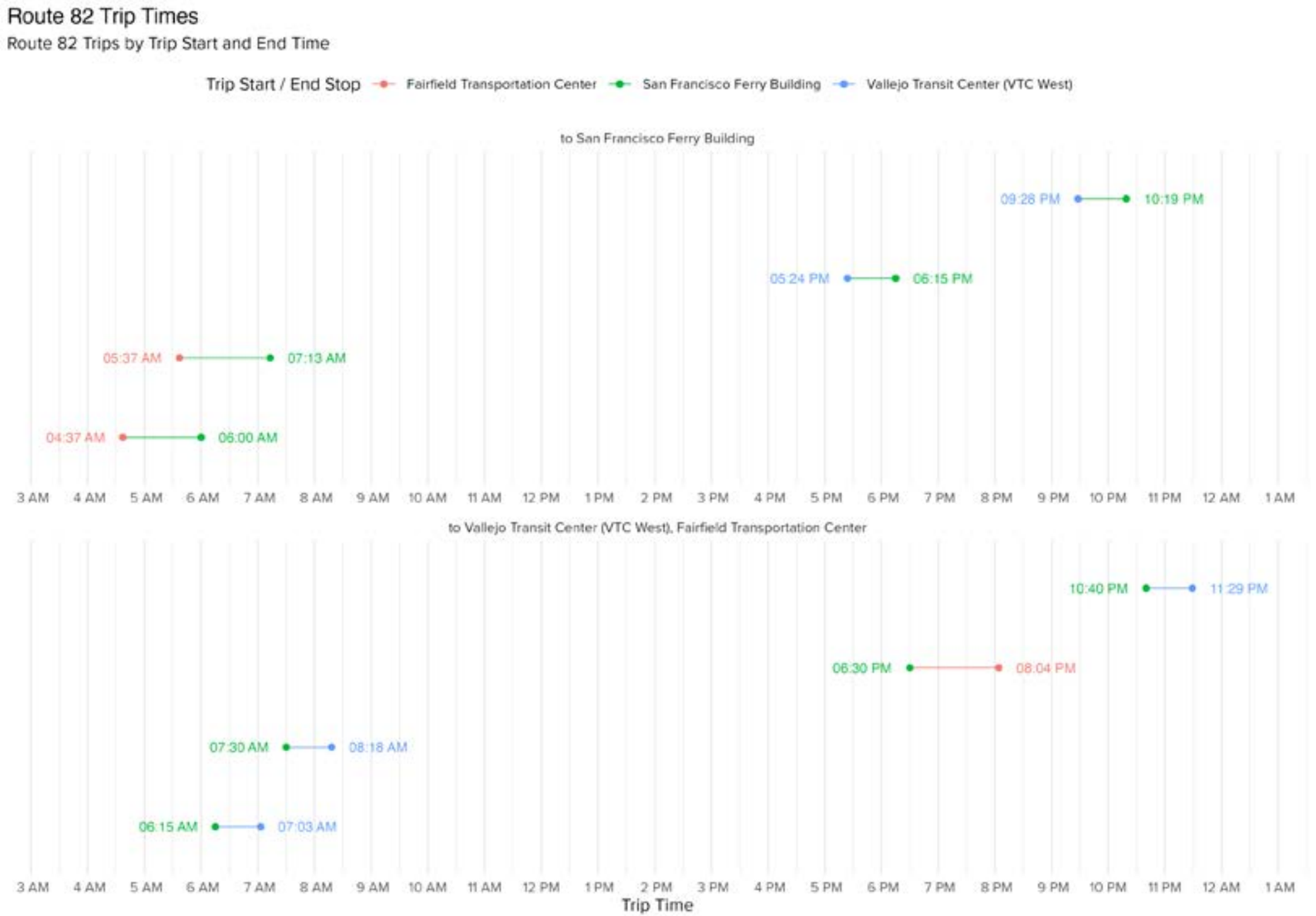

Figure 30: Route 82 trips by origin and destination stop

School Services

SolTrans is the primary transportation provider for middle and high school students in Vallejo and Benicia.

School Services

In Vallejo, the local network connects most neighborhoods to their local schools. Vallejo High School is served by routes 1, 7A/B, and 6. There is one additional route, 38, that provides extra service to Jesse Bethel High School. Route 38 connects South Vallejo, Glen Cove and residential areas between I-780 and Springs Rd to Jesse Bethel.

In Benicia, routes 15 and 17 provides trips to Benicia Middle School and Benicia High from neighborhoods north of I-780 where walking or cycling to class would be impractical.

Youth Pass

Beginning in April 2024, SolTrans began offering free fares for all riders up to age 18. This initiative is currently in the pilot stage; the program will be evaluated in mid-2025, when SolTrans' Board of Directors will decide whether to adopt it permanently.

Other Transit Service Providers

SolTrans services connect and overlap with 7 different agencies.

AC Transit

The primary agency offering local service throughout Oakland, Berkeley, Richmond, and the East Bay. SolTrans connects with multiple AC Transit routes at the El Cerrito del Norte BART station.

BART

The region's rapid transit network. SolTrans' Red and Green lines connect with BART Red and Orange lines at the El Cerrito del Norte station; SolTrans' Yellow and Blue line connects with the BART Yellow Line at the Walnut Creek station.

City Coach (Vacaville)

The City of Vacaville's Public Works Department operates a network of five local routes. City Coach connects with the SolTrans' Blue Line at Vacaville Transit Center.

County Connection (Central Contra Costa County)

County Connection provides local transit service in Concord, Walnut Creek, Danville and San Ramon, with express connections to Pleasanton and Antioch. SolTrans' Yellow Line meets several County Connection routes at the Walnut Creek BART station.

Fairfield and Suisun Transit (FAST)

FAST provides local service within Fairfield and Suisun City. In addition to local mobility, FAST also enables connections to Solano Express and the Capitol Corridor. FAST connects with the Solano Express Blue, Green and Red lines at Fairfield Transit Center and the Suisun City Amtrak Station. SolTrans express routes also stop in Fairfield connecting with FAST at Solano Community College.

San Francisco Bay Ferry

The Vallejo - San Francisco ferry operates between the Vallejo Ferry Terminal and the SF Ferry Building. The first departure south leaves Vallejo at 5:30 AM; the last trip from San Francisco arrives in Vallejo at 9:10 PM. The trip from Vallejo to San Francisco takes about 60 minutes.

The Vine (Napa County)

Napa County's main public transit provider. Two Vine routes operate within Vallejo. Route 11 provides local service between Napa, American Canyon, and Vallejo TC, stopping at both the Sutter Solano and Kaiser hospitals along the way. Route 11X offers a fast express connection to the transit center and ferry terminal, with no other stops in Vallejo.

YoloBus

YoloBus provides service in Yolo County, with most routes in West Sacramento, Davis and Woodland. SolTrans does not correctly with YoloBus, but both agencies serve Davis. YoloBus routes 42A, 42B, 43 and 44 all serve Davis and Sacramento. None of these routes stop near the Mondavi Center where the SolTrans Blue Line currently ends.

Provider	Connection Location	Connecting Routes
AC Transit	El Cerrito del Norte	72, 72R, 72M, 76, 376, 684, 800
BART	El Cerrito del Norte, Walnut Creek	Red Line; Yellow Line; Orange Line
City Coach	Vacaville Transit Center	All City Coach services.
County Connection	Walnut Creek	1, 4, 5, 9, 14, 21, 93X, 95X, 96X, 98X, 301, 311, 321, 601, 602, AC (Alamo Creek shutle)
FAST	Fairfield Transportation Center	All FAST services
San Francisco Bay Ferry	Vallejo TC / Vallejo Ferry Terminal	Vallejo - Downtown San Francisco; Vallejo - Oracle Park (seasonal)
YoloBus	No connection, but also serves Davis.	42A, 42B, 43, 44.
The Vine	Vallejo TC	11, 11X

Figure 31: Summary of Connecting Transit Providers

Vehicle Blocking Structure

SolTrans network has 17 distinct routes, which it operates with a peak pullout of 28 vehicles. Because some routes are longer than others or require multiple vehicles at any one time (as with the express services), the system is scheduled so that the same vehicle often provides service on multiple routes.

This is a common transit scheduling practice, often referred to with the term “interlining”. Interlining uses transit resources more efficiently, since short routes can be paired with longer routes to reduce the time a vehicle spends in layover between trips. However, interlining can also make the system more vulnerable to disruption, since a delay on a trip of one route can mean a late departure on the next trip of a different route.

Figure 32 charts how vehicles are shared between routes. This image shows the number of vehicle “blocks” (the schedule of trips a single vehicle does throughout the day) by route. For each row on the y axis, the cells on the x axis show how many of that route’s blocks are shared with other routes. The schools routes are not shown in this graphic, since they operate only a few trips per day.

Route 3 is SolTrans’ most heavily interlined route Ⓐ. Route 3 is short, so it can be operated using extra time with other routes; it shares blocks with routes 1, 2, 7A and 7B. Routes 4 and 8 Ⓑ and 5 and 6 Ⓒ are similarly paired.

The only route in the system that is not interlined with anything is the Green Line. Red Line buses also run some of Route 82’s trips; the Yellow and Blue lines are interlined, so that when Blue trips arrive at Walnut Creek BART, they depart north as inbound Yellow Line trips to Vallejo. Because the Blue Line does not reach Vallejo, interlining with the Yellow Line is necessary to return vehicles and operators to Vallejo TC without requiring long deadheads serving no passengers.

Why is this important? Right now, the design of SolTrans network requires this type of interdependency. The current set of routes could not be provided with the current number of vehicles if without interlining.

However, there is a tradeoff associated with this type of scheduling: when most buses have to serve multiple routes over the course of a single drivers’ shift, any delay on one route can impact the schedule of next route in the run.

At its worst, this can produce delays that cascade through the system. Imagine a bus that runs into heavy traffic during a trip on Route 3. It was originally scheduled to get back to Vallejo TC at 2:10 PM, and depart at 2:15 PM as a trip of Route 7B. That means that if that trip of Route 3 is more than 5 minutes behind schedule, not only are riders on Route 3 inconvenienced, but that following 7B trip will start late, delaying and potentially impacting the connections of everyone who needs to use it.

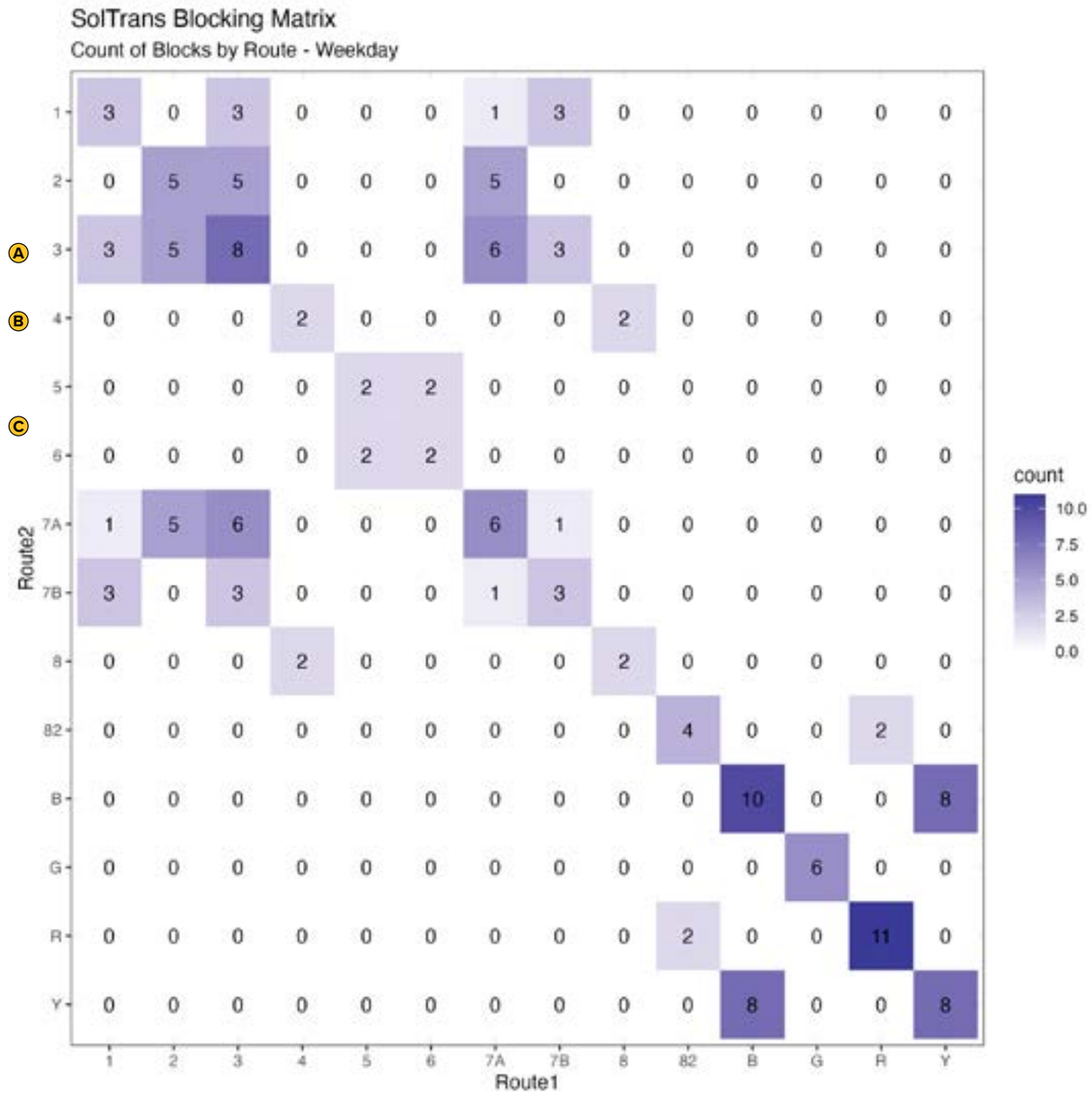

Figure 32: SolTrans Existing Network Vehicle Blocking - Weekday

Service and Ridership by Time of Day

Service level and ridership vary throughout the day. This is sometimes referred to as “peaking”, after the common pattern of higher ridership observed during the rush hours, or “peaks”.

Figure 33 shows SolTrans service and ridership by time of day for local and express routes. To create this plot, the day is divided into 30 minute intervals starting from midnight. The solid line on each chart shows the number of unique bus trips running during each 30 minute period; the dashed line shows the average number of daily passenger boardings that happened during that period. To display each variable on a single chart, we have represented them as a percentage of the daily average value.

Service is mostly flat throughout the day on the local network, while ridership peaks around school bell times. There is slightly more service during these times when the school routes are in operation, but because the local routes serving Vallejo operate consistent 30 or 60 minute headways all day long, the amount of service available doesn’t vary much throughout the day.

On the other hand, the express network is highly peaked in both service and ridership. Servicet is highest during the rush hours, and lower in the midday, when the Green Line and Route 82 are not operating, and when service is reduced on the Red and Blue lines. During the heaviest portion of the peak periods, more than twice as many trips are running on the express network as during the middle of the day.

The dashed ridership line closely follows the solid trips line in this chart. Ridership is highest during the peaks when there is much more express service available, and much lower at midday or in the evening when service is reduced. Compared to the average throughout the day, ridership is much higher than service level during the PM peak period.

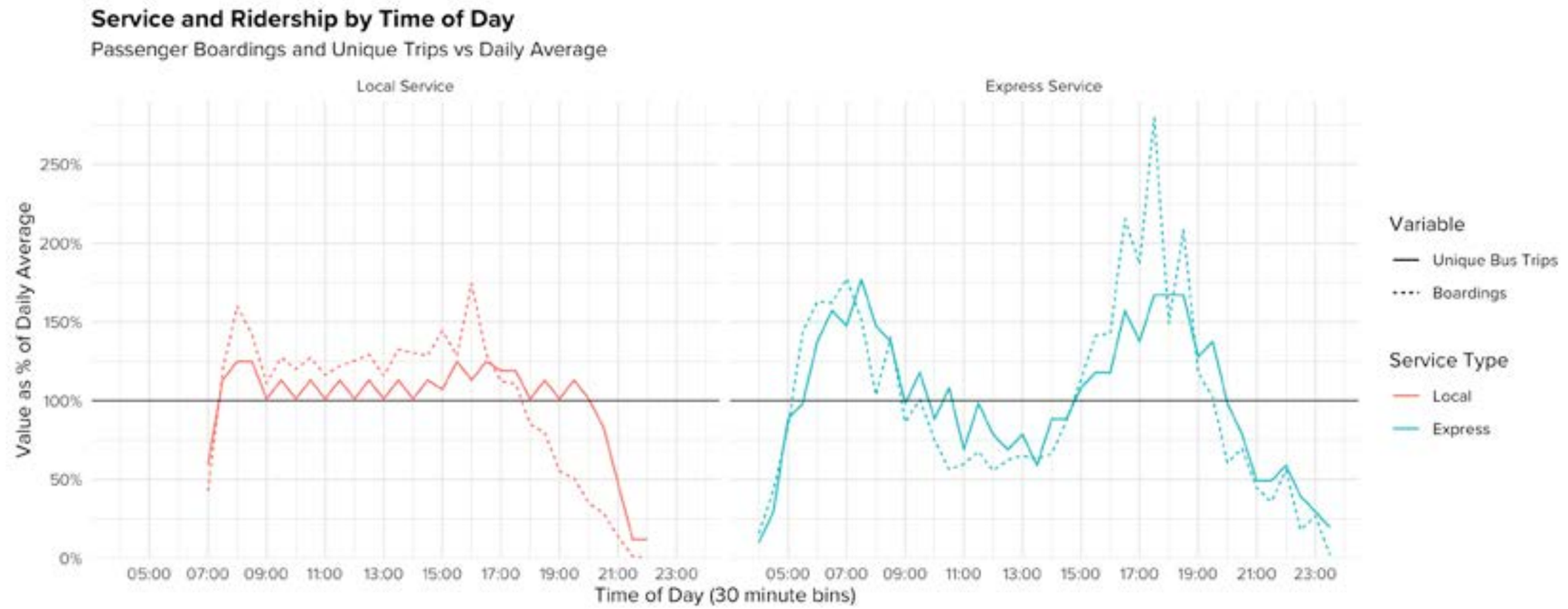

Figure 33: SolTrans Service and Ridership by Time of Day

In the years since the pandemic, an overall peaked demand pattern has returned, but with important differences. **Figure 34** provides a basic visualization of this, charting total trips originating in Solano County by time of day for Fall 2019 and Fall 2023 from Replica.

Both the green 2019 and blue 2023 lines show an overall peaked demand pattern, but trips during the AM peak hour (7:00 AM to 8:00 AM dropped from about 8.7% to about 7.1%. PM peak demand during the busiest hour of the afternoon was similar (3:00 PM - 4:00 PM, the afternoon “school peak), but the 2024 Replica data show higher trip volumes throughout the afternoon and evening than in 2019.

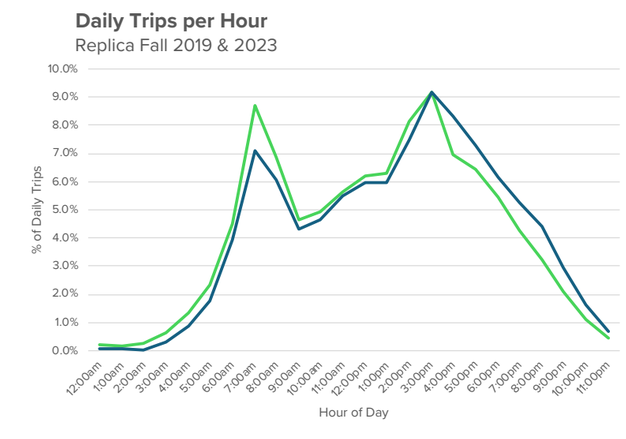

Figure 34: Hourly distribution of Solano County-originating trips, 2019 and 2024 (Replica)

Mobility Outcomes

What level of mobility does the SolTrans network deliver to riders? This section uses to measures to quantify how useful the network is:

- **Coverage.** How many people are near transit service?
- **Access.** How many potential destinations are actually reachable using transit?

The potential usefulness of the system is a product of the underlying land use and development pattern, as well as the design of the transit network overlaid upon it.

How do we measure coverage?

Figure 35 provides a simple illustration of the steps to estimate the number of people near transit service.

To estimate how many people are located within a short walk to transit, we first use a service called Mapbox to generate the 10-minute walkshed from each SolTrans stop. This walkshed shows us all the places that are reachable along the street network (not "as the crow flies") from each stop. We then merge all of the individual stops' walksheds together to form a complete systemwide walkshed that represents all the areas that are up to a 10-minute walk from SolTrans service.

In the analysis on the following pages, we report coverage in terms of the number of people near 30-minute, 60-minute, all-day and any service. To do this, we create separate combined walksheds for only the set of stops that are served at these different service levels.

Once we have created the polygons representing each service level's walkshed, we intersect them with data from the US census that tell us the number of residents and jobs in each block group. We calculate the number of people covered by each walkshed based on the percentage of the area of each block group that overlaps with the walkshed.

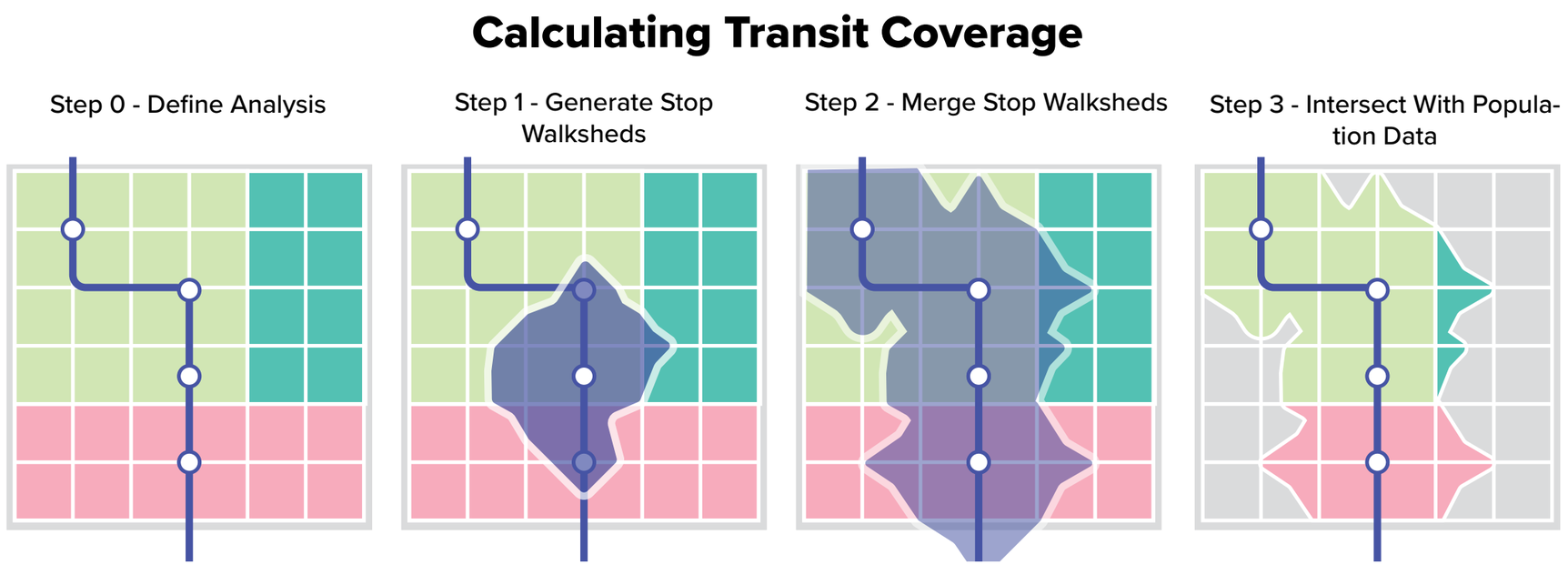

Figure 35: Transit Coverage Analysis Simple Methodology

Mobility Outcomes - Coverage

About 82% of Vallejo residents live within a 10-minute walk to transit that runs all day. Only about 11% of Benicia residents live near all-day service, although most neighborhoods are served by school routes.

How well does the SolTrans network at putting residents within a short distance to service? For transit to be useful, it needs to be relatively close to the places people need to go.

Figure 36 maps the area within a 10 minute walk to a SolTrans bus stop in Vallejo and Benicia. Places near any service are shown in light blue; the areas near a route that runs all day are outlined in dark blue.

Transit coverage is fairly comprehensive in Vallejo, with a few exceptions:

- No service is offered on Ⓐ Mare Island.
- Some of the area along Ascot Pkwy Ⓑ is more than 10 minutes walk to the 7A/7B.
- Some residential areas at the south end of Columbus Pkwy Ⓒ are just beyond a 10-minute walk to either routes 7A/7B or 8.

Apart from these gaps, almost all of Vallejo has access to service that runs all day. About 82% of Vallejo residents live within a 10-minute walk to transit.

Transit coverage in Benicia is more limited. The residential areas north of I-780 Ⓓ are served by routes 15 and 17 (the school routes), but all-day service is only available on the along Military Rd Ⓔ and the Yellow Line. Almost all of Benicia south of I-780 is within a 10-minute walk to one of these Yellow Line stops, including most of the commercial area along First St, but a majority of residents of Benicia live in other areas.

No all-day service is available north of I-780 in Benicia. In our analysis, while about 56% of Benicia residents live within a 10-minute walk to a bus stop, only about 11% are within a 10-minute walk to all-day transit service. All-day service in Benicia also misses the Ⓕ Southampton shopping center and the cluster of dense apartments along Southampton Rd.

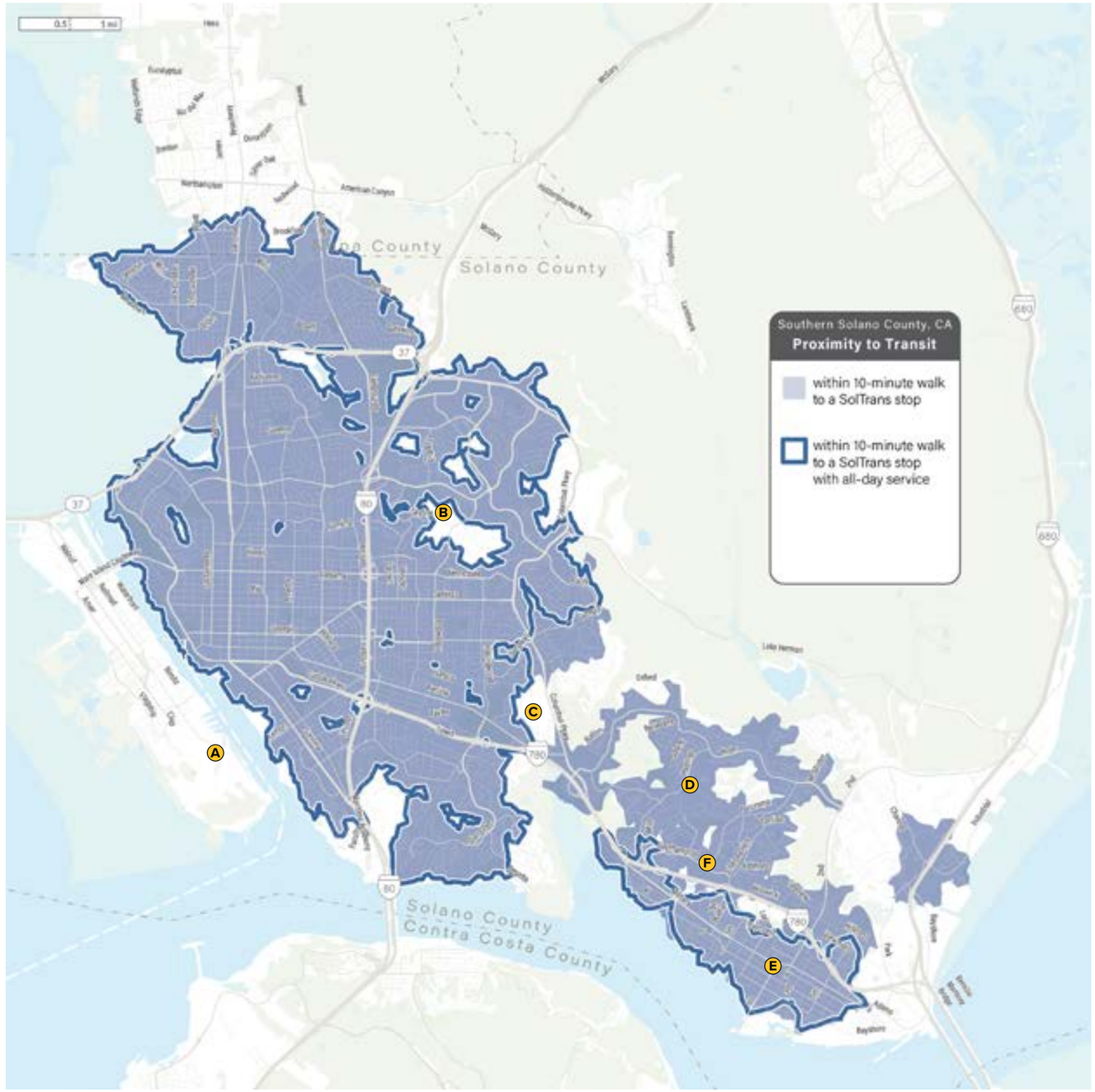

Figure 36: SolTrans Existing Network Coverage Area

Mobility Outcomes - Coverage

Figure 37 plots the number of residents, lower-income people, people of color, and jobs near transit service at different levels. This plot shows the number of people within a 10 minute walk to transit located anywhere (in and out of Solano County), in Solano County, in Vallejo, and in Benicia.

For Solano County, Vallejo, and Benicia, the pink bar shows the number of people within that geography that are not within a short walk to transit. A more detailed table of these statistics is available on the following page. “All Areas Near Service” does not include a pink bar showing people who are not served because this segment includes stops in Alameda County and San Francisco.

About 130,000 people live within a 10-minute walk to SolTrans service. Almost all (126,000) are in Solano County, and a majority (98,000) are in Vallejo, representing about 82% of the population of the city. About the same share of people of color in Vallejo are near service, and a slightly greater (87%) share of lower-income people and jobs.

About 28% of Solano County residents are near SolTrans service. While most people in Vallejo and Benicia are near at least some service, SolTrans service is only available near Solano Express stops in Fairfield, Suisun City, Vacaville and Dixon.

Only about 10% of Vallejo residents are near a 30-minute all-day service, because only 1 route (Route 3) operates at this frequency. Because of the socioeconomic characteristics of Route 3’s service level, a greater share (19%) of lower-income residents of Vallejo are near 30 minute service.

Coverage is much lower in Benicia. Only about 11% of the population of the town is near all-day service (the Blue and Yellow lines). About 56% of Benicia residents are near a transit stop, but the vast majority of those people are only served by Route 15 and 17, the very limited school services.

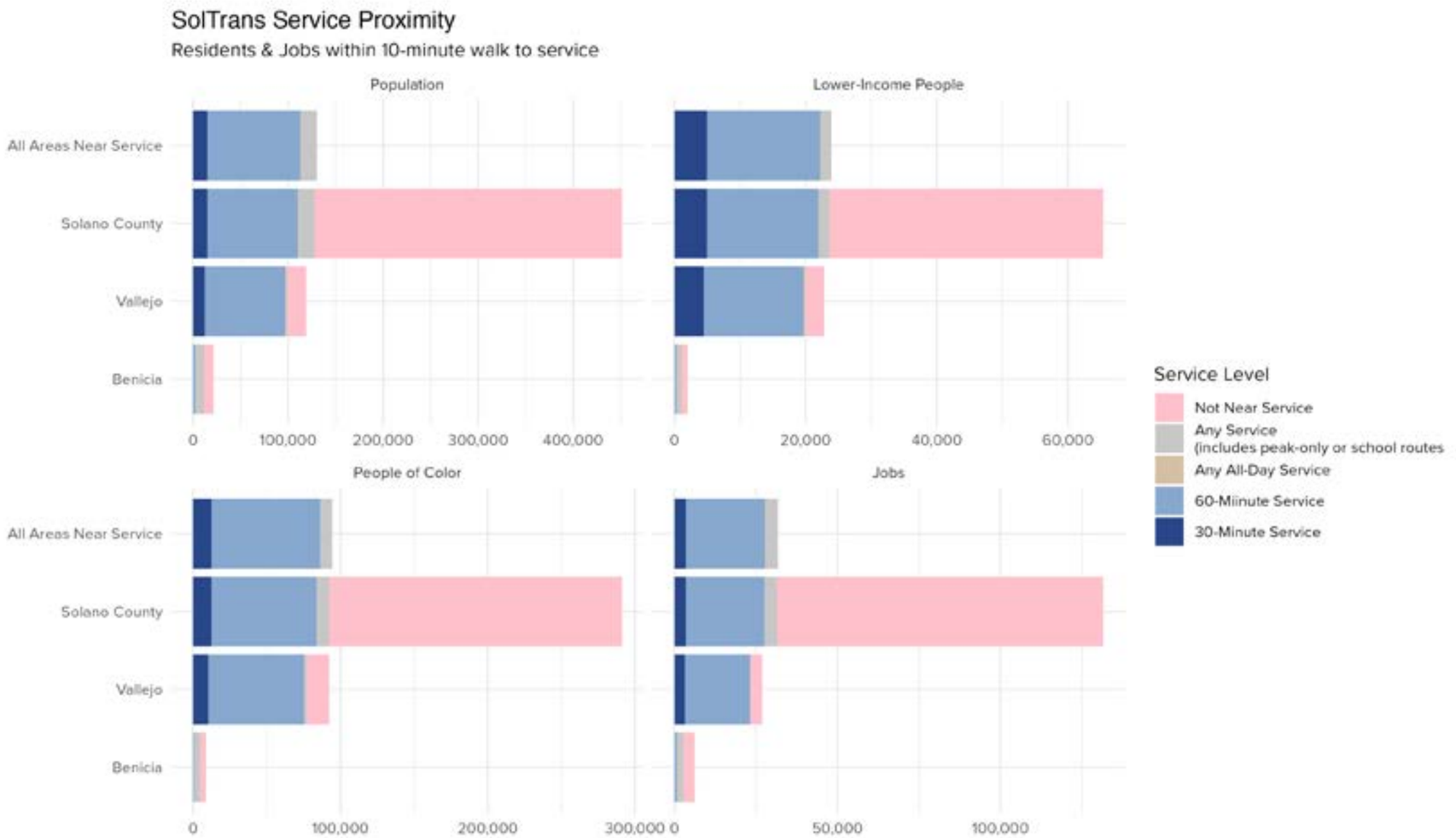

Figure 37: SolTrans Existing Network Coverage by Boundary

About 130,000 people live within a 10-minute walk to SolTrans service, including over 80% of Vallejo residents and over half of Benicia residents.

Mobility Outcomes - Coverage

Group	Service Level	Total	Cumulative Total	Total - Solano County	Cumulative Total - Solano County	Pct Cumulative - Solano County	Total - Vallejo	Cumulative Total - Vallejo	Pct Cumulative - Vallejo	Total - Benicia	Cumulative Total - Benicia	Pct Cumulative - Benicia
Population	30 minute	14,998	14,998	14,998	14,998	3%	12,217	12,217	10%	-	-	0%
	60 minute	97,871	112,869	94,799	109,797	24%	85,473	97,690	82%	2,313	2,313	11%
	Any Midday Service	109	112,978	109	109,906	24%	46	97,736	82%	77	2,390	11%
	Any Service	16,156	129,134	16,156	126,062	28%	129	97,865	82%	9,638	12,027	56%
Lower-Income Residents	30	4,910	4,910	4,910	4,910	8%	4,394	4,394	19%	-	-	0%
	60	17,251	22,161	16,991	21,900	34%	15,354	19,748	87%	251	251	12%
	Any Midday Service	14	22,175	14	21,914	34%	10	19,758	87%	7	258	13%
	Any Service	1,615	23,790	1,615	23,529	36%	21	19,779	87%	879	1,136	56%
People of Color	30	12,191	12,191	12,191	12,191	4%	10,043	10,043	11%	-	-	0%
	60	74,264	86,455	71,846	84,037	29%	65,875	75,918	82%	731	731	8%
	Any Midday Service	75	86,530	75	84,112	29%	43	75,961	82%	25	756	9%
	Any Service	6,899	93,429	6,899	91,011	31%	96	76,056	82%	3,844	4,600	53%
Jobs	30	3,418	3,418	3,418	3,418	3%	3,173	3,173	12%	-	-	0%
	60	23,886	27,304	23,700	27,118	21%	19,903	23,076	86%	786	786	13%
	Any Midday Service	42	27,345	42	27,160	21%	4	23,080	86%	18	804	13%
	Any Service	4,278	31,624	4,278	31,438	24%	43	23,123	86%	1,793	2,597	42%

Figure 38: Residents and Jobs Within 10 Minute Walk to Transit Service

Mobility Outcomes - Access

WHAT IS ACCESS?

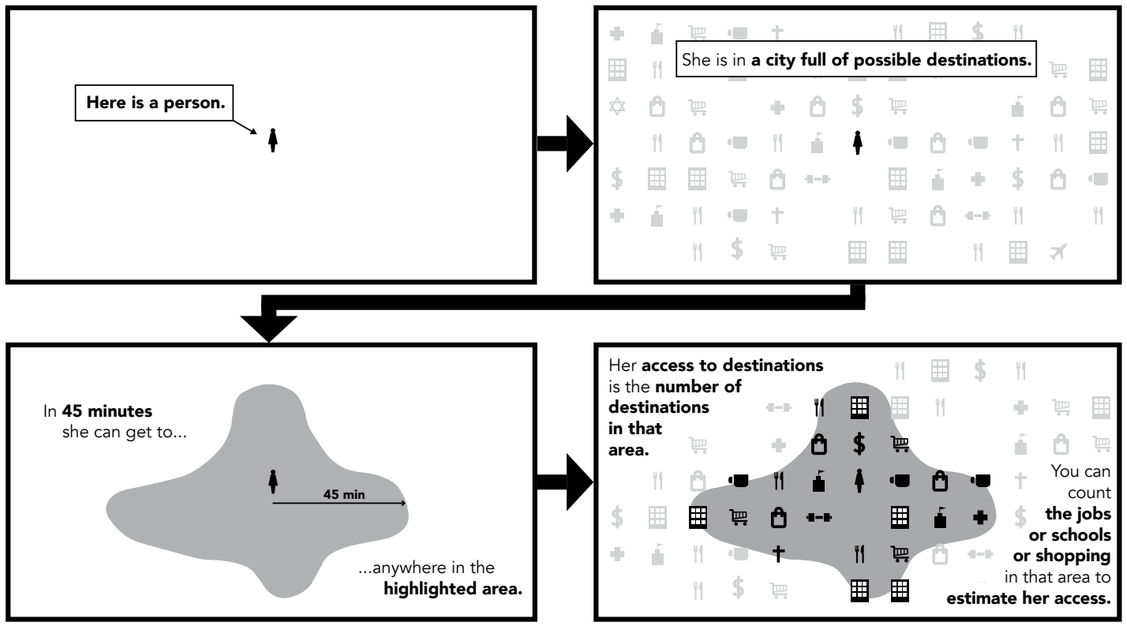

Figure 39: What is access?

How useful is someone likely to find the SolTrans network for the trips they need to make? We use a measure called “access analysis” to quantify how SolTrans’ network can take riders to different places.

Figure 39 provides a simple explanation of this concept. “Access” is a way of measuring how many jobs, destinations, shops, restaurants, or other places you might want to go to are actually reachable in a given amount of time using transit. The more jobs are reachable from a particular place, the more likely a person living in that place will find transit a convenient option to travel to work; the more grocery stores are reachable, the more likely the one they like to go is reachable, and the more likely they are to take transit.

The simplest way to look at access is to draw a shape on a map that encloses all the places reachable in some amount of travel time, like 45 minutes, similar to the cartoon in **Figure 39**. This type of map is called an “isochrone”.

Figure 40 shows an isochrone for Vallejo TC; everywhere shown in orange is reachable in 45 minutes or less using transit in the middle of the day.

Because all SolTrans local routes converge at Vallejo TC, most places in Vallejo are reachable within 45 minutes. The only place that’s not is the Gateway Plaza Ⓐ shopping center and the area along Columbus Pkwy Ⓑ. This area is on Route 7A/7B, but because they are on the opposite side of the loop from the transit center, it takes almost 30 minutes of riding to reach

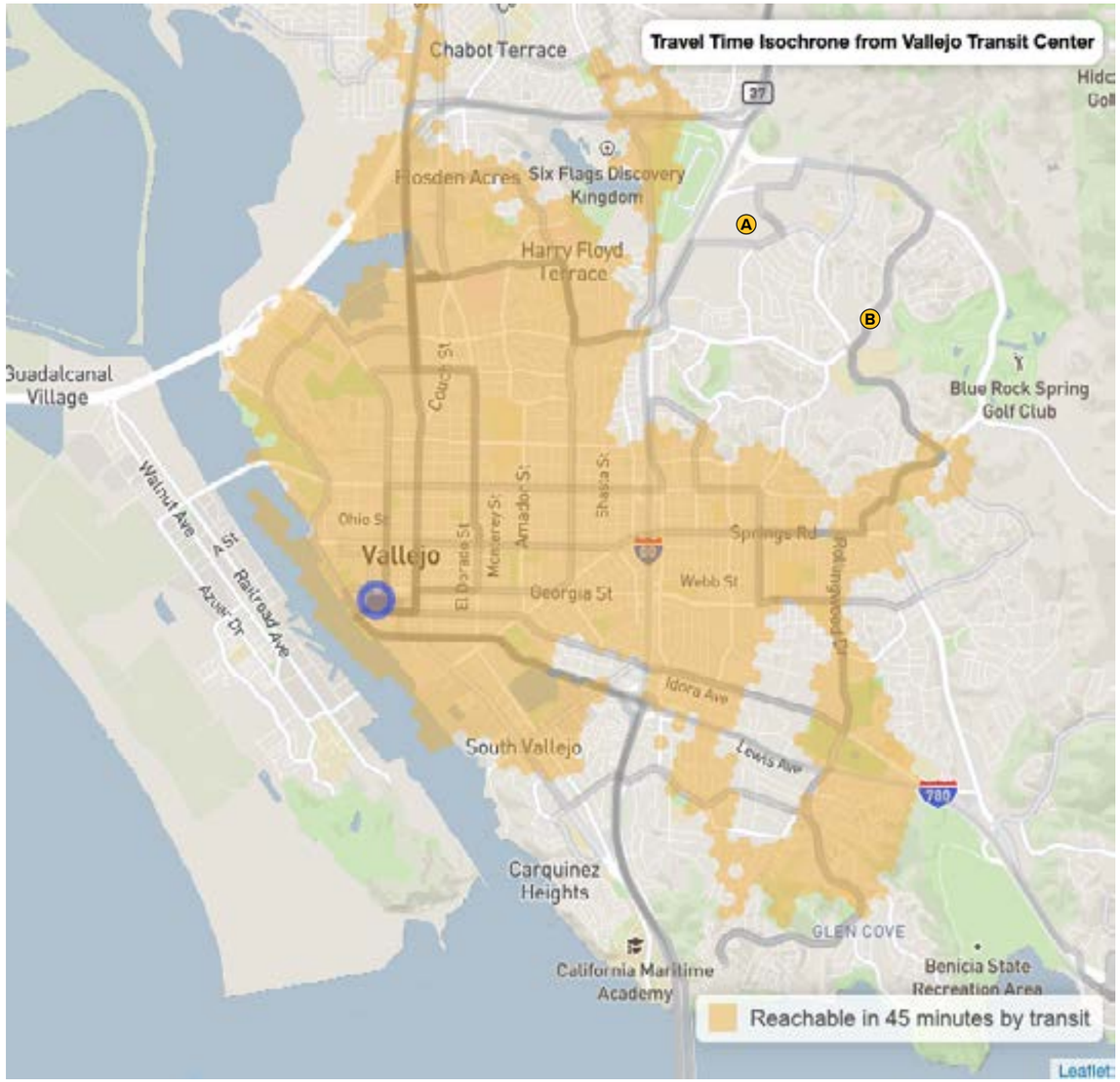

Figure 40: Travel Time Isochrone - Vallejo TC

What’s included in travel time? In an isochrone, travel time includes any time that would be spent walking, waiting for the bus, riding, waiting to transfer to another route, and walking to your final destination.

Mobility Outcomes - Access

them. When you include the initial wait (on average, 30 minutes for a 60 minute route), that puts Gateway Plaza more than 45 minutes away from the transit center.

Every route serves the transit center, so most of the rest of Vallejo is accessible. From other places served by fewer routes, fewer places are reachable. **Figure 41** shows the 45 minute travel time isochrone from Sutter Solano Medical Center on Tuolumne St. on the north side of Vallejo. This hospital is directly served by Route 4; Route 7A/B and Route 5 stop along Sereno Dr., about a 1/4-mile walk to the south.

From this location, much less of the city is reachable in 45 minutes. Since the hospital is right on Route 4, a person boarding there could reach Vallejo TC Ⓐ and any point along Tuolumne St Ⓑ along the way. Six Flags and the residential areas immediate to the north Ⓒ are reachable using Route 5, as is Broadway Ⓓ , which could be accessed via either Route 7A or potentially through a transfer from Route 4 to Route 1 at Sereno Transit Center.

Very little of the rest of the city is reachable in under 45 minutes. Any trips to the east side Ⓔ(Springs Rd., Benicia Rd.) would require a transfer at the transit center, which already takes 45 minutes to reach from the hospital. The same is true for trips to South Vallejo, or any longer regional trips using an express route.

Just because a transit trip takes over 45 minutes doesn't mean its impossible, or that nobody will do it. However, it is important to put these travel times in context. Travel between this hospital and the point labeled "E" on the map will take over an hour on transit; to drive between the two would take about 10 minutes, according to Google Maps.

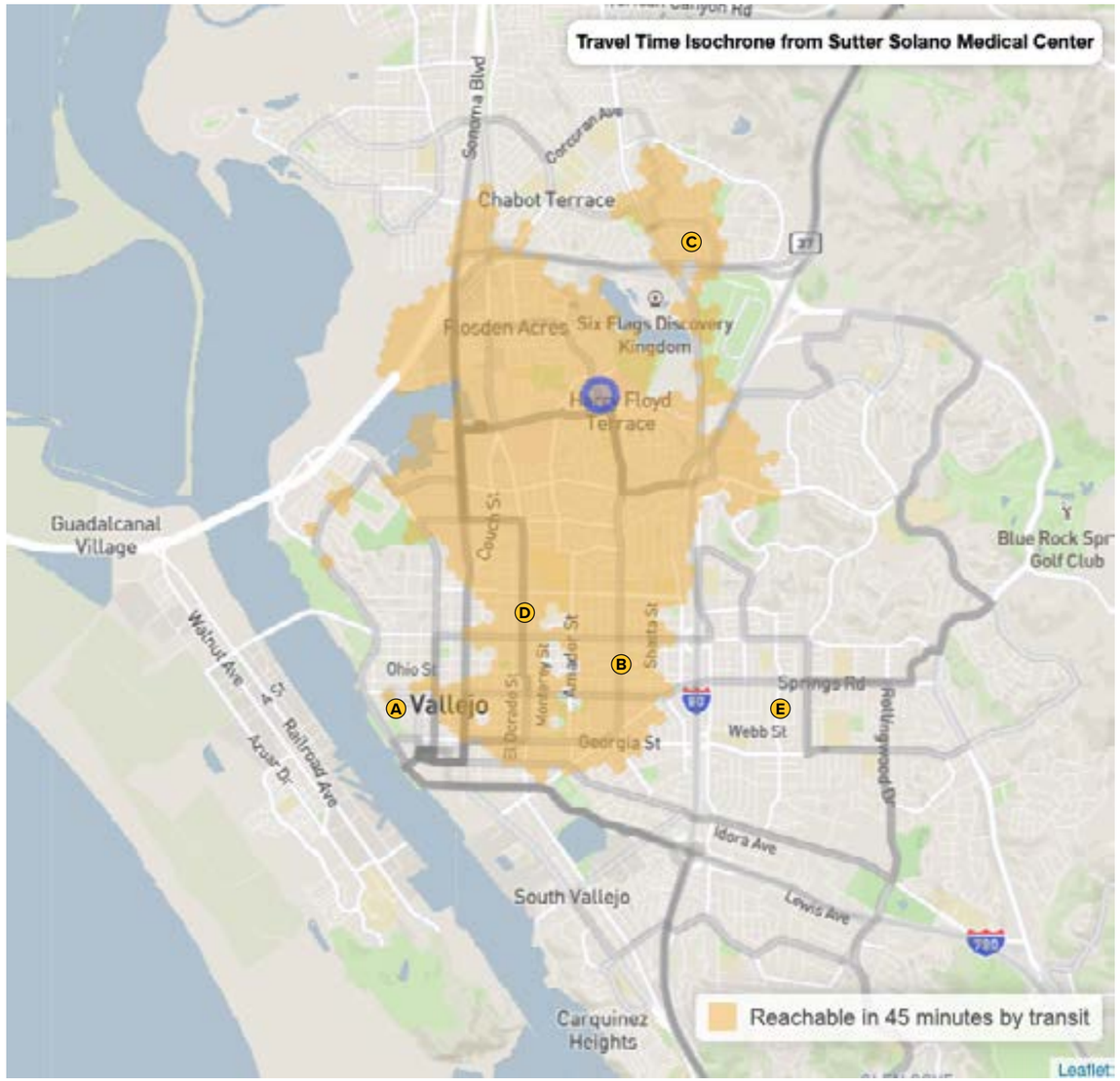

Figure 41: Travel Time Isochrone - Sutter Solano Medical Center

Access to Jobs - 45 minutes

How do we measure access?

The isochrones shown on the preceding pages provide a good sense of how far the network can take you from a few particular places. But how much access does the network provide throughout all of Vallejo and Benicia?

One way to measure this is to look at the number of jobs reachable in up to 45 minutes. While commuting makes up only about a quarter of overall travel, commutes are the most regular type of trip made by most adults; places with more jobs also tend to be places that attract people for other reasons; for example, a shopping center has a lot of employment and also attracts many customers.

We calculate the travel time from a grid of points covering all of the two cities to all census block groups in the Bay Area. This is done using a software called a "routing engine", which enables us to quickly query travel times similar to how Google Maps works, but for millions of possible origin-destination pairs. In our analysis, we use a open-source routing engine called R5 whose development is primarily carried out by the software company Conveyal.

The access values shown here are based on the number of jobs in all Bay Area census block groups (using LEHD data) that are reachable in 45 or 60 minute with transit.

Figure 42 shows the number of jobs located in the block groups reachable from the center of each little hex on the map in 45 minutes or less. Places were more jobs are reachable are shown in darker shades of orange.

In Vallejo, job access is highest in downtown Vallejo Ⓐ . Downtown Vallejo has many jobs, which are all within walking distance. Because most routes converge here, it is also well-connected to other local job centers like the Kaiser and Sutter hospitals, or the commercial areas along Sonoma Blvd.

Higher levels of job access are also shown to the north along Sonoma Blvd Ⓑ and Redwood St Ⓒ, and near Sereno TC. These parts of Vallejo's north side have multiple routes running close together, providing good connections to job centers along Sonoma, in downtown, and along Redwood (Gateway Plaza).

Job access is lower on the east side Ⓓ of Vallejo. Even though there are routes serving each of Tennessee St, Springs Rd, Benicia Rd, and Rollingwood Dr, the east side does not have the same level of local job density as in the north. There are no equivalent employment centers to the Kaiser or Sutter Solano hospitals on the east side. Because reaching the hospitals, or the commercial areas along Sonoma Blvd requires transferring at Vallejo TC, these jobs are not within reach in 45 minutes from origin locations on the east side..

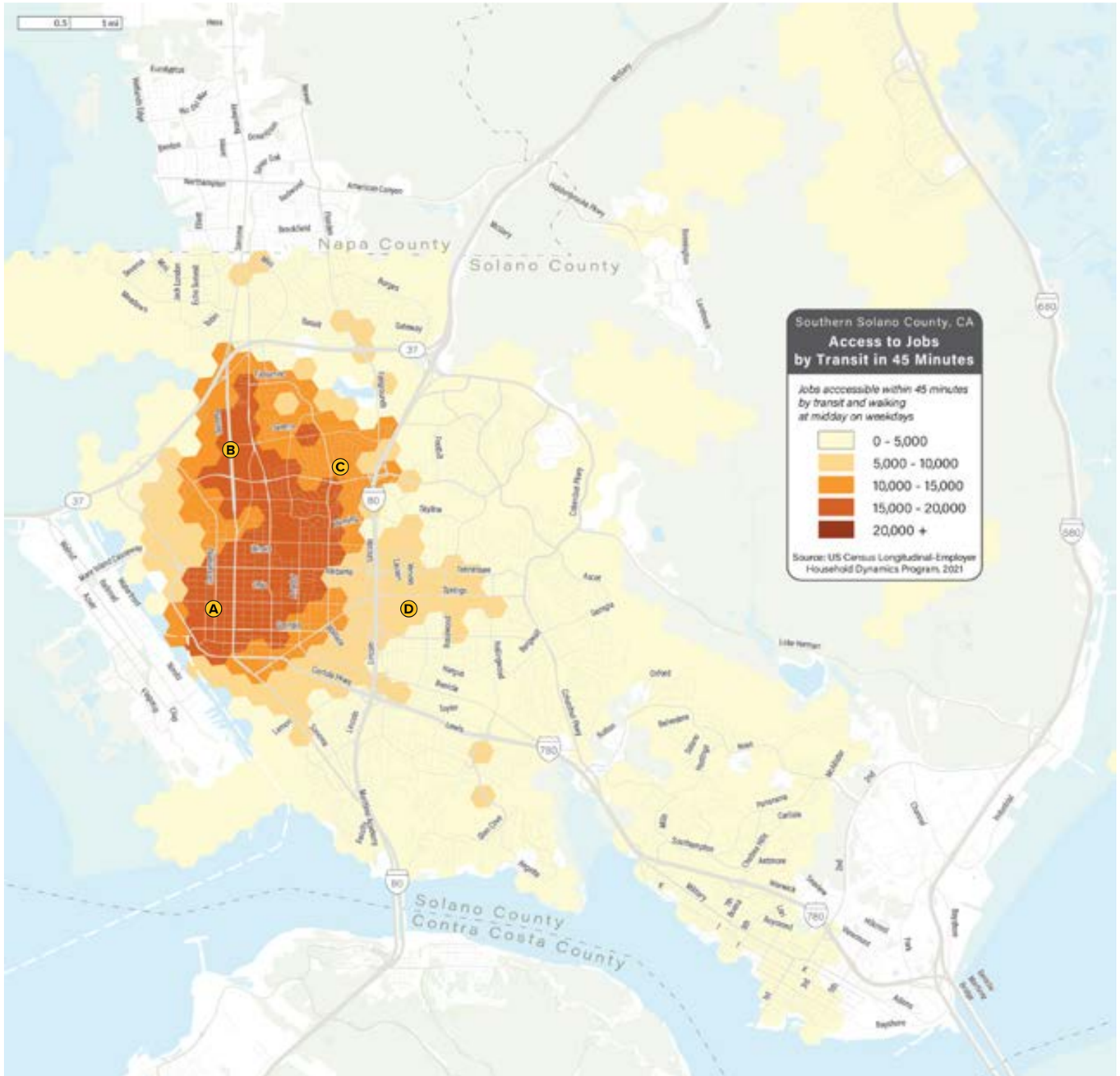

Figure 42: 45-Minute Job Access

Access to Jobs - 60 Minutes

With more travel time, more jobs are reachable from most places; some of the elements of the network that are mainly useful for longer trips also become more apparent. **Figure 43** maps the number of jobs reachable in up to 60 minutes of transit travel time.

The same basic pattern is apparent; the highest levels of job access are seen in downtown, central Vallejo, and on the north side.

In the 45 minute map, most areas outside of these core zones showed up with the lowest levels of access. 60 minutes of travel time is enough for the value of the network to start showing up in places with access to only a single route. Examples include the path of Route 3 in South Vallejo Ⓐ, and Route 1 and 2 on the north side Ⓑ.

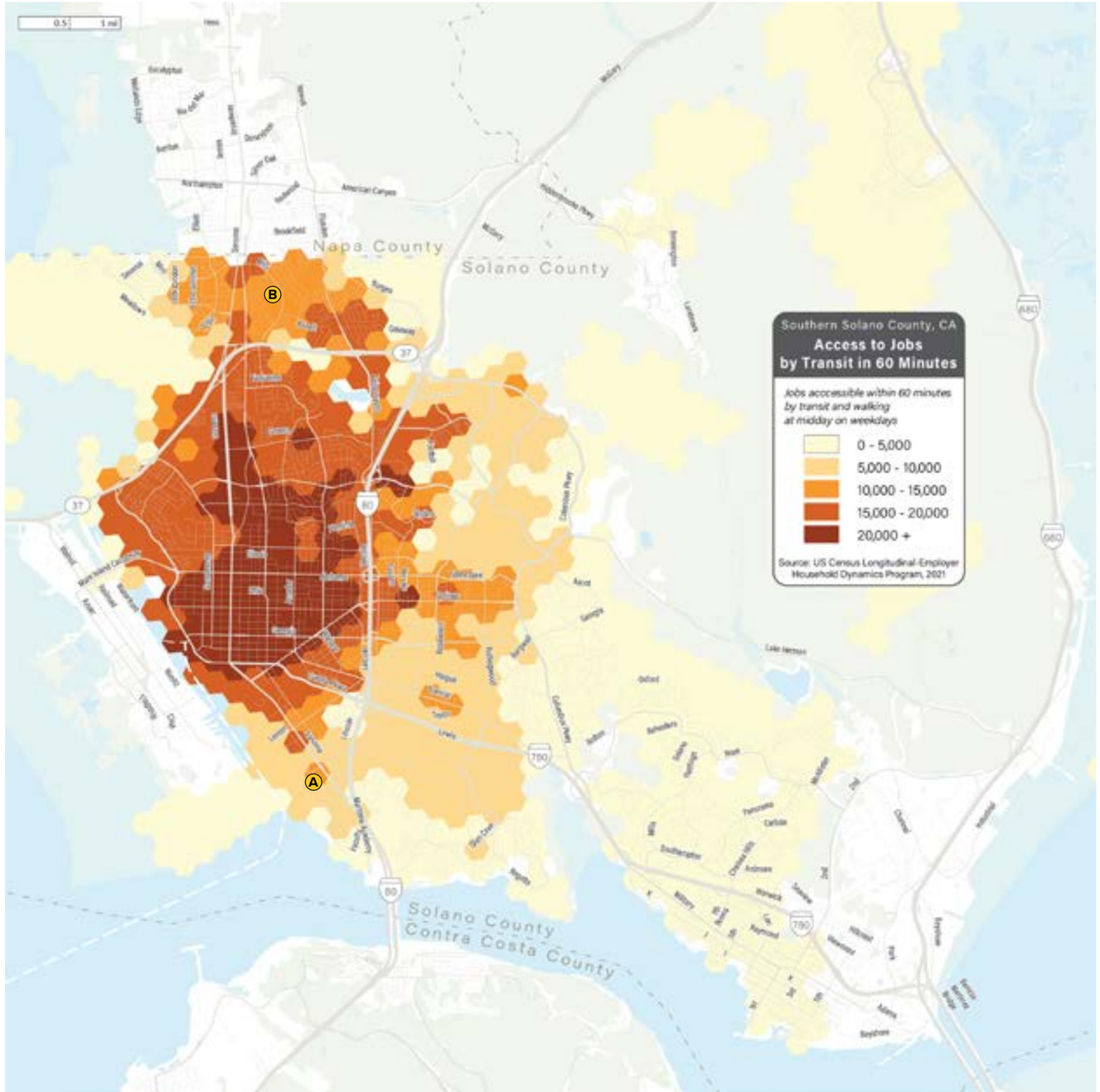

Figure 43: 60-Minute Job Access

Access to Destinations

Access to jobs is an important baseline for how well the network serves one of the most important recurring trips, but what about all the other trips? According to the National Household Transportation Survey (NHTS), only about 22% of total trips are commutes; the rest is made up of all the other types of travel people engage in: to shop, to visit friends, for recreation, to access services, and so on.

We can also measure how well the network performs at connecting people to these other types of opportunities. To do so, we evaluate the number of Replica trip destinations reachable from each hexagon.

Measuring the number of trip destinations reachable is a good proxy for the usefulness of transit because it directly relates to the range of potential trips that can be conveniently executed using the system. The more destinations a person can reach within a reasonable time, the more valuable the transit network is for daily needs, such as commuting to work, running errands, accessing healthcare, or enjoying leisure activities. This is distinct from the analysis of access to jobs because it includes trip destinations for all purposes, not just commutes.

Figure 44 shows the number of destinations of trips in Replica's trip database that are reachable by transit in 60 minutes. Similar to the maps of job access, trip destination access is greatest in central Vallejo west of I-80 Ⓐ, especially from downtown north along Sonoma Blvd Ⓑ. These areas have the highest density of employment and trip destinations, and are well connected by multiple transit routes.

As we saw in the job access analysis, access is lower east of I-80 Ⓒ. This is for two primary reasons: there are fewer major trip generators in this area, and transit connections to Sonoma Blvd, the Kaiser and Sutter hospitals, and other busy places requires a transfer at Vallejo TC, extending travel time.

On the east side, access is greatest along Springs Rd Ⓓ (served by Route 7A/7B). Only places near the 7A/7B have a single-seat ride to Gateway Plaza and other important destinations on the north side of Vallejo, without requiring a transfer downtown.

Destination access is lower in Benicia, because there is less transit available, and fewer local jobs within walking distance. Interestingly, destination access is highest north of I-80 Ⓔ, likely because in this area, the Southampton Shopping Center is within walking distance.

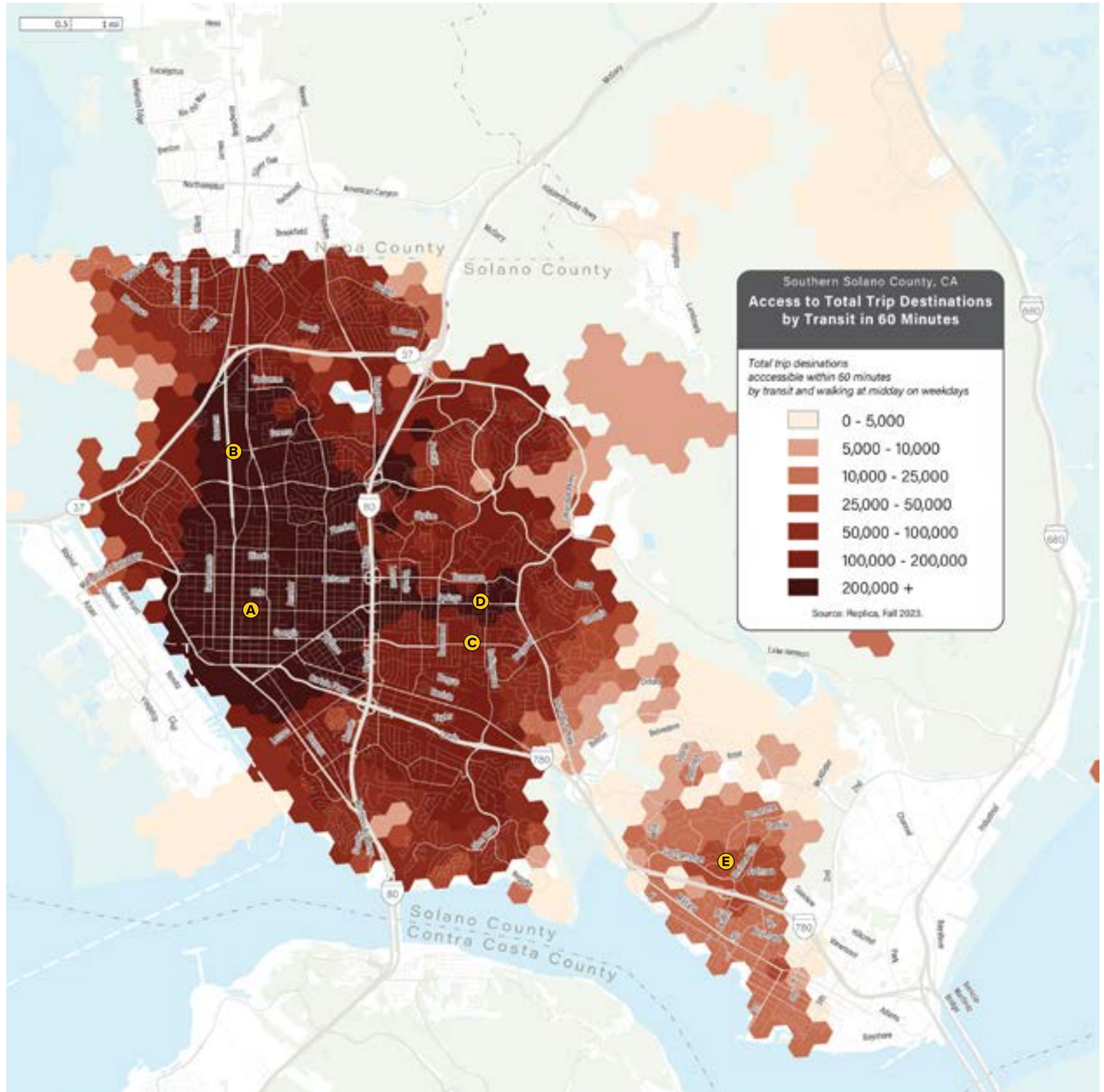

Figure 44: Trip Destinations Reachable in 60 minutes

Access to Non-Work Destinations

What about trips to non-work destinations? The map on the last page looked at trips for all purposes. **Figure 45** shows the same analysis, but only for access to the destinations of non-work, non-home trips. In other words, how many trip destinations are reachable when the purposes included shopping, errands, recreation, or other reasons besides going to a job or returning home?

This map looks a little different than the previous analyses. While the areas with the highest access are still in downtown Vallejo and to the north, we can also clearly see how destination access is elevated along the path of Route 7A/B, which offers a connection to shopping and other opportunities.

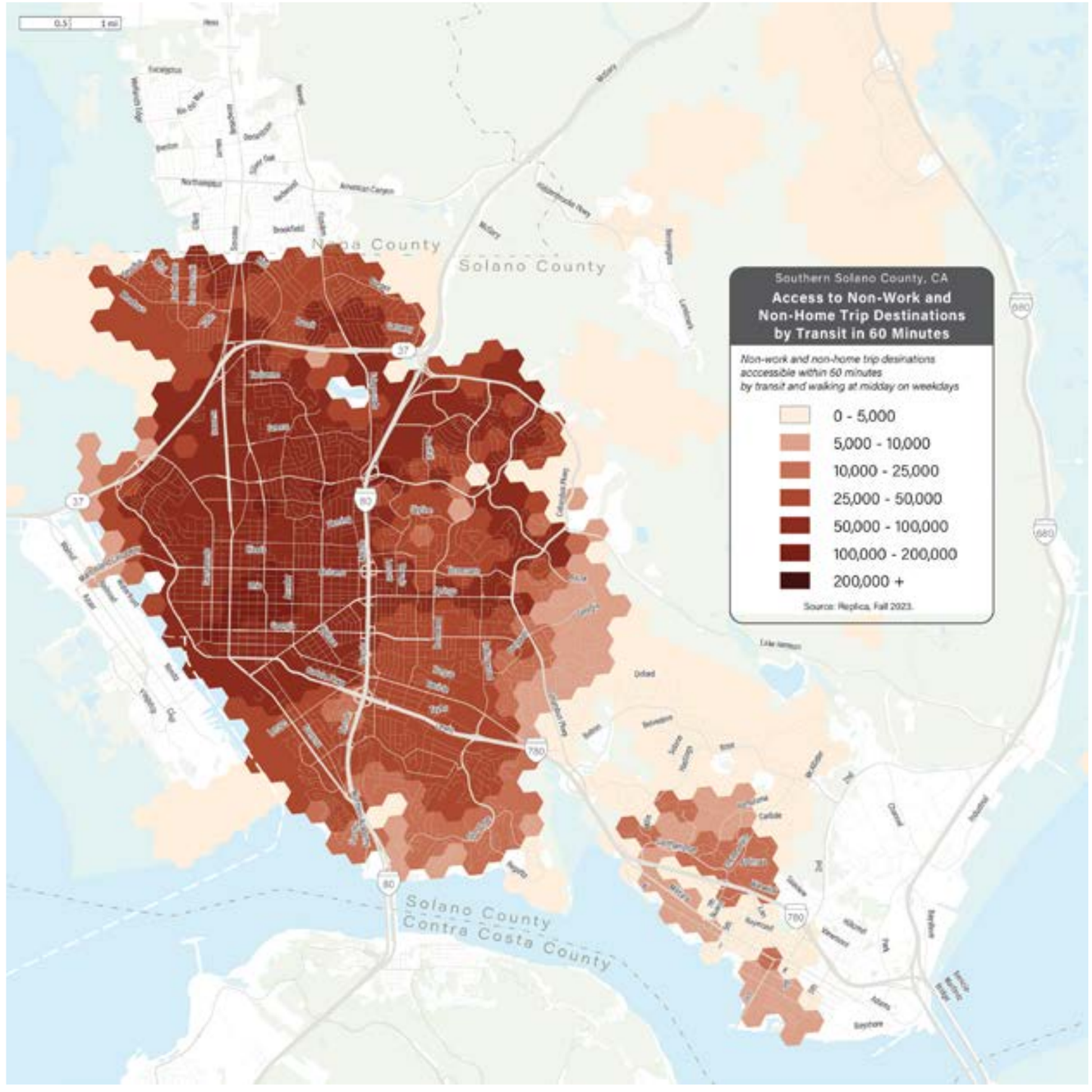

Figure 45: Non-work, non-home Trip Destinations Reachable in 60 minutes

Access Summary

Median Access

Figure 46 displays the median number of jobs and trip destinations reachable in 45 and 60 minutes at midday by Vallejo and Benicia residents, based on the job access at their residential location.

The median resident of Vallejo can reach about 4,100 jobs in 45 minutes, and a about 12,500 in an hour. Job access is much lower for the median resident of Benicia at just 667 jobs; this is because at midday when this analysis was conducted, the only transit service available in Benicia is the Yellow Line, which runs infrequently and is within a short walk to only about 5% of residents.

Many more trip destinations are reachable by the median resident of both cities. That is because trip destinations include all the places people need to travel for work, errands, school, and to return home.

In Vallejo, access is slightly lower for People of Color compared to the median member of the general population, with about 1.5% fewer jobs reachable in an hour. On the other hand, job access is higher for lower-income people (here defined as those living at 200% of the federal poverty level). About 15,000 jobs are reachable by the median lower-income resident, over 23% more than the median number of jobs reachable by a member of the entire population.

Access outcomes are higher for lower-income people in Vallejo than for the entire population because they are more concentrated in central areas of the city near the most useful transit services, as seen in the map of density of lower-income people (**Figure 9 on page 13**).

Job access outcomes are relatively consistent for all people, People of Color, and lower-income people in Benicia. The median Benicia resident can reach about 667 jobs in 45 or 60 minutes, compared to 667 for People of Color and 670 for lower-income people. The values for 45 and 60 minute trips are similar for Benicia residents because this analysis imposes a 1-mile limit on walking, and few residents are close enough to the Yellow Line to benefit from a longer trip without exceeding that long of a walk.

		Vallejo		Benicia	
Demographic Group	Destination Type	45 min	60 min	45 min	60 min
All Residents	Job Locations	4,113	12,496	667	667
	All Trip Destinations	63,214	162,012	12,187	12,187
	Non-Work, Non-Home Trip Destinations	24,814	49,315	4,982	4,982
Lower-Income People	Job Locations	5,301	15,207	670	670
	All Trip Destinations	81,947	175,650	13,008	13,008
	Non-Work, Non-Home Trip Destinations	27,169	56,374	4,982	4,982
People of Color	Job Locations	4,103	12,313	667	667
	All Trip Destinations	61,114	157,401	10,607	10,607
	Non-Work, Non-Home Trip Destinations	24,117	48,401	2,218	2,218

Figure 46: Median Job and Destination Access

Comparing Transit Alternatives

Later in this project, we will develop a draft plan of potential changes to the SolTrans network aimed at making the service more useful and attracting more riders. One way of determining the potential of a transit plan to meet that goal is to compare these kinds of access outcomes with the proposed changes and the existing network.

If access increases with the proposed changes, that is a sign the network could become more useful for more people. It's potential attractiveness to riders is thus increasing.

However, access can also show us where a proposed change could have a negative impact. Imagine a transit option that shifts a route from one street to the next. The people living on the original path of the line would have to walk farther to the nearest bus stop, so their access would be reduced. Through this type of analysis, we can identify which people and which places would gain or lose from any proposed set of changes to the transit network; this is important information for the public, stakeholders and decisionmakers to understand when evaluating changes to service.

3 Ridership & Utilization

Frequency and Productivity

While SolTrans has lost substantial ridership in the years since the pandemic, we can learn a lot about the system by examining where people are using it the most today.

One of the most fundamental ways to understand ridership is to compare it to service level and cost. **Figure 47** charts each SolTrans route comparing productivity on the y axis and peak frequency on the x axis. Productivity is a measure of how many boardings each route generates for each hour of service required to operate it. Higher-productivity service generates ridership more efficiently, given its costs.

Since 2020, almost all SolTrans routes have operated at hourly frequencies. Only the Red Line, Route 3, and the Yellow Line exceed that threshold at rush hour; all routes run hourly or less often at midday.

Despite this, the most productive routes in SolTrans' network are local, hourly routes in Vallejo: Routes 7A/7B, Route 2 and Route 4. However, since September 2024, all local routes are now exceeding 10 boardings per revenue hour, a marked improvement from their performance prior to the permanent implementation of YouthPass.

These routes have something important in common. Each one serves major sources of transit demand in addition to local residential areas. The Red Line connects Fairfield, Six Flags, downtown Vallejo, and BART. The 7A/7B serve Vallejo High, the Kaiser hospital, Gateway Plaza, and the Springs Rd commercial corridor. Along with Route 1, Route 2 is one of the main services along the Sonoma Blvd corridor. And Route 4 is the only route that directly serves the Sutter hospital as well as the various judicial and social services offices near Tuolumne and Florida St.

Most of the other all-day local services in Vallejo are also strong performers, with routes 1, 4 and 5 all exceeding 10 boardings per revenue hour. The least productive routes in Vallejo are routes 6 and 8, which operate on the south and east sides of the city where there are fewer major destinations present.

Prior to the launch of permanent YouthPass, SolTrans' lowest performing routes are the school services, lines 15 and 17. In September 2024, ridership and productivity on these routes has increased dramatically, but it remains to be seen if this will be a durable trend.

Apart from the Red Line, the most productive Solano Express is the Green Line at just under 10 boardings per revenue hour. The productivity of the express routes is slightly exaggerated in this view, because the denominator for the y-axis is revenue hours, which only include time spent on trips where passengers could be riding, and not the extra time routes spend laying over between trips or in positioning "deadhead" runs from the garage to their starting point. Because of their length and directional alignment with peak demand, the express services spend an average of 15% of their total service time in pull-in/pull-out and preparatory time, compared to an average of 4% for the local services.

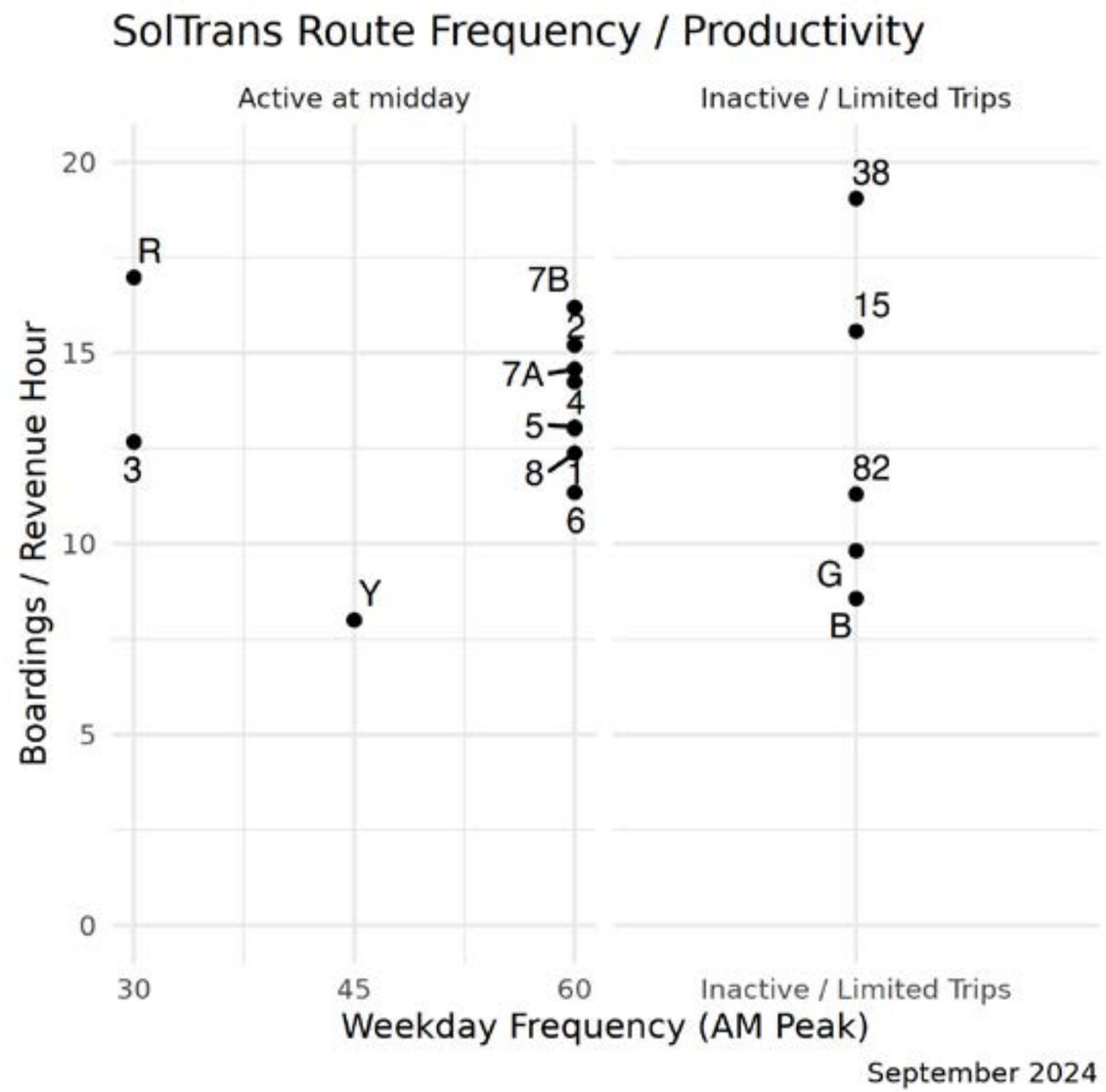

Figure 47: SolTrans Route Frequency and Productivity

Route Key Performance Indicators

The Red Line is one of SolTrans' most productive routes; its also the highest-ridership route in the system, with over 1000 daily boardings contributing over 27% of daily weekday system ridership. **Figure 48** provides a summary of key performance indicators for each current route for September 2024.

From this table, we can make a few more detailed observations about the performance of current services. As mentioned previously, the most productive routes in the system are routes 7A/7B, 2, 4, and the Red Line. These 5 services contribute over 50% of daily systemwide ridership, and make up about 39% of overall daily service.

On Saturdays, all routes operate a more limited schedule, and carry less ridership. Systemwide, Saturday ridership is about 43% of weekday, and Sunday is about 19%. Systemwide productivity is lower as well, at about 7 boardings per revenue hour compared to 8.7 on weekdays.

On Sundays, only five routes operate, including three of SolTrans' highest ridership services: the Red Line, 7A, and 7B. While Sunday ridership is less half of Saturday, systemwide productivity is actually higher at about 7.6 boardings per revenue hour, led by the Red Line at over 16 boardings per revenue hour.

Ridership has risen substantially through 2024, with September average system ridership at over 4,000 boardings per weekday, compared to about 2,600 in spring 2024. This increase in ridership coincided with the expansion of the YouthPass program, which provides free access to the system to all users under age 18.

In September 2024, all routes averaged at least 20% more weekday riders than on an average weekday in the spring. Routes 15 and 17 gained the most in relative terms, with about 5-10 times as many students using them to travel to school as in the previous school year. Other local routes that saw the largest increase in ridership included Route 3 (+73%), Route 8 (+80%), and Route 1 (+38%).

In September, the highest-ridership local route was still the combined 7A/7B (over 500 daily boardings when both directions are combined). However, routes 1, 2, 3 and 4 all averaged at least 200 average daily weekday boardings, with routes 2 and 4 exceeding 14 boardings per revenue hour.

Ridership on the Red and Blue lines also grew by over 50%.

		Weekday			Saturday			Sunday		
Route Number	Route Name	Boardings	Revenue Hours per Weekday	Boardings / Rev Hr	Boardings	Revenue Hours per Weekday	Boardings / Rev Hr	Boardings	Revenue Hours per Weekday	Boardings / Rev Hr
Local Routes										
1	Rancho Vallejo	231	18.45	13.01	133	13.02	10.22	107	13.02	8.22
2	Crest	259	18.53	15.21	140	11.52	12.16			
3	South Vallejo	200	16.37	12.67	112	11.42	9.81			
4	Tuolumne	211	15.27	14.24	90	10.32	8.72			
5	Six Flags	178	14.13	13.06	128	9.98	12.82			
6	Tennessee	145	13.25	11.34	74	9.53	7.76			
7A	Clockwise	241	17.18	14.58	128	11.72	10.92	108	13.82	7.82
7B	Counterclockwise	264	16.80	16.20	130	11.50	11.30	108	13.42	8.05
8	Glen Cove	165	13.80	12.38	56	9.35	5.99			
15*	Rose	34	4.00	15.57						
17*	Hastings	105	4.40	42.28						
38*	Jesse Bethel	20	1.77	19.05						
Express Routes										
	Blue Line	328	47.87	8.56	92	19.13	4.81	0		
	Green Line	235	29.13	9.82	0			0		
	Red Line	1088	69.23	16.98	554	28.70	19.30	310	12.83	24.16
	Yellow Line	184	25.80	8.00	89	12.92	6.89	75	12.77	5.87
	82	113	12.00	11.3						
Full System		**4001**	**304**	**13.2**	**1726**	**159**	**10.8**	**708**	**71**	**10.7**

Figure 48: SolTrans Route Performance Summary

Weekday Ridership

Where are people finding the system useful today? This section examines data on current system ridership. **Figure 49** shows one of the simplest ways of viewing this data, mapping the average number of people who board a bus each day at each stop.

Many stops in SolTrans' network average fewer than one daily boarding. Some of the places with the highest average daily ridership include:

- SolTrans' transit centers Ⓐ. Boardings are high at these locations due to transfers between routes.
- Curtola Park-and-Ride Ⓑ.
- Vallejo High School Ⓒ.
- Stops serving commercial destinations near Redwood and Sonoma.
- Benicia High School and Middle School Ⓔ.

This map also includes a heatmap layer that sums ridership for all stops within 1/2-mile of the center of each hex, weighted by the distance to the stop. This visualization helps show the combined ridership activity of multiple smaller stops.

The heatmap mainly calls out the same activity centers as the stop map, with a few additions. Gateway Plaza is much clearer on the heatmap Ⓓ, because unlike some other destinations its ridership is split among multiple stops in the area.

Weekend Ridership

The maps on the following page display average daily ridership activity for Saturday and Sunday.

The ridership pattern for both weekend days is generally quite similar to that of weekdays, with the busiest areas apart from the SolTrans' facilities at Gateway Plaza and along Springs Rd on Route 7A/7B.

With Sunday service in Vallejo and Benicia limited to the Red and Yellow lines, 7A/7B, and Route 1, the pattern of ridership on Sundays is similarly limited to the service areas of these routes. As average daily ridership on Sunday is less than 1/4 of the level of weekdays, the overall magnitude of boarding activity is lower across the network.

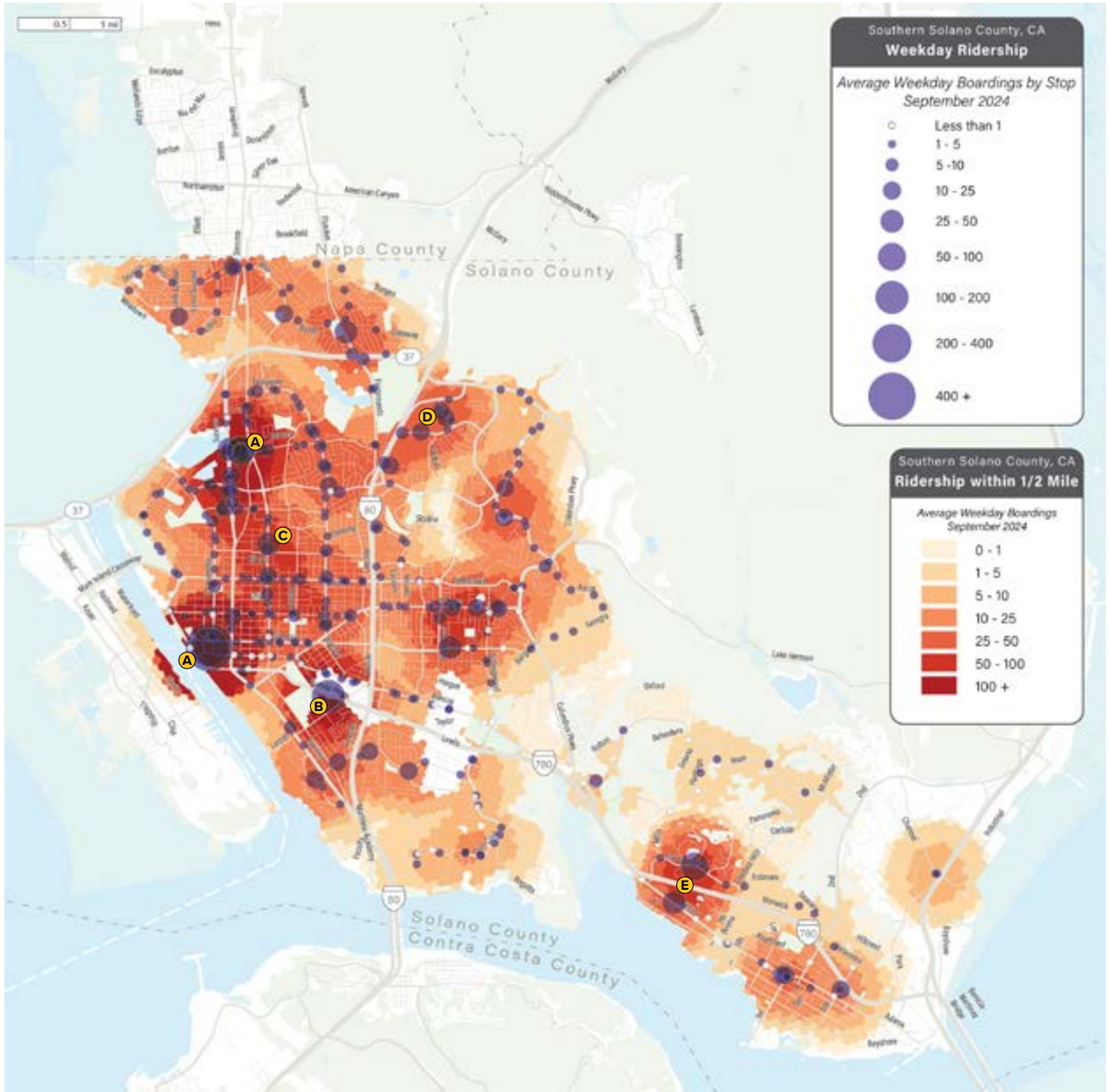

Figure 49: SolTrans Weekday Ridership by Stop - Vallejo & Benicia

Saturday & Sunday Ridership by Stop

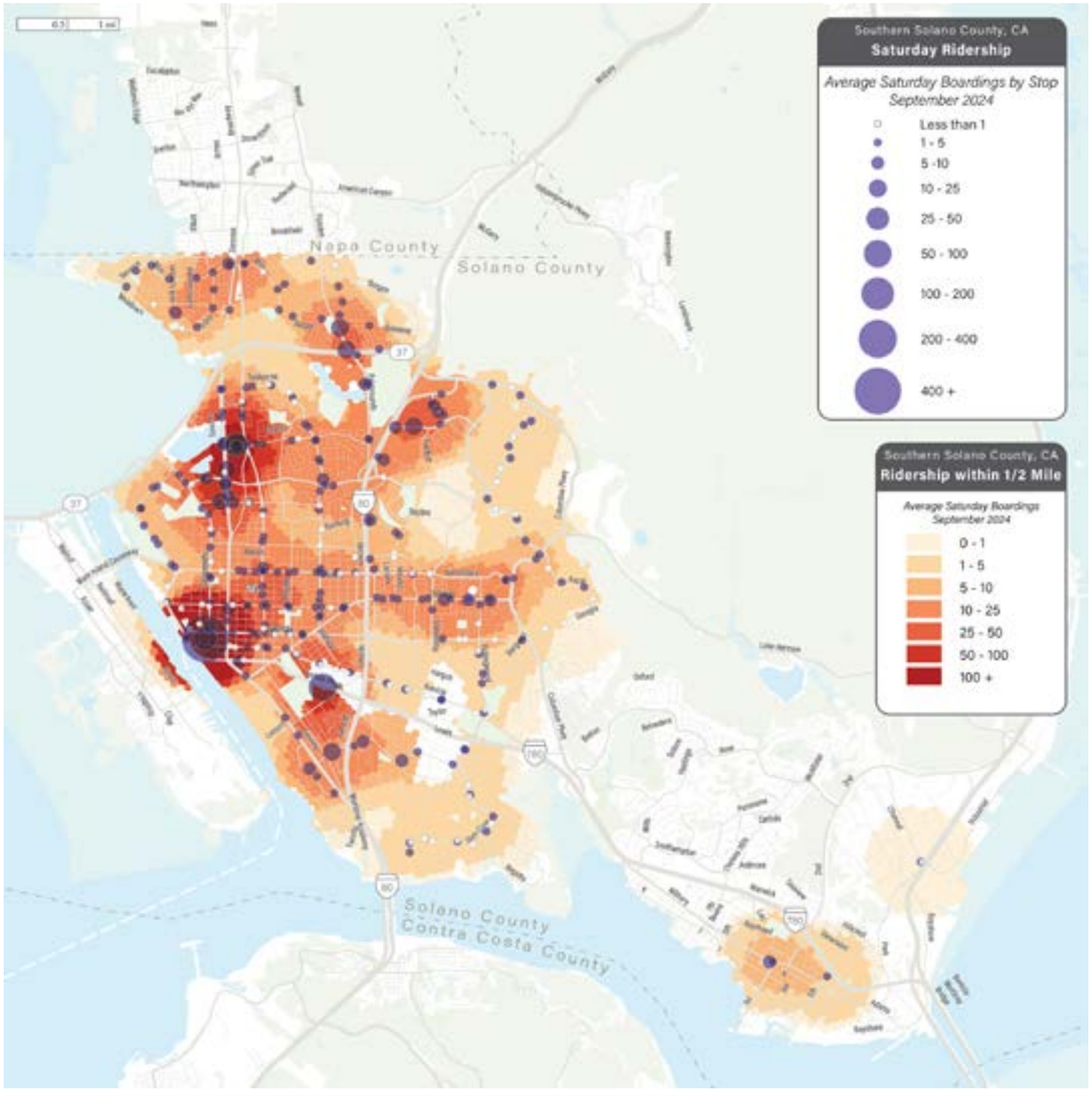

Figure 50: SolTrans Saturday Ridership by Stop - Vallejo & Benicia

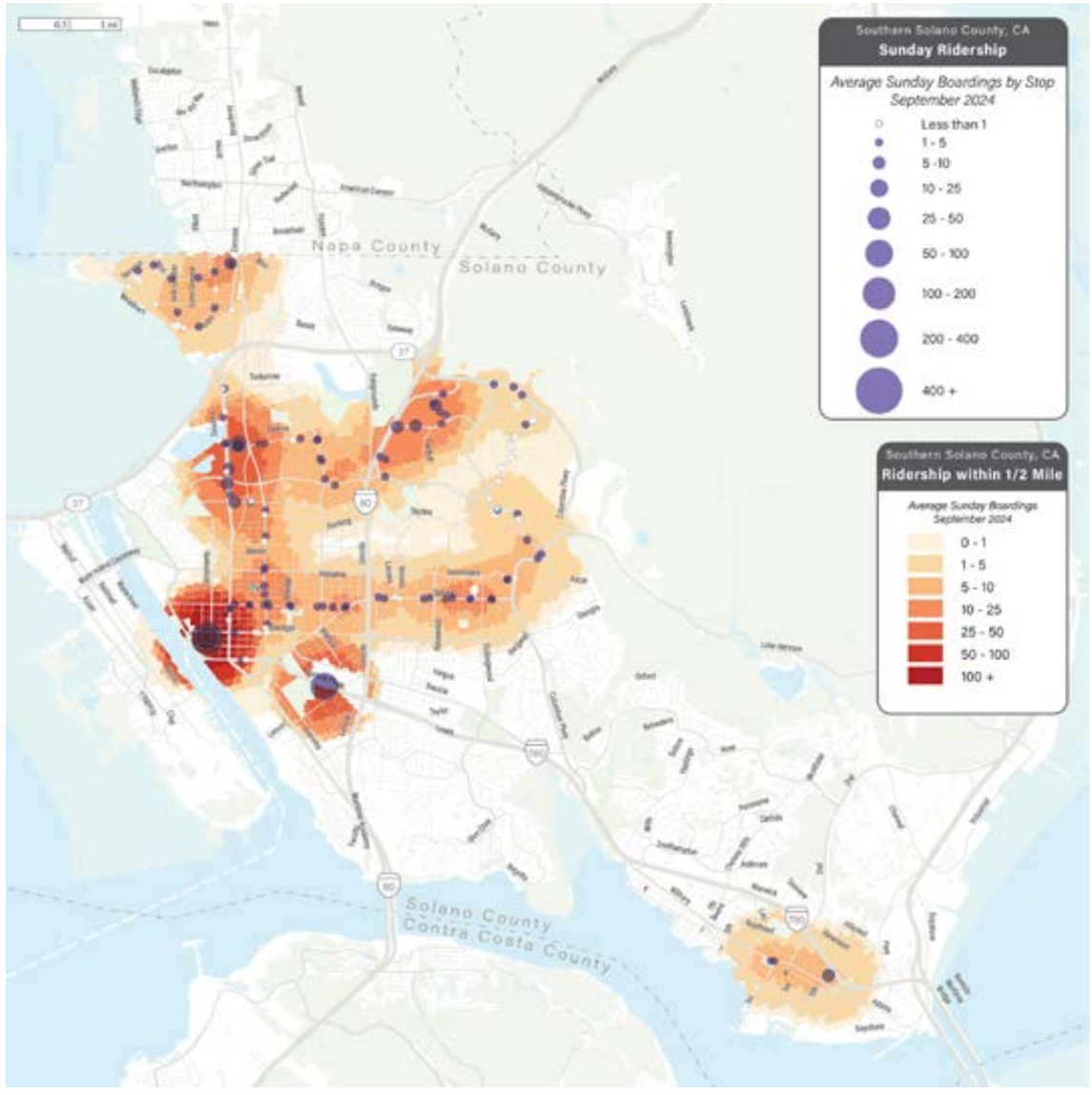

Figure 51: SolTrans Sunday Ridership by Stop - Vallejo & Benicia

Express Ridership - Red, Green

The previous two pages examined local ridership in Vallejo and Benicia. This section maps ridership on each of SolTrans' Solano Express services.

Red Line

Figure 52 displays average weekday boarding activity by stop for the Red Line.

Because the majority of people riding the Red Line use it to travel between Solano County and the El Cerrito del Norte BART station, the northbound Red Line stop at the station is the Red Line's busiest stop Ⓐ. About 440 people per day board at this stop.

Southbound, about 46% of Red Line boardings occur at Vallejo TC; about 24% at Curtola Park & Ride, about 12% at Fairfield TC, and about 8% at the Suisun City Amtrak station. The remainder are spread among the other stops, including Sereno TC, Six Flags, and SCC Fairfield.

Through travel from BART to Solano County is the most common type of trip made on the Red Line, there is also some activity for trips between Vallejo and Fairfield. About 80 boardings per day total happen on the Red Line northbound at Vallejo TC or Sereno TC;. Since only about 23 people per day get off a northbound Red Line trip at Sereno TC or Six Flags, the majority of these boardings are people using the Red Line to travel between Vallejo and Fairfield.

Green Line

Figure 53 shows ridership by stop for the Green Line. The Green Line offers direct service from Fairfield to El Cerrito del Norte, stopping at both the Suisun City Amtrak station and Fairfield TC. The vast majority of southbound ridership on the Green Line occurs at Fairfield TC, with only about 7% boarding at the Suisun City station.

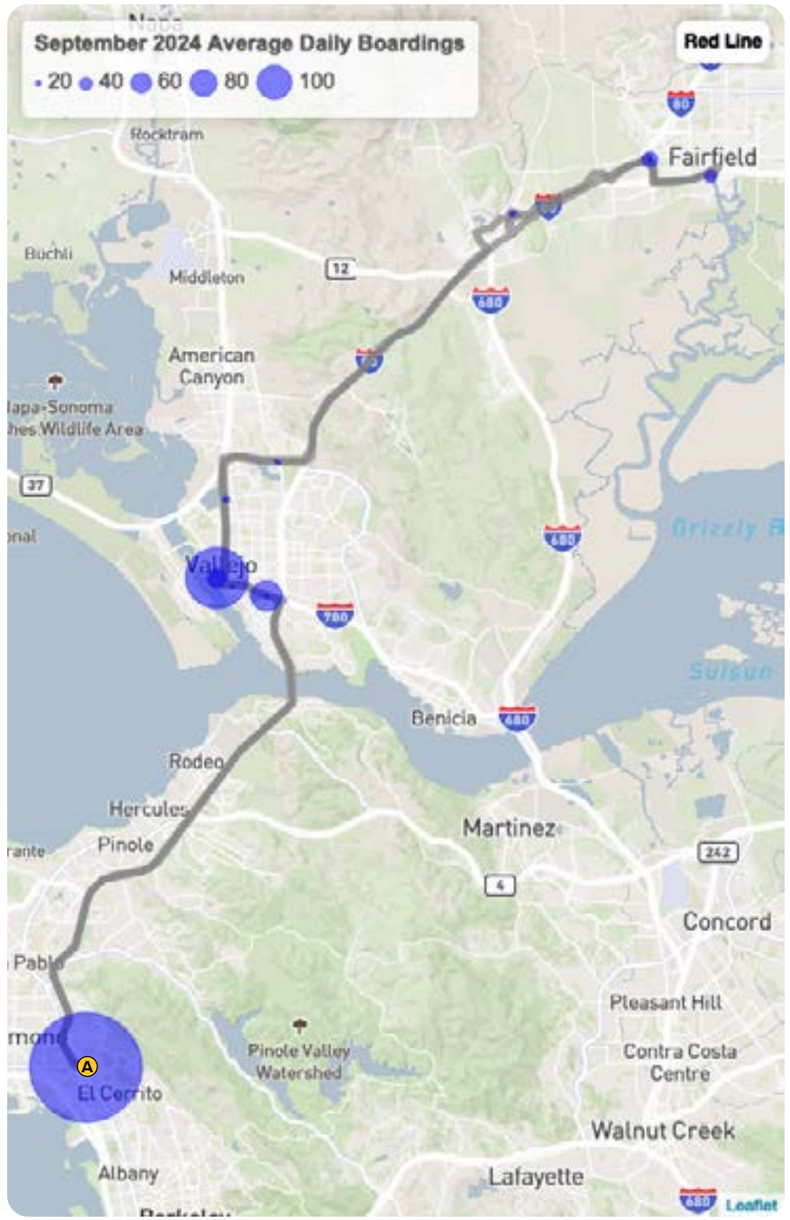

Figure 52: Red Line Weekday Ridership by Stop

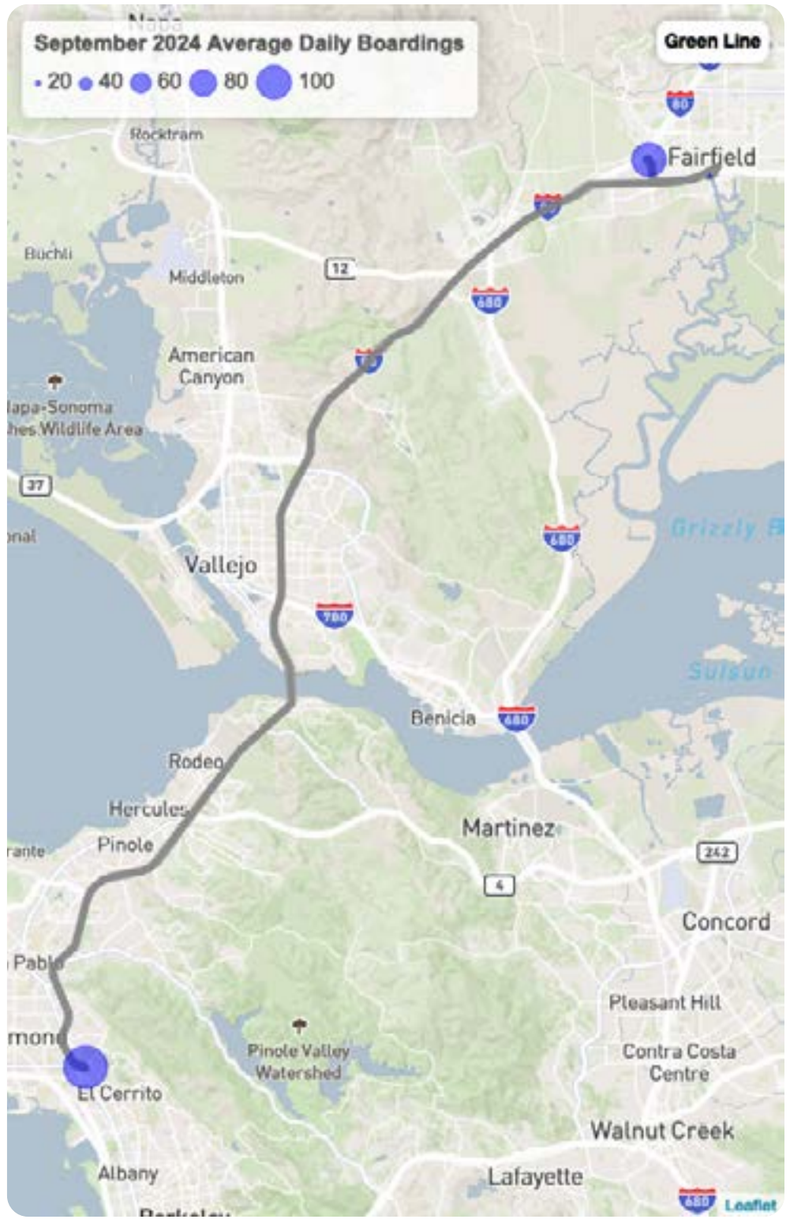

Figure 53: Green Line Weekday Ridership by Stop

Express Ridership - Blue, Yellow

Blue Line

Figure 54 shows average weekday ridership on the Blue Line. The Blue Line connects Dixon, Vacaville Fairfield and Benicia to BART at Walnut Creek. A few trips also serve Davis at a stop near the south end of the university. As mentioned earlier in this document, the Blue Line has relatively limited midday service south of Fairfield.

The majority of riders using the Blue Line utilize it to reach BART from northern Solano County. About 109 boardings per day occur at the Walnut Creek stop, representing about 58% of all northbound ridership on the route.

Interestingly, while trips to and from BART make up the largest source of ridership for the Blue Line, there is evidence that it is also serving an important local circulation function for trips between Fairfield and Vacaville. Nearly 25% of northbound ridership on the Blue Line is actually boarding in Fairfield, which means their destination is somewhere north along I-80.

Yellow Line

The Yellow Line connects Vallejo and Benicia to the BART Yellow Line at Walnut Creek. **Figure 55** shows average weekday ridership by stop on the Yellow Line. The largest number of daily boardings eastbound occur at Vallejo TC, with about 45% of eastbound boardings. In the first half of 2024, Vallejo TC was responsible for the majority of eastbound boardings, but as of September 2024, nearly as many eastbound riders board in Benicia.

Westbound, over 84% of boardings happen at Walnut Creek; there are only about 6-7 boardings per day westbound in Benicia, indicating that few people are using the route to travel between Vallejo and Benicia, despite the fact that it is the only transit connection between the cities.

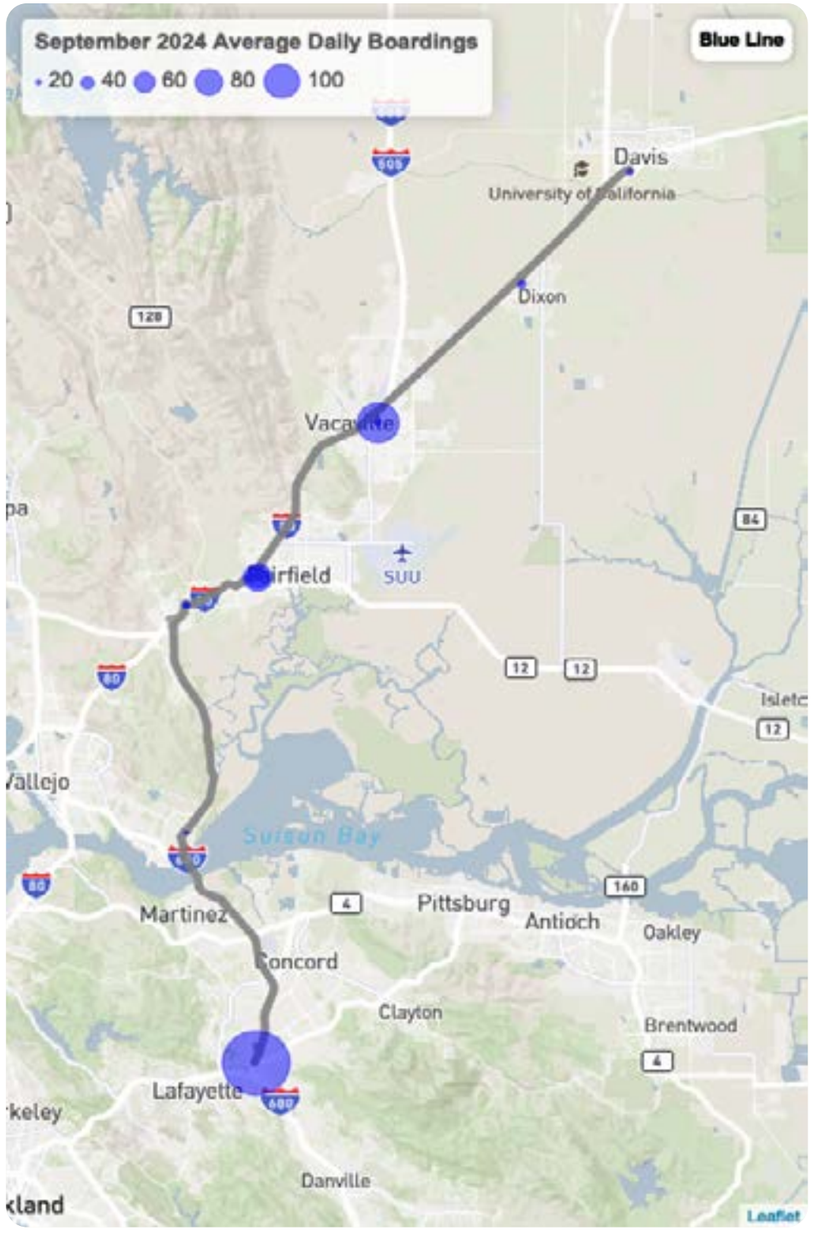

Figure 54: Blue Line Weekday Ridership by Stop

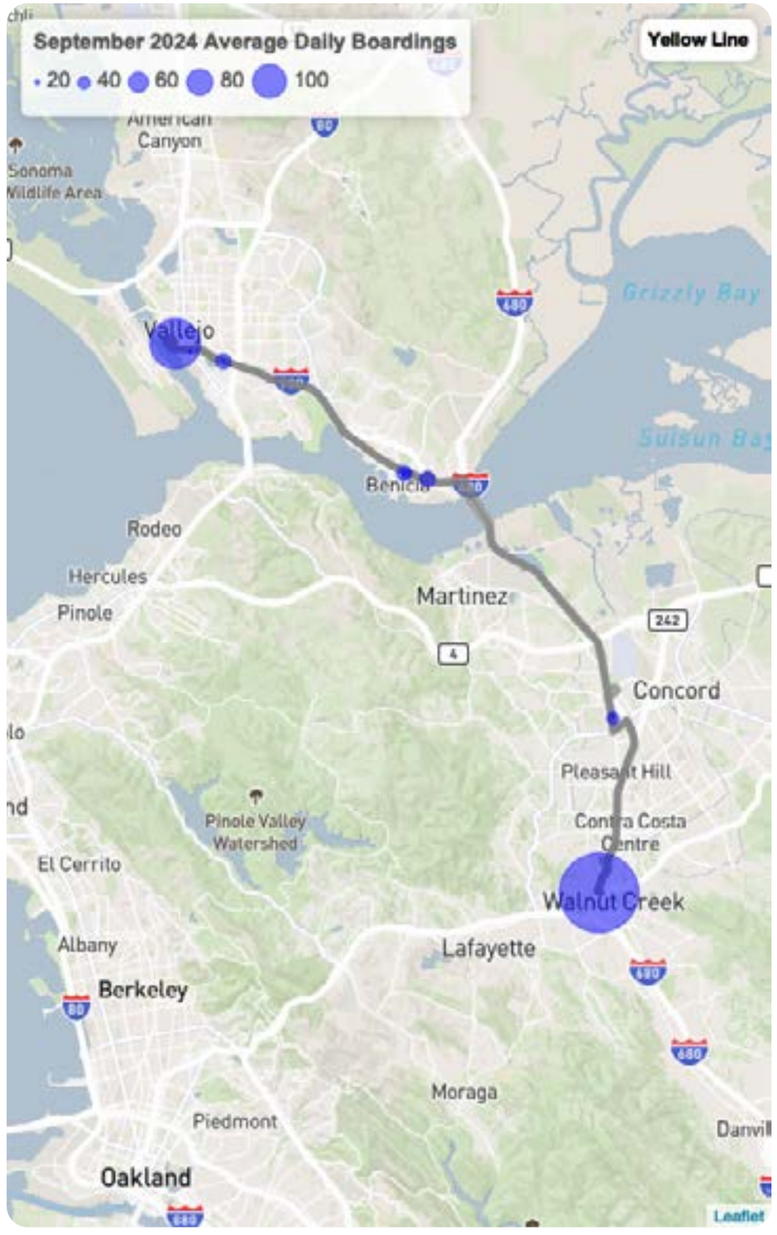

Figure 55: Yellow Line Weekday Ridership by Stop

4 Network Design Strategies

Potential Strategies - Local

If SolTrans wants to build ridership, making changes to the network could be a powerful tool. Many people already find the existing network useful; the success of high-productivity routes like the 7A/7B and the Red Line are evidence of this.

Making the Network More Useful

In Chapter 2, we described how the usefulness of the network for reaching jobs and destinations varies in different places, and at different times of the day. Ridership arises when lots of people find the network to be a relatively convenient option for their trips, so the best way to build ridership is to try to broaden the range of trips that could be conducted on transit.

How do we do that? By increasing access. How do we increase access? By addressing some of the challenges in the existing system that make travel hard because of long travel times, insufficient span, or a lack of coverage.

Key Local Improvements

From our analysis, we identify four major service design challenges for the local network in Vallejo and Benicia:

- **Low-frequency service.** Currently, all local routes run hourly except for Route 3. Prior to the pandemic, several other SolTrans routes ran at 30-minute frequencies. Improving frequency reduces waiting time, which is the most effective way to reduce overall journey times for short trips around Vallejo. Based on the ridership and productivity of current services, the top priority investments for enhanced frequency should be the 7A/B loop and Sonoma Blvd.
- **Limited span of service.** Most local routes turn off by about 8-9 PM on weekdays. This means that transit is not an option for anyone who needs to travel after that time, including anyone who works a closing shift at most retail, food or service jobs.
- **Limited service on Saturdays.** While all routes except school services run on Saturday, spans are shorter limiting the range of potential trips transit can service.
- **Limited service on Sundays.** Only a handful of routes operate on Sundays. That means that anyone who needs to travel to a place that isn't on one of those few routes in operation will need to find another way to travel.

All of these have the potential to make service more useful. Improving frequency throughout the day can reduce waiting times for all sorts of existing trips. On the other hand, extending span or turning on more Sunday routes has the potential to make some trips possible by transit that are just not viable with the current system.

What would be required to make improvements?

Making any of these improvements would require adding service hours and spending more money. SolTrans is not projecting substantial new revenue in coming years, so any improvements focused on these challenges must be offset by changes that reduce cost elsewhere in the network.

In practice, this will likely require consolidating some existing services to reduce cost, and reinvesting that savings in the enhancements described above. Route consolidation means combining pieces of multiple routes in a new route, saving resources that can then be deployed elsewhere in the network.

Early Engagment

In August 2024, we conducted a few public engagement activities to help inform stakeholders and the public about the COA and describe some initial concepts of improvements to the SolTrans network that we are considering.

We hosted a stakeholder meeting, where various community organization leaders and social service providers from the county were invited to provide their feedback on the initial concepts that we developed.

We also tabled at the Vallejo Farmers Market in August, where we showed ideas of route changes to the public, and asked for feedback using a sticker voting exercise.

What We Heard

For local bus service, we polled attendees at the stakeholder workshop about their priorities for better service. Attendees agreed that better frequency on busy routes was a high priority. They also generally agreed that more service on weekends would be another important area to prioritize.

This input represents only the first engagement effort in this project; further sessions and online efforts will be conducted in 2025 around the draft plan. The initial round of engagement was intended as an early "gut check" to confirm that these service issues are relevant to everyday riders and members of the community, and worthy of consideration during further design efforts.

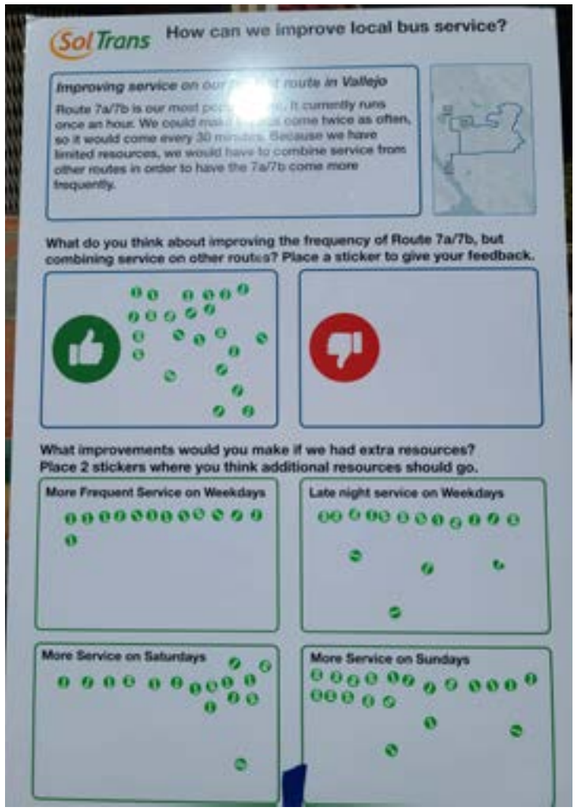

Figure 56: Vallejo Farmers Market Engagement Activity

Potential Strategies - Express

At the Vallejo Farmers Market, people were asked about their thoughts on doubling the frequency of Route 7A/7B, while consolidating service elsewhere. Most people responded positively to this idea, as shown in the engagement board responses in **Figure 56**.

We also asked farmers market attendees about their top two priorities on how to improve local service, if SolTrans had additional resources to spend. Many people identified having more frequent service on weekdays and more service on Saturdays and Sundays as a top priority.

Key Express Service Improvements

In addition to local service changes, we asked key stakeholders and the attendees at the farmers market about changes to improve the Express service network. **Figure 57** shows our initial concepts for changing SolTrans' Express Service routes. We wanted to hear from the public whether these ideas were worth exploring further. The changes include:

- Combining Red and Green line service into the Red Line, which would add more trips between Fairfield and Vallejo, or to BART.
- Moving the southern end of Blue and Yellow lines to North Concord instead of Walnut Creek. The route to Walnut Creek BART experiences substantial congestion making service less reliable.
- Discontinuing Blue Line service to UC Davis, and moving the southern end of the route to North Concord. The extra resources from shortening the route could be used to provide a more regular schedule of trips between BART, Fairfield, Vacaville and Dixon.

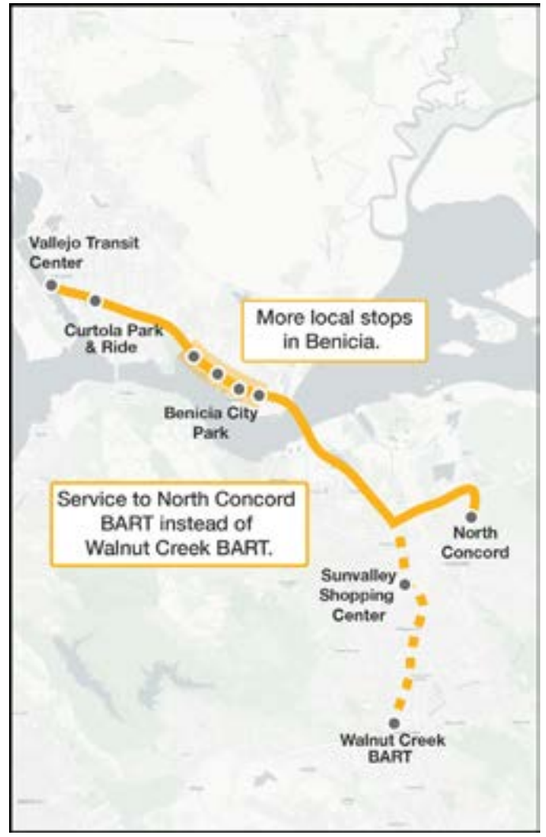

Figure 57: SolTrans Express Service Improvements: Initial Red and Green Line Concepts

These ideas were included in the initial engagement activities, but do not represent the full range of possible improvements that could be developed for the express network. Further input on more detailed express service alternatives will be sought during the second phase of public engagement in 2025.

Red and Green Line

The Red Line is SolTrans' busiest route, the only connection between Vallejo and El Cerrito del Norte BART, and between Vallejo and Fairfield. It also offers a longer schedule of trips between Fairfield and El Cerrito del Norte than the nonstop Green Line service.

The Red Line offers 30-minute headways between Vallejo TC and El Cerrito del Norte during the peak periods, but this headway drops to approximately hourly in the middle of the day when all trips continue to Fairfield. As a result, passengers face longer waiting times and fewer opportunities to travel between Vallejo and Richmond during the middle of the day.

The purpose of studying combining the Green and Red lines is to determine whether using those resources to offer a higher and more consistent all-day frequency between Vallejo and Richmond would improve mobility outcomes in a way that riders and members of the public would value.

Blue and Yellow Terminus

Walnut Creek is a major transfer point to BART and County Connection services, but accessing it requires operating on the frequently congested I-680 corridor. There are two potential alternative terminus options that

Initial Public Feedback

would help get Blue and Yellow lines out of this traffic, each with their own advantages and disadvantages.

The first option would be to terminate the Yellow and Blue lines at the North Concord BART station. This would mean a faster connection to BART in terms of the time spent on a SolTrans bus, but at a station with few local bus connections, and with a higher BART fare for trips into Oakland or San Francisco.

The second option would be to terminate at Concord BART station. Concord is a much larger transit hub, where BART fares to major employment centers are less costly. Concord also offers a better range of connections to destinations in Concord than are available at Walnut Creek. If Concord were the Yellow and Blue lines' terminus, the most efficient way to reach the station would likely be via Highway 4 and the North Concord station; with this arrangement, people who just wanted to get on BART as soon as possible and didn't mind paying a little more could transfer at North Concord, while people who wanted to connect with a local bus or pay a lower BART fare could stay on to Concord.

Davis Terminus

Right now, the Blue Line services Davis at a location that is not particularly convenient for either of the main reasons to serve the town: access to UC Davis, or connections with YoloBus routes continuing into Sacramento. Few people use the service, and it requires expensive deadhead trips from Vallejo to Fairfield to move Blue Line buses to the northern end of the I-80 corridor in time for the commute period.

There are two basic options when it comes to Davis service. The first is to just stop serving Davis, and use those resources to improve the Blue Line somewhere else. This is the concept we discussed with the members of the public and stakeholders who attended our events in August 2024.

The other option is to extend the Blue Line deeper into Davis to reach the transit hub at the Memorial Union. This would require adding running time (and cost) to the Blue Line, but has the potential to establish a connection with YoloBus that could possibly be used to complete trips between Fairfield, Vacaville, or Dixon, and Sacramento.

What We Heard

When we asked stakeholder workshop attendees about their opinions on these changes, most strongly agreed or agreed that these changes were worth exploring further.

At the farmers market, many people we talked to also agreed that these ideas were worth exploring further. **Figure 58** shows the results of the sticker voting exercise we conducted at the farmers market. Many people strongly supported exploring these changes further

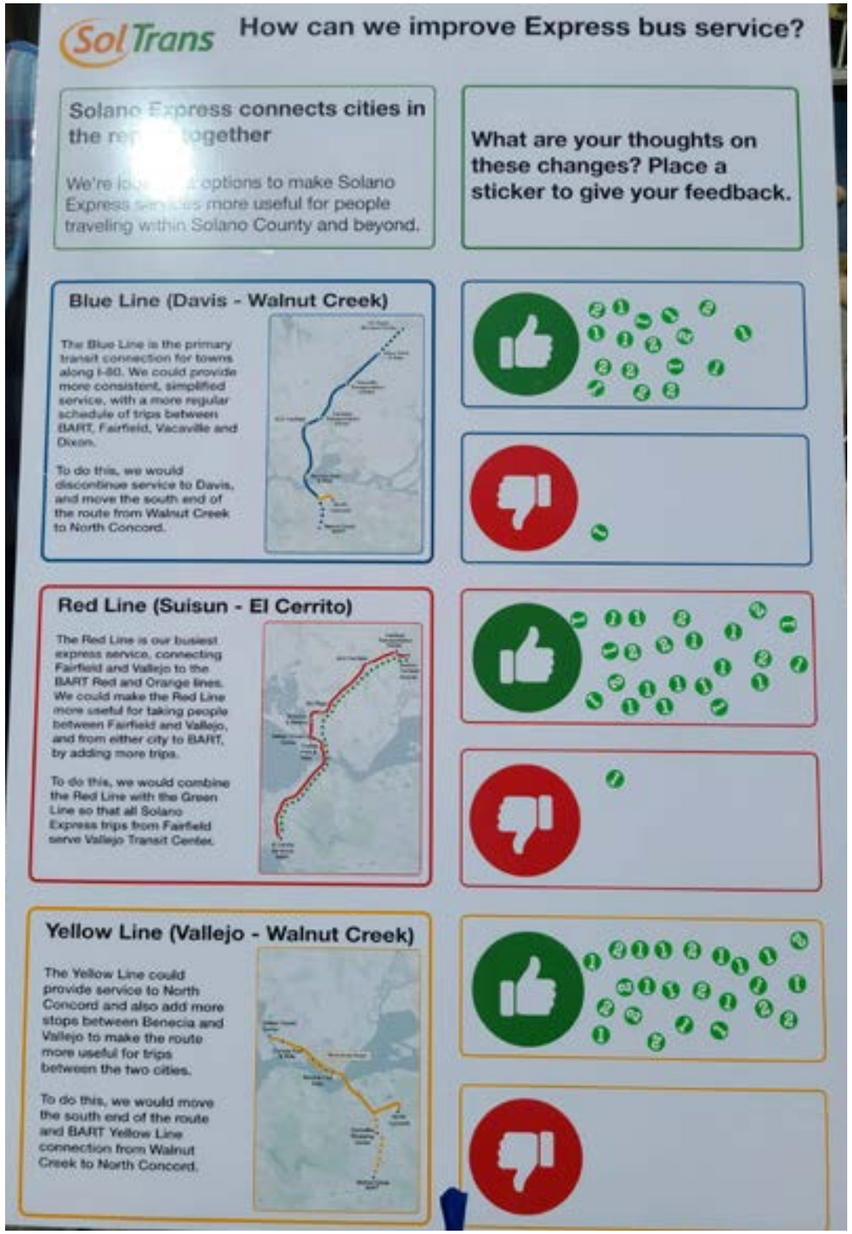

Figure 58: Vallejo Farmers Market Express Engagement Activity

Next Steps

Next Steps

As we have heard from our initial public feedback, there is support for exploring our early concepts in a more in-depth way. We will now be developing a detailed draft plan with more specific recommendations and changes during Fall 2024. We will then analyze cost and mobility outcomes of that network, so that the benefits and costs of changes along these lines can be clearly understood.

After the initial plan is developed, we will conduct a more robust engagement effort in early 2025, and ask the public about their specific feedback on the future SolTrans network. That feedback will be used in Spring 2025 to refine the draft into the final plan.

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